ODESA NATIONAL MEDICAL UNIVERSITY

Department of Foreign Languages

ENGLISH FOR PROFESSIONAL PURPOSES

for 3rd year students of the Faculty of Pharmacy

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CONTENTS

1. GREEK-LATIN TERM ELEMENTS IN THE ENGLISH MEDICAL TERMINOLOGY

Exercise 1. Form terms using the suffixes given below and Greek-Latin term elements:

A. Use the suffix -ic to write a word for the following definitions.

1. pertaining to the liver _____
2. pertaining to the gallbladder _____
3. pertaining to the pancreas _____

B. Use the suffix -graphy to write a word for the following definitions.

4. radiographic study of the liver _____
5. radiographic study of the gallbladder _____
6. radiographic study of the bile ducts _____
7. radiographic study of the pancreas _____

C. Use the suffix -lithiasis to write a word for the following definitions.

8. condition of having a stone in the common bile duct _____
9. condition of having a stone in the pancreas _____

Exercise 2. A) Match the following terms to their definitions

1. primitive	a. one-half or one side of the chest
2. biceps	b. having two forms
3. unify	c. combine into one part
4. dimorphous	d. a muscle with two parts
5. hemithorax	e. occurring first in time

1. erythematous	a. cell with yellow color
2. melanoma	b. having a bluish discoloration
3. xanthocyte	c. darkly pigmented tumor
4. cyanotic	d. red in color
5. leukocyte	e. white blood cell

B) Match the following prefixes to their meanings

1. poikilo-	a. good, true, easy
2. eu-	b. straight, correct
3. ortho-	c. false
4. pseudo-	d. few, scanty
5. oligo	e. varied, irregular

Exercise 3. Fill in the blanks:

1. Inflammation of the liver is called _____.
2. The word biligenesis means the formation of _____ .
3. A cholelith is a(n) _____ .
4. Choledochotomy is incision of the _____ .
5. Cholecystectomy is removal of the _____ .
6. Hepatomegaly is enlargement of the _____ .
7. Cholangitis is inflammation of a(n) _____ .
8. Hepatosplenomegaly is the simultaneous enlargement of both the _____ and the _____.
9. Pancreatolysis is _____ of the pancreas.
10. Pancreatitis is _____ of the pancreas.

Exercise 4. Write words for the following definitions using the word parts provided. Each word part can be used more than once.

-itis -logy -ptosis nephro- gastr- cardio- neuro-

1. Inflammation of the stomach _____
2. Study of the nervous system _____
3. Dropping of the kidney _____
4. Study of the kidney _____
5. Inflammation of a nerve _____
6. Downward displacement of the heart _____

mon(o)- -al dextr(o) end(o) macro cardi cyt -ic ecto micro -ia

1. Pertaining to a very small cell _____
2. A condition in which the heart is outside its normal position _____
3. Pertaining to a cell with a single nucleus _____
4. Condition in which the heart is displaced to the right _____
5. Pertaining to the innermost layer of the heart _____
6. Pertaining to a very large cell _____
7. Condition in which the heart is extremely small _____

Exercise 5. Explain the medical terms analyzing the term elements

Thyroidectomy -
Thyrotomy -
Thyroiditis -
Hypothyroidism -
Hyperthyroidism -
Hemithyroidectomy -

Exercise 6. Write a word that means the opposite of each of the following

1. humidify _____
2. permeable _____
3. heterogeneous _____
4. exotoxin _____
5. microscopic _____
6. hyperventilation _____
7. postsynaptic _____
8. septic _____

Exercise 7. Choose the correct option. Explain your choice by analyzing term elements

1. The presence of abnormally large amounts of fluid in the tissues that results in swelling is called
   a. dilatation ***b. edema***
   b. c. emesis ***d. ptosis***
2. Excessive bleeding from the eye is
   a. ophthalmalgia ***b. ophthalmological***
   c. ophthalmoplasty ***d.ophthalmorrhagia***
3. Herniation of the brain through an opening in the skull is called
   a. craniectomy ***b. craniotomy***
   c. encephalocele ***d. encephalopathy***
4. Which of the following terms means dilation of a blood or lymph vessel?
   a. angioplasty ***b. vasotomy***
   c. vascular ***d. angiectasis***
5. A term that means excessive vomiting is

a. edema ***b. hyperemesis***
c. hypoglycemia ***d. hysteria***

6. A term that means pertaining to the eye is
a. adenic ***b. ophthalmic***
c. otic ***d. vascular***

7. Excision of a gland is called
a. adenectomy ***b. appendectomy***
c. neurectomy ***d. tonsillectomy***

8. *Dermatoplasty* is
a. any disease of the skin ***b. pertaining to the skin***
c. skin grafting ***d. the science that studies the skin***

9. An instrument for incising brain tissue is a/an
a. cerebrotomy ***b. cerebrectomy***
c. encephalotome ***d. encephalocele***

10. A 78-year-old man who had a blood vessel removed during surgery is likely to have which term documented in his chart?
a. angiectomy ***b. angiogram***
b. c. angiotomy ***d. angioscopy***

11. Which of the following terms contains a word part that means yellow?
a. chloropia ***b. cyanotic***
c. melancholy ***d. xanthosis***

12. Abnormal, uncontrollable, involuntary movements
a. bradykinesia ***b. dyskinesia***
c. kinesiotherapy ***d. tachykinesia***

13. *Cephalometry* is
a. a headache ***b. an instrument used to measure the head.***
c. measurement of the head ***d. study of the head***

14. A *lipoma* is
a. the breakdown of lipids in digestion ***b. a benign tumor composed of fatty tissue***
c. surgical crushing of a stone ***d. an ectopic pregnancy***

15. *Aphonia* is
a. absence of speech ***b. difficult speech***
c. rapid speech ***d. absence or loss of voice***

16. *Cryptorchidism* means
a. tissue compatibility ***b. undescended testicle***
c. within a vein ***d. without water***

17. A record or tracing of the electrical impulses of the heart is called an
a. electrocardiograph ***b. electrocardiogram***
c. electrocardiography ***d. electrocardiopathy***

18. A term for a large cell, usually restricted to mean an extremely large red blood cell, is
a. erythrocyte ***b. megalocyte***
c. microcyte ***d. phagocyte***

19. A patient who has a stroke usually displays deficits on the other side of the body. For instance, a patient with a right-side stroke has left hemiparesis. Which term best describes the location of the weakness in relation to the area of the stroke?
a. bilateral ***b. contralateral***
c. ipsilateral ***d. unilateral***

20. A woman who has just given birth is considered to be
a. antepartum ***b. postpartum***
c. primigravida ***d. multigravida***

21. Which term means inflammation of the tear sac?
a. dacryolithiasis ***b. dacryocyst***
c. dacryocystitis ***d. lacrimitis***
22. Surgical puncture of the chest wall for aspiration of fluids is called
a. open thoracic surgery ***b. thoracentesis***
c. thoracodynia ***d. thoracoplasty***
23. A term that means tumor of a sweat gland is
a. hematoma ***b. hidradenoma***
c. hydrophobia ***d. omphaloma***
24. You're treating a patient who has a swollen eyelid caused by an infected eyelash. What's the proper term for the eyelid condition?
a. blepheral ***b. blepharitis***
c. blepharoplegia ***d. blepharospasm***
25. A patient has a disease of the fingernails of unknown cause. What's the term that best describes this condition?
a. onychectomy ***b. onychomalacia***
c. onychomycosis ***d. onychopathy***
26. Replacement of bone marrow by fibrous tissue is called
a. fibrosclerosis ***b. myelofibrosis***
c. osteoarthritis ***d. osteofibrosis***
27. The term that means pertaining to a rib and a vertebra is
a. costal ***b. costovertebral***
c. spondylocostal ***d. sternocostal***
28. A condition in which the whole spine is stiffened is called
a. ankylosed spine ***b. kyphosis***
c. scoliosis ***d. spina bifida***
29. A term that means pertaining to the wrist and the fingers is
a. carpophalangeal ***b. metacarpal***
c. metatarsal ***d. tarsophalangeal***
30. Which adjective does not pertain to a bone of the arm?
a. costal ***b. humeral***
c. radial ***d. ulnar***
31. Atelectasis is
a. a collapsed or airless condition of the lungs
b. an acute, contagious respiratory infection
c. chronic dilation of the lungs
d. paroxysmal dyspnea
32. Rhinitis is inflammation of the
a. chest ***b. nose***
c. throat ***d. voice box***
33. A respiratory condition in which there's discomfort in breathing in any position except sitting erect or standing is
a. apnea ***b. bradypnea***
c. orthopnea ***d. tachypnea***
34. A 75-year-old woman with a left cerebrovascular accident (stroke) is now unable to speak. You document which term to indicate this deficit?
a. anoxia ***b. aphasia***
c. dysphasia ***d. dysphonia***
35. Which term means any dry condition?
a. hidrosis ***b. ichthyosis***

c. necrosis ***d. xerosis***

36. Paralysis affecting like parts on both sides of the body is
a. cerebral palsy ***b. diplegia***
c. hemiplegia ***d. paraplegia***

37. Which of the following terms means a nervous condition characterized by chronic weakness and fatigue?
a. narcolepsy ***b. neurasthenia***
c. neurolysis ***d. neurosclerosis***

38. The term for localized dilation of the wall of a cerebral artery is
a. cerebral aneurysm ***b. cerebral contusion***
c. epidural hematoma ***d. intracerebral hematoma***

39. Severe headache is
a. analgesic ***b. cephalgia***
c. cerebral contusion ***d. neuralgia***

40. Which term means inflammation of the eyelid?
a. blepharitis ***b. ophthalmitis***
c. photophobia ***d. ptosis***

41. Gastrocele means herniation of the
a. gallbladder ***c. liver***
b. large intestine ***d. stomach***

42. Eupepsia means
a. deficient appetite ***c. normal digestion***
b. excessive appetite ***d. sluggish intestinal action***

43. Inflammation of her gums is
a. cheilitis ***c. glossitis***
b. gingivitis ***d. stomatitis***

44. The term for painful, burning urination is
a. diuresis ***c. nephrolithiasis***
b. dysuria ***d. voiding***

45. A condition in which there are degenerative but not inflammatory changes in the kidneys is called
a. catheterization ***c. nephrosis***
b. nephritis ***d. percutaneous nephrostomy***

46. Pus in the urine is called
a. albuminuria ***c. pyuria***
b. hematuria ***d. uremia***

47. Incision of the kidney to remove a calculus is called
a. nephrectomy ***c. nephrotomy***
b. nephrolithotomy ***d. nephrotripsy***

48. Removal of impurities from the blood is referred to as
a. diuresis ***c. peritoneal dialysis***
b. hemodialysis ***d. renal insufficiency***

49. Gestation means
a. after birth ***c. childbirth***
b. before birth ***d. pregnancy***

50. A woman who has had two live births is referred to as
a. nullipara ***c. tripara***
b. secundipara ***d. unipara***

Exercise 8. Read USMLE Step 1 Test. Fill in the gaps with the words from the box. Explain the words in bold by analyzing the term elements they consist of.

current	ribosomal	fever	antibiotic
susceptible	bicuspid	shorten	action
culture	p-aminobenzoic	murmur	DNA-dependent

A 67-year-old woman with **congenital** (1) _____ aortic valve is admitted to the hospital because of a 2-day history of (2) _____ and chills. (3) _____medication is lisinopril. Temperature is 38.0°C (100.4°F), pulse is 90/min, respirations are 20/min, and blood pressure is 110/70 mm Hg. Cardiac examination shows a grade 3/6 systolic (4) _____ that is best heard over the second right intercostal space. Blood (5) _____ grows viridans streptococci (6) _____ to penicillin. In addition to penicillin, an (7) _____ **synergistic** to penicillin is administered that may help (8) _____ the duration of this patient's drug treatment. Which of the following is the most likely mechanism of (9) _____ of this additional antibiotic on bacteria?

(A) Binding to (10) _____ RNA polymerase
(B) Binding to the 30S (11) _____ protein
(C) Competition with (12) _____acid
(D) Inhibition of **dihydrofolate** reductase
(E) Inhibition of DNA gyrase

2.1. PHARMACEUTICAL BOTANY

Part 1

Exercise 1. Active Vocabulary.

NOUN	VERB	ADJECTIVE	ADVERB
ancestor	arrange	acicular	moderately
attractant	occur	carotenoid	additionally
bundle	fuse	flattened	radially
flax	undergo	lignified	
galipot	confirm	slender	
lacticifer	treat	stellate	
lenticel		retained	
protrusion		racemose	
stalk		plicate	
stoma		articulated	
turgor		cavernous	

Exercise 2. Fill in the table.

NOUN	VERB	ADJECTIVE
	connect	
relation		
		obtainable
	protect	
inclusion		
		exposed
	examine	
retention		
		accumulated

Exercise 3. Give a singular or a plural form of the following words.

stoma			mitochondria
plasmodesma		sporangium	
	cilia	apex	
	flagella		gemmae
nucleus			fungi

Plant Anatomy

Plant Cell Structure. Plants are unique among the eukaryotes whose cells have membrane-enclosed nuclei and organelles, because they can manufacture their own food. Like the fungi, another kingdom of eukaryotes, plant cells have retained the protective cell wall structure of their prokaryotic ancestors. The basic plant cell shares a similar construction motif with the typical eukaryote cell, but does not have centrioles, lysosomes, intermediate filaments, cilia, or flagella, as does the animal cell. Plant cells do, however, have a number of other specialized structures, including a rigid cell wall, central vacuole, plasmodesmata, and chloroplasts.

So, a plant cell consists of the living part – *protoplast* and the products of its life activities.

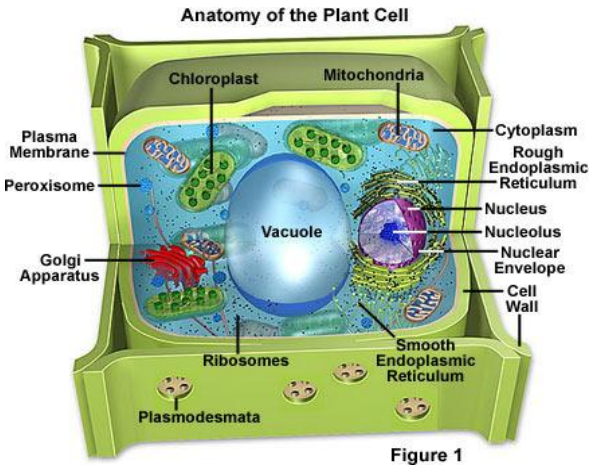


Figure 1

The constituent parts of the protoplast are *nucleus* and *cytoplasm* containing *organelles,* which are: endoplasmic reticulum, ribosomes, Golgi complex (dictyosomes), lysosomes, spherosomes, mitochondria and plastids. *Plasmodesmata* are small channels that directly connect the cytoplasm of neighbouring plant cells to each other, establishing living bridges between cells.

Plant cells are characterized by a unique group of interconvertible organelles called plastids, which are descended from prokaryotic endosymbionts. *Plastids* are differentiated, according their form, colour and function, into: chloroplasts (green, disc-shaped), chromoplasts (yellow, orange or red), leucoplasts (without pigments). *Chloroplasts* provide the most widely recognized and important characteristics of plants – photosynthesis; *chromoplasts*, due to the large accumulations of carotenoid pigments, take part in flowers fertilization, fruits and seeds distribution as pollinators and animal visual attractants, as well as precursors for Vitamin A biosynthesis; *leucoplasts* are commonly found in storage tissue and primarily involved in the storage of starch (amyloplasts), lipids (elaioplasts), and proteins (proteinoplasts or aleuroplasts).

The derivatives of the protoplast are:

- *Vacuoles* are primary storage spaces of water, saccharides, amino acids, proteins, lipids, nitrogenous compounds (such as alkaloid and anthocyanin pigment), ions, and secondary metabolites; they provide the osmotic pressure and maintain the cell turgor.
- *Cell inclusions* can be liquid (inulin, fatty oils, alkaloids, glycosides and other biologically active substances) and solid (crystals of oxalates, carbonates, silicates, etc.). *Crystals of calcium oxalate* are formed in vacuoles and differ in their shapes, among which: *styloids* – elongated, slender, prismatic crystals with a sharp edge; *druses* – stellate concentrations of many crystals; *crystalline sand* – small crystals filling almost the whole cell cavity called crystalline bag or idioblast; *raphids* – acicular crystals, that usually form a bunch and commonly occur in monocotyledons, rarely – in dicotyledons; *cystolith* – a stalk-like crystal of calcium carbonate formed inside an epidermal cell by crystal growth on to an ingrowth from the cell wall (commonly found in representatives of *Acanthaceae, Urticaceae*, known as stinging nettles, *Cannabaceae* plant families).
- The *plant cell wall* is mainly made up of the carbohydrate molecules, cellulose and lignin. As the result of membrane thickening there are primary, secondary and tertiary cell walls. They undergo considerable secondary changes in chemical composition and physiochemical properties, such as: *lignification, suberization, cutinization, sliming* and *mineralization.*

Exercise 4. Answer the questions to the text.

1. What makes plants different from other eukaryotes?
2. What have plant cells retained of their prokaryotic ancestors?
3. What similar features does a plant cell share with a typical eukaryotic one?
4. What constituents doesn't a plant cell include compared to an animal one?
5. What are the unique plant cell structures?

6. What does a plant cell consist of?
7. Name the constituent parts of the protoplast.
8. How are plant cells interconnected?
9. How are plastids differentiated?
10. What function do chloroplasts provide?
11. Where are chromoplasts usually found?
12. How do they ensure flowers fertilization, fruits and seeds distribution?
13. What function are leucoplasts involved in?
14. What are the products of protoplast's life activities?
15. What ensures the cell osmotic pressure and turgor?
16. What do vacuoles store?
17. Name the cell inclusions you know.
18. What acicular crystals usually form a bunch?
19. Which plant families are cystoliths commonly found in?
20. Name the key features of styloids and druses.

Exercise 5. Mark the following sentences as true (T) or false (F).

1. The plant cell wall is the living part of a plant.
2. The basic plant cell structure differs from the animal one considerably.
3. Cystolith is a star-shaped crystal formed inside the idioblast.
4. Chromoplasts are mainly of green colour.
5. Plant cells as well as fungi have the protective cell wall structure which is descended from prokaryotes.
6. Vitamin A biosynthesis occurs from chromoplasts containing a large amount of β-carotenes.
7. All the eukaryotes have got plasmodesmata.
8. The plant cell wall doesn't change during its life-cycle.

Exercise 6. Study the following KROK tests.

1. During examination of a plant cell under the electron microscope some structures in form of a stack of flattened membrane cisterns and vesicles were found. What organelles are these?

A. Golgi apparatus; B. Endoplasmic reticulum; C. Plastids; D. Mitochondrions; E. Microbodies.

2. Connection between plant cell protoplasts and their metabolic function is provided by thin cytoplasmic threads that pass through pores in the cell walls. Name these threads:

A. Plasmodesma; B. Fibrils; C. Microtubules; D. Microfilaments; E. Cytoskeleton

3. It is known that depending on pH of cellular fluid petal coloration can vary from blue-and-violet to pink and light pink. This is caused by presence of:

A. Anthocyanins; B. Carotins; C. Xanthophylls; D. Phycobilins; E. Chlorophylls.

4. It is known that in plants the synthesis of secondary reserve starch occurs in:

A. Amyloplasts; B. Chloroplasts; C. Chromoplasts; D. Elaioplasts; E. Proteinoplasts.

5. During photosynthesis within plant cell chloroplasts there is short-term retained starch being produced, which rapidly hydrolyzes into glucose. This starch is called:

A. Primary; B. Secondary; C. Reserve; D. Resistant; E. Transitory.

6. Microscopic examination of a potato tuber showed some cell inclusions that become blue-violet as affected by Lugol's iodine solution. These inclusions are:

A. Starch granules; B. Aleurone grains; C. Drops of fatty oil; D. Insulin crystals; E. Calcium oxalate crystals.

7. Microscopic examination of a ficus leaf revealed in some cells of its epidermis a protrusion of the cell membrane with an accumulation of crystals that dissolve in the hydrochloric acid and release carbonic acid gas. This structure is called:

A. Cystolith; B. Raphide; C. Druse; D. Single crystal; E. Styloid;

8. Racemose clusters of calcium carbonate crystals are detected among the waste products of a protoplast. These crystals are:

A. Cystoliths; B. Isolated crystals; C. Raphides; D. Styloids; E. Druses.

9. Examination of the leaf epidermis revealed cells containing cystoliths. Presence of cystoliths is typical for plants of the following family:

A. *Urticaceae*; B. *Brassicaceae*; C. *Fabaceae*; D. *Solanaceae*; E. *Papaveraceae*.

10. Elongated narrow prismatic crystals with sharpened points were detected during microscopic investigation of *Convallaria majalis* mesophyll. These crystals are:

A. Styloids; B. Druses; C. Crystalline sand; D. Cystoliths; E. Perigonium.

11. Morphologically the herbaceous plant being studied can be identified as *Convallaria majalis*. To confirm this conclusion additionally, a leaf of this plant was examined under the microscope and a search for the following crystalline inclusions was conducted:

A. Raphides; B. Single crystals; C. Druse crystals; D. Styloid crystals; E. Crystal sand.

12. In monocotyledonous plants metabolism end-products are often represented by multiple needle crystals of calcium oxalate arranged in clusters. Name these structures:

A. Raphides; B. Druses; C. Styloids; D. Twinned crystals; E. Crystalline sand.

13. Styloids are big single elongate-prismatic needle-like crystals. They are mostly typical for the following plants:

A. Monocotyledonous; B. Dicotyledonous; C. Gymnospermous; D. Lycopodiophyta; E. Equisetophyta.

14. The section of a sunflower seed has been treated with Sudan III solution that caused pink-and-orange staining. This is the evidence of presence of:

A. Fatty oil; B. Protein; C. Starch; D. Inulin; E. Cellulose.

15. Microscopic study of soybean seeds stained with Sudan III revealed some droplets of various sizes. They are:

A. Lipids; B. Proteins; C. Starch; D. Inulin; E. Glycogen.

16. Histochemical test for fixed oils with Sudan III results in the following stain colour:

A. Pink and orange; B. Blue and violet; C. Lemon-yellow; D. Raspberry-red; E. Black and purple.

17. After application of chlorine-zinciodine to the thick colourless cell membranes of collenchyme they became violet. That means the membranes are:

A. Cellulose; B. Lignificated; C. Cutinized; D. Mineralized; E. Suberinized.

18. In the course of plant cells treatment with phloroglucinol with concentrated sulfuric acid their cell walls became crimson-red, which means:

A. Lignification; B. Suberization; C. Mucification; D. Cutinization; E. Mineralization

19. After a plant microslide had been processed with phloroglucinol together with concentrated hydrochloric acid, the cell membranes turned crimson red. This indicates presence of:

A. Lignin; B. Pectin; C. Cellulose; D. Hemicellulose; E. Suberin.

20. Destruction of intercellular substance and cell breakaway in overripe fleshy fruits is a result of:

A. Maceration; B. Lignification; C. Mineralization; D. Sliming; E. Gummosis .

21. Flax seeds are used in medicine as coating agents, due to the following ability of their secondary membranes:

A. Sliming; B. Suberization; C. Gummosis; D. Lignification; E. Mineralization.

22. A vegetational microspecimen was treated with Sudan III solution. As a result of it cell membranes turned pink that means they contain:
A. Suberin; B. Cellulose; C. Lignin; D. Pectin; E. Hemicellulose.
23. Name the process of cell membrane saturation with a fat-like substance suberin:
A. Suberization; B. Lignification; C. Mineralisation; D. Cutinization; E. Sliming.
24. Stem thickening occurs due to functioning of the following structures:
A. Lateral meristem; B. Apical meristem; C. Wound meristem; D. Intercalary meristem; E. Endoderm
25. Microscopic examination of a stem of a perennial plant revealed integumentary tissue of secondary origin that was formed as a result of activity of:
A. Phellogen; B. Procambium; C. Cambium; D. Pericycle; E. Protoderm
26. Microscopic examination of ground tissue of a small branch revealed cork and felloderm. These are the derivates of: A. Phellogen; B. Cambium; C. Procambium; D. Protoderm; E. Pericycle
27. A sample section of an axial body shows a complex consisting of phellogen and its derivatives - cork and phelloderm. This tissue is called:
A. Periderm; B. Colenchyma; C. Sclerenchyma; D. Epiblema; E. Epidermis
28. When studying a stem covered with periderm a researcher came to conclusion that gaseous exchange takes place through:
A. Lenticels; B. Stomata; C. Pores; D. Throughput cells; E. Hydatodes
29. Microscopy of a leaf epidermis of *Convallaria majalis* showed that the stomata had four accessory cells. Two of them were lateral, and two other were polar. What type of stomatal mechanism is it?
A. Tetracytic; B. Diacytic; C. Anisocytic; D. Anomocytic; E. Paracytic
30. Microscopy of leaf epidermis of *Lamiaceae* (*Labiatae*) family plants revealed that both accessory cells are perpendicular to a stoma. Such stomata are called:
A. Diacytic; B. Paracytic; C. Anisocytic; D. Anomocytic; E. Tetracytic
31. Anatomico-histochemical analysis of a petiole revealed living parenchyma cells with cellulose, angular thickened membranes under the epidermis and above the fascicle. This is typical for:
A. Angular collenchyma; B. Spongy perenchyma; C. Lamellar collenchyme; D. Lacunar collenchyme; E. Bast fibers
32. Characteristic peculiarity of mechanic plant tissues is that they consist mainly of dead cells, but there is one type of mechanic tissues consisting of living cells. Which of the listed mechanic tissues contains the living protoplast?
A. Collenchyma; B. Scleroids; C. Libriform; D. Perivascular fibers; E. Phloem fibers
33. A substance performs mechanical function; its cells are covered with uniformly thick lignified membranes. This substance is:
A. Sclerenchyma; B. Collenchyme; C. Periderm; D. Cambium; E. Sieve tubes
34. Having been studied, conifer wood is determined to be composed of cells with pointed ends and lignified ring-porous cell wall. Therefore, this tissue of conifers is represented only by:
A. Tracheids; B. Vessels; C. Sieve tubes; D. Companion cells; E. Bast fibers
35. When root is studied under microscope, one leading bundle is detected in its maturation zone, where xylem and phloem areas interchange radially. It can be concluded that this bundle type is:
A. Radial; B. Collateral; C. Bicollateral; D. Amphicribal; E. Amphivasal
36. Each root site performs a certain function due to the special cells that form tissues. Zones allow growing in the earth, sucking substances out of the soil and carrying them to

all other plant parts. Which of the following types of conducting beams are inherent in all root zones of single-seeded plants?
A. Radical; B. Central phloem (Amphivasal); C. Bilateral; D. Collateral; E. Central xylem
37. While determining the type and characteristics of conducting bundles of axial organs one should take into account the positional relation between phloem and xylem and ...
A. Cambium; B. Procambium; C. Collenchyme; D. Pericycle; E. Phellogen
38. On the photomicrograph of a herbaceous plant stem the bicollateral vascular bundles are clearly visible. The microspecimen represents the stem of the following plant:
A. Pumpkin; B. Rye; C. Flax; D. Corn; E. Solomon's seal
39. Pulp of a needle leaf consists of living tissue with inner ansiform protuberances of membrane and chloroplasts along them. What is type of this leaf's parenchyma?
A. Plicate; B. Spongioid; C. Palisade; D. Storage; E. Aeriferous
40. It is known that rhizome and roots of *Inula helenium* have cavities without distinct inner boundaries filled with essential oils. They are called:
A. Lysigenous receptacles; B. Schizogenous receptacles; C. Resin ducts; D. Segmented lacticifers; E. Nonsegmented lacticifers
41. Microscopic examination of leaf serration revealed secretory structures secreting some liquid. What are these structures called?
A. Hydathodes; B. Nectaries; C. Stomata; D. Glandules; E. Osmophores
42. Fruits of the *Apiaceae* family can be identified on the basis of a set of morphological features and presence of the following formation in the pericarp:
A. Essential oil tubules; B. Resin ducts; C. Articulated lacticifers; D. Non-articulated lacticifers; E. Wax strips with stomata
43. It is known that the leaves of *Eucalyptus globulus* have cavities with well-defined internal boundaries and filled with essential oils. They are called:
A. Schizogenous cavities; B. Non-articulated lacticifers; C. Schizolysigenous cavities; D. Articulated lacticifers; E. Lysigenous cavities
44. Within folded parenchyma of a fir needle there are cavernous structures filled with galipot and lined with live thin-walled secretory cells. Name these structures:
A. Resin ducts; B. Laticifers; C. Hydatodes; D. Glandules; E. Nectar glands.

Exercise 7. Match the beginnings and the endings of the sentences.

1) Collenchyma and sclerenchyma make up tissues that...	a) maintaining the shape of the leaf.
2) The cells are closely arranged and between each of them are...	b) have a supportive structural role in plants.
3) Palisade cells are green colour due to...	c) the positional relation between phloem and xylem and cambium.
4) Xylem forms the upper part of a vascular bundle in the leaf...	d) minimizing water loss from the surface of the leaf.
5) Parenchyma cells are regarded as basic cells...	e) from which other cells have evolved.
6) Each stoma is flanked by a pair of guard cells...	f) air spaces connecting the mesophyll with the stomata.
7) The waxy cuticle is waterproof...	g) the numerous chloroplasts they contain.
8) Leaves are made up of three main types of tissue...	h) that regulate the size of the pore.
9) The veins provide mechanical support...	i) epidermal tissue, vascular tissue and ground tissue.

10) While determining the type and characteristics of conducting bundles of axial organs one should take into account...	j) bringing water and mineral salts to the leaf.

Exercise 8. Find the synonyms from the tests.

petiole –
bundle –
kind –
loop-shaped –
protuberance –
folded –
notch –
needle-shaped –
to dye –
embryonic root –

Exercise 9. Match the terms with their definitions.

1. Lenticel	a) becoming woody through the formation and deposit of lignin in cell walls.
2. Stoma	b) The plant tissue that has the mechanical function of supporting the plant
3. Lignification	c) The conversion of cell walls into a material that repels water, when primary cell walls of epidermis are impregnated with cutin.
4. Suberization	d) a body of cells formed on the periderm of a stem, appearing on the surface of the plant as a lens-shaped spot, and serving as a pore.
5. Cutinization	e) a modified pore, especially on a leaf, which exudes drops of water.
6. Collenchyma	f) a transport tissue found in the vascular bundles of higher plants and functions in the transport of dissolved organic substances.
7. Sliming	g) one of the minute orifices or slits in the epidermis of leaves, stems, etc., through which gases are exchanged.
8. Hydathode	h) Deposition of suberin on the walls of plant cells, as in the formation of cork tissue.
9. Sclerenchyma	i) intramolecular modification that results in mucus formation.
10. Phloem	j) a plant tissue that consists of living usually elongated cells with unevenly thickened walls and acts as support especially in areas of primary growth.

Exercise 10. Fill in the blanks with the words given in the box.

dividing	support	xylem	Parenchyma
Collenchyma	storage	Vascular	cuticle
phloem	epidermis	Sclerenchyma	Intercalary

Plant tissues

There are four types of plant tissue systems:
Ground Tissue System includes all tissues that are neither dermal nor vascular. It functions primarily in _____, support, photosynthesis, and the production of defensive and attractant substances (oils and toxins). There are three types of ground tissue:
_____ cells have thin primary walls and form the "filler" tissue in the soft parts of plants; _____ cells have thin primary walls with secondary thickening, providing an

extra structural support; _____ cells have thick lignified secondary walls and, therefore, provide the main structural _____ to a plant.
_____ *Tissue System* is the conductive or "plumbing" system of the plant. It includes the _____ transports carbohydrates from leaves to other parts of the plant and the _____ distributes water and mineral ions taken up by the roots to the stem and leaves.
Dermal Tissue System covers the plant body and consists of _____ which is made of parenchyma cells in a single layer. Epidermis on stem and leaves prevents water loss by transpiration and produces a waxy material called_____.
Meristematic Tissue System consists of the meristems (Meristematic cells) which are _____ ones. They are found in zones of the plant where growth take place. There are three main types of meristematic tissue in angiosperms (the flowering plants): Apical Meristem, _____ Meristem, and Lateral Meristem.

Exercise 11. Fill in the table with information learned from tests.

Microchemical reactions

Detection of	*solution*	*colour*
lignin	– phloroglucinol –	– – yellow
starch		blue – light violet
reserve proteins (aleuronic grains)	Lugol	
	Sudan III	pink or orange

2.2. PHARMACEUTICAL BOTANY
Part 2

Exercise 1. Active Vocabulary.

NOUN	VERB	ADJECTIVE	ADVERB
corm	ensheathe	borne	significantly
lamina	dehisce	ventral	collectively
calyx	swell	dorsal	
carpel	converge	aerial	
drupe		adventitious	
inflorescence		pinnate	
conifer		palmate	
bulbil		sessile	
suffrutex		palisade	
legume		succulent	
peduncle			
shoot			
rhizome			
whorl			

Exercise 2. Fill in the table.

NOUN	VERB	ADJECTIVE
	swell	
absorption		
		accumulated
	occur	
comprisal		
		lignified
	converge	
classification		
		modified

Morphology of vegetative and generative organs

The three main types of vegetative organ are the root, stem and leaf. Roots typically occur underground, and extract moisture and nutrients from the soil, though there are many examples of plants with aerial roots. The stem and leaves together comprise the shoot. Stems occur both above and below ground. Some stems are modified into underground perennating or storage organs such as *corms* or *rhizomes*. Leaves typically occur above ground level, though some underground stems possess reduced scale leaves, and underground bulbs possess swollen leaves or leaf bases.

Root (lat. radix) is the vegetative organ of a plant body that has radial symmetry and positive geotropism. The two major functions of roots are: 1) absorption of water and inorganic nutrients, 2) anchoring the plant body to the ground. There are the following types of roots according to their origin: 1) primary root develops from seed embryo, 2) lateral roots develops from primary root, 3) additional (adventitious) roots grow from stem or leaf.

Angiosperm ***leaves*** display much morphological and anatomical diversity. Mature leaves of monocots are typically narrow and consist of a linear lamina with parallel venation and a leaf base that ensheathes the stem. This contrasts with the typical leaf of eudicots and magnoliids, which has

a well-defined petiole and elliptical blade (lamina) with reticulate venation. However, some species possess compound leaves in which individual leaflets are borne either on a central stem-like axis (pinnate leaves; e.g. tomato, *Solanum lycopersicum*) or radiate from a single point at the distal end of the petiole (palmate leaves; e.g. *Arisaema*). There are two main leaf venation types among the angiosperms: parallel and reticulate. In leaves with *parallel venation* the main veins (primary veins) are parallel for most of their length and converge or fuse at the leaf tip. In leaves with *reticulate venation* there is often a major vein in the middle of the leaf, the midrib or primary vein, which is continuous with the major venation of the petiole.

Flowers are complex structures that consist of several organ types borne on a central axis (receptacle). Within each flower, the organs are arranged in distinct bands (whorls) or in a spiral pattern. The outer two types of floral organs (collectively -*perianth*) are modified leaf-like structures, termed *sepals* (collectively - calyx, or sometimes - the first whorl) and *petals* (collectively - corolla, or the second whorl). Enclosed within the perianth are the *stamens*, which are collectively termed the androecium, or sometimes the third whorl, though they are often borne in two or more distinct whorls. The *carpels* (collectively - gynoecium, sometimes termed the fourth whorl) are borne in the centre of the flower, and normally terminate the floral axis.

In ***fruits*** that are derived from a single ovary, the fruit wall, termed the *pericarp*, is typically derived from the ovary wall. It is divided into three layers: the outer *exocarp*, central *mesocarp* and inner *endocarp,* though in some fruits this three layers are not readily distinguished. At least one layer of the fruit wall often consists of thick-walled lignified cells, though in some fleshy fruits (berries), such as those of *Vitis vinifera* (grape), the entire endocarp consists of thin-walled succulent cells. In other fleshy fruits (drupes), such as those of *Prunus persica* (peach), the endocarp cells are thick-walled and only the mesocarp is fleshy, the exocarp being a narrow epidermal layer, and in *Olea europaea* (olive) the fleshy mesocarp is interspersed with thick-walled sclereids.

Exercise 3. Answer the questions to the text.

1. What are the main types of the plant vegetative organ?
2. What is the function of roots?
3. Where do stems usually occur?
4. Name the main types of roots according to their origin.
5. What are the typical features of monocots' mature leaves?
6. What is the structure of the eudicots and magnoliids' typical leaf?
7. What kind of compound leaves do some species possess?
8. What are the main leaf venation types in angiosperms?
9. How do they differ?
10. How are the floral organs arranged?
11. What is the perianth? What types are they differentiated into?
12. What are the inner structures of a flower?
13. What is the pericarp and how it is divided?
14. In which fruits does the endocarp consist only of thin-walled succulent cells?
15. How do some drupes and olives differ from the general fruit structure?

Exercise 4. Mark the following sentences as true (T) or false (F).

1. There are recognised four types of roots by their structure.
2. Each fruit consists of exocarp, mesocarp and endocarp.
3. Gynoecium is situated in the centre of the flower and terminates the floral axis.
4. In pinnate leaves the individual leaflets grow on a central stem-like axis.
5. Stems are found only above the ground.

6. The stamens called gynoecium are borne in the centre of the flower.
7. The leaves of monocots, eudicots and magnoliids have a well-defined petiole and elliptical blade (lamina) with reticulate venation.
8. Perianth can be of two types: calyx and corolla.

Exercise 5. Study the following KROK tests.

1. A student analyses plant organ with radial symmetry, unlimited growth and positive geotropism, which provides nourishment, vegetative reproduction and plant fastening in soil. This organ is:
   A. Root; B. Stem; C. Leaf; D. Rhizome; E. Seed
2. When studying white mistletoe, - perennial medicinal semiparasite plant, - it was revealed that its embryonic root buries into higher plant stem tissue and reaches vascular tissue system. This type of roots is called:
   A. Haustorial roots; B. Photosynthetic roots; C. Aerating roots; D. Contractile roots; E. Aerial roots
3. Examination of a medicinal plant revealed that its underground organ had nodes, internodes, cataphylls, gemmae and secondary roots. Therefore, this underground organ is:
   A. Rhizome; B. Storage root; C. Root bulb; D. Stolon; E. Tuber
4. Comparison of the underground organs of herbaceous plants revealed that in the bipartite annuals the following organ prevails:
   A. Main root system; B. Adventitious root system; C. Rhizome; D. Bulb; E. Corm
5. Microscopical examination of transverse section of a root revealed investing tissue consisting of thin-walled, closely joining cells with root fibrilla. This tissue is called:
   A. Epiblem; B. Root cap (pileorhiza); C. Periderm; D. Endoderm; E. Epiderm
6. In root transverse section laying and formation from pericycle of the following organs can be seen in maturation zone:
   A. Lateral roots; B. Trichome; C. Additional roots; D. Root hairs; E. Root cap
7. Microscopic examination of a root cortex in the absorbing zone revealed that it consists mainly of multilayer living loose parenchyma with starch granules. This is:
   A. Mesoderm; B. Endoderm; C. Exoderm; D. Collenchyme; E. Phellogen
8. On the root section of *Helianthus annuus* a secondary fascicular structure was found. This means that the section was made in the zone of:
   A. Fixation and conduction; B. Growth and distension; C. Absorption; D. Dividing cells; E. Root cap (pileorhiza)
9. A section of beet root has several layers of cambium that form additional conducting bundles. What is the structure of the given root?
   A. Secondary, polycambial; B. Secondary monocambial; C. Primary, polycambial; D. Primary, monocambial; E. Transitional, monocambial
10. Microscopic analysis of a root revealed the following features: primary structure, endodermal cells with horseshoe-shaped areas, radial fascicle of the central cylinder, more than six xylem rays. Such root structure is typical for the following plants:
    A. Angiosperms, monocotyledons; B. Angiosperms, dicotyledons; C. Gymnosperms, conifers; D. Gymnosperms, gnetalians; E. Pteridosperms
11. During excursion into a conifer forest the students noticed that bilberry (*Vaccinium myrtillus*) stems are lignified only partially in their lower part, the upper part of the stem retains the form of caulis. Therefore, this plant can be classified as:
    A. Suffrutex; B. Annual grass; C. Liana; D. Perennial grass; E. Tree
12. Species character of *Thymus serpyllum* includes: apical inflorescences (flower heads), dark punctate glands on the inferior surface of a leaf, long hairs along the edge of leaf base, and:
    A. Creeping stems; B. Thorns; C. Stems with prickles; D. Climbing stems; E. Short decumbent stems

13. The study object is an undeveloped or embryonic shoot which normally occurs at the tip of a stem or in the axil of a
    A. Bud; B. Lenticel; C. Root apex; D. Bulb; E. Bulbotuber
14. *Quercus robur* leaves have the following type of lamina shape and division:
    A. Pinnatilobate; B. Trilobate; C. Pinnatipartite; D. Palmatilobate; E. Palmatipartite
15. During practical field session students have detected plant with diversity of leaves that differ by their placement on stem, parts development, size, shape, lamina division. This phenomenon is called:
    A. Heterophylly; B. Phyllotaxy; C. Metamorphosis; D. Leaf mosaic; E. Venation
16. Leaves of *Aesculus hippocastanum* are composed of 5-7 assidenous folioles that are oblong-obovate shaped with dentate-serrated margin, are attached to petiole (leaf rachis), and therefore are: A. Palmately compound; B. Pinnately; C. Pinnatisected; D. Palmatisected; E. Palmatilobed
17. Leaves of a plant under examination have a distinct main nerve in the middle with regularly diverging side nerves. What type of nervation is it?
    A. Pinnate; B. Digitate; C. Arcwise; D. Parallel; E. Dichotomic
18. Morphological analysis of leaves revealed that each vein runs along the lamina separately and the veins join together only at the top of the lamina. This kind of venation is called:
    A. Arcuate; B. Pinnate; C. Dichotomous; D. Palmate
19. Examination of a medicinal herb revealed that its leaves were divided down to the base of the leaf blade with segments radiating from a common point in a fan manner. These leaves are: A. Palmatisected; B. Pinnatisected; C. Palmatipartite; D. Pinnatipartite; E. Palmatilobate
20. Each stem node of white deadnettle (*Lamium album*) has two leaves which grow perpendicularly to the leaves of the previous node. Such leaf arrangement is called:
    A. Cross-opposite; B. Spiral; C. Verticillate; D. Rosette; E. Leaf mosaic
21. A plant has erect stem with only one leaf growing from each node. What phyllotaxy is characteristic of this plant?
    A. Alternate; B. Opposite; C. Verticillate; D. Dichotomous; E. Parallel
22. During the morphologic analysis of various plant leaves the students found the leaves, whose length of the leaf blade is 5 times more than its width. Specify the shape of the leaf blade:
    A. Elliptical; B. Lanceolate; C. Ovoid; E. Reniform
23. *Berberis vulgaris* has spines that are modifications of:
    A. Leaves; B. Stipules; C. Petioles; D. Stems; E. Rachises
24. In a sample studied under a microscope the multilayer palisade (columnar) parenchyma can be clearly seen. Such structure is typical for:
    A. Leaf; B. Root; C. Dicotyledon stem; D. Rhizomes of ferns; E. Adventitious roots
25. Name the above-ground sprout modifications that develop from lateral buds, are situated in leaf angles or inflorescences, and take part in vegetative reproduction:
    A. Bulbils; B. Above-ground tubers; C. Cladodes; D. Tendrils; E. Thorns
26. Coloured or white component of double perianth, which consists of petals, is a:
    A. Corolla; B. Flower cup; C. Androecium; D. Gynoecium; E. Perigonium
27. Androecium of *Brassica oleracea* flower has six stamens, with four stamens of inner circle longer than two stamens of outer circle. What is this type of androecium called?
    A. Tetradynamous; B. Didynamous; C. Diadelphous; D. Monadelphous; E. Polydelphous
28. A flower has the androecium consisting of two long and two short stamens. Therefore, the flower's androecium is:
    A. Didynamous; B. Tetradynamous; C. Diadelphous; D. Tetradelphous; E. Polyadelphous
29. Students should identify the following to determine the sex of a flower:
    A. Stamens and pistils; B. Flower cup and corolla; C. Pedicle and receptacle; D. Symmetry; E. Color and type of indumentum

30. A dissected flower has numerous stamens that are united by the stamen filaments into several bundles. What is this type of androecium?
    A. Polyadelphous; B. Monadelphous; C. Diadelphous; D. Didynamous; E. Tetradynamous
31. Upon examination of a flower it is determined to have one pistil made up of single free carpel. Therefore, this gynoecium can be identified as:
    A. Monocarpous; B. Apocarpous; C. Lysicarpous; D. Paracarpous; E. Syncarpous
32. Name the male gametophyte of flowering plants:
    A. Pollen grains; B. Carpel; C. Embryo sac; D. Ovule; E. Nucellus
33. Cherry (*Prunus cerasus*) inflorescence has short floral axis and approximately same length pedicles emerging from one point. It is characteristic of the following inflorescence organisation:
    A. Umbel; B. Corymb; C. Raceme; D. Spike; E. Head
34. Inflorescence of *Ledum palustre* has a significantly shortened rachis, connivent nodes, pedicles of the quite similar length. This inflorescence is called:
    A. Umbel; B. Glomus; C. Bostryx; D. Spike; E. Ament
35. Morphological analysis of an inflorescence revealed that its flowers were attached to the same axis at different levels but due to different length of peduncle they grew in the same plane. Such inflorescence is called:
    A. Corymb; B. Anthodium; C. Glomus; D. Umbel; E. Spike
36. Examination of an inflorescence of sweet flag *Acorus calamus L.* revealed that it was encircled with a covering leaf (spathe) and small sessile flowers grew compactly on the thickened pulpy axis. Such inflorescence is called:
    A. Ear; B. Glomus; C. Spike; D. Umbel; E.Corymb
37. The birch has compound inflorescences with drooping main axis bearing dichasia composed of unisexual cells. Therefore, this inflorescence is called:
    A. Ament; B. Raceme; C. Spadix; D. Spike; E. Glomus
38. During the field practice a student found a plant with disk-shaped structure of its rachis, sessile flowers and husk. This inflorescence is called:
    A. Anthodium; B. Spike; C. Spadix; D. Glomus; E. Raceme
39. Corolla of the origanum flower is zygomorphic, sympetalous and consists of a tube and two limbs. The upper limb is bilobate and the lower is trilobate. Such corolla is called:
    A. Bilabiate; B. Unilabiate; C. Lingulate; D. Thimble-like
40. One of the important diagnostic features of garden sage and motherwort is their shape of corolla. Their flowers have the following type of corolla:
    A. Bilabiate; B. Thimble-shaped; C. Funnelform; D. Pseudoligulate; E. Ligulate
41. Morphological analysis of poplar inflorescence showed that it is a simple monopodial inflorescence: main axis is drooping, the flowers are sessile, unisexual. Specify the type of inflorescence:
    A. Catkin; B. Head; C. Capitulum; D. Cyme; E. Panicle
42. *Plantago major* inflorescence grows at the apex, its rachis is long, with sessile flowers. Name this type of inflorescence:
    A. Spike; B. Panicle; C. Spadix; D. Capitulum; E. Thyrse
43. *Astragalus dasyanthus* has sessile flowers gathered into inflorescences with a short thick axis. This inflorescence is called:
    A. Capitulum; B. Cyme; C. Truss; D. Spike; E. Head
44. One of fleshy fruits under examination is characterized by essential oil exocarp, spongy mesocarp and overgrown endocarp consisting of juice sacs. What fruit was examined?
    A. Hesperidium; B. Pepo; C. Cinarodium; D. Drupe; E. Bacca
45. During field practice a student was tasked with making a morphological collection of coenocarpous fruits. What type of fruit belongs to this group?
    A. Hesperidium; B. Aggregate-accessory fruit; C. Fragaria; D. Cynarodium; E. Drupe

46. You need to specify a monocarpous one-seeded fruit with hard scleroid endocarp and soft mesocarp. This fruit is:
A. Monodrupe; B. Legume; C. Silique; D. Capsule; E. Bacca
47. A fruit under examination is pseudomonocarpic, with woody pericarp and one seed. The seed cuticle remains unfused with the pericarp. Such fruit is called:
A. Nut; B. Cremocarp; C. Achenocarp; D. Caryopsis; E. Pseudomonocarpic drupe
48. You need to specify a monocarpous one-seeded fruit with hard scleroid endocarp and soft mesocarp. This fruit is:
A. Drupe; B. Legume; C. Silique; D. Capsule; E. Bacca
49. Dry many-seeded monocarp fruit opens along its ventral suture. It can be identified as:
A. Follicle; B. Legume; C. Nutlet; D. Drupe; E. Capsule
50. Many species of wild rose are a source of vitamins, fatty oils and herbal material. Specify the juicy pseudocarps that are procured as herbal raw material:
A. Rose hips; B. Coenobia; C. Hesperides; D. Aggregate-accessory fruits; E. Cenocarp stone-fruits
51. Nuciform fruits include a certain type of one-seeded fruit that does not burst when ripe. Its base is enclosed in a cup-shaped cupule formed by the broad part of the peduncle to which the flower was attached. Name this type of fruit:
A. Acorn; B. Nut; C. Nutlet; D. Samara; E. Caryopsis
52. The fruit of black locust is dry, formed of a single carpel, dehisces by the ventral and dorsal sutures on two sides, the seeds are attached along the ventral suture. Such fruit is called:
A. Legume; B. Siliqua; C. Follicle; D. Capsule; E. Silicula
53. It is known that a seed without endosperm and perisperm has its nutrients accumulated in:
A. Embryo cotyledons; B. Embryo root; C. Embryo stalk; D. Gemma; E. Seed coat
54. What forms from an ovule after fertilization of flowering plants?
A. Seed; B. Gametophyte; C. Sporophyte; D. Fruit; E. Endosperm
55. Seeds of rye, corn, and other crops have small corymb-shaped cotyledon and accumulate nutrients in the:
A. Endosperm; B. Perisperm; C. Shell; D. Gemmule; E. Embryo root

Exercise 6. Match the beginnings and the endings of the sentences.

1) In Arcuate venation each vein runs along the lamina separately....	a) vitamins, fatty oils and herbal material.
2) The epiblema is an investing tissue consisting of	b) a cup-shaped cupule formed by the broad part of the peduncle to which the flower was attached.
3) Many species of wild rose are a source of...	c) and soft mesocarp is a monodrupe.
4) Hesperidium has a fleshy fruit which is characterized by...	d) main axis is drooping, the flowers are sessile, unisexual.
5) The typical root structure of angiosperms, monocotyledons has the following features:	e) thin-walled, closely joining cells with root fibrilla.
6) Each stem node of *Lamium album* has two leaves which grow...	f) and the veins join together only at the top of the lamina.
7) The poplar inflorescence is a simple monopodial:	g) essential oil exocarp, spongy mesocarp and overgrown endocarp consisting of juice sacs.
8) Seeds of rye, corn, and other crops have	h) perpendicularly to the leaves of the

small corymb-shaped cotyledon and..	previous node. Such leaf arrangement is called cross-opposite.
9) Acorn is a one-seeded fruit that does not burst when ripe. Its base is enclosed in...	i) accumulate nutrients in the endosperm.
10) A monocarpous one-seeded fruit with hard scleroid endocarp...	j) primary structure, endodermal cells with horseshoe-shaped areas, radial fascicle of the central cylinder, more than six xylem rays.

Exercise 7. Find the synonyms from the tests.

sprout –
vast –
joint –
binding –
thread –
fleshy, juicy –
extension –
top –
detached –
lamina –

Exercise 8. Match the terms with their definitions.

1) cotyledon	a) the sepals of a flower, typically forming a whorl that encloses the petals and forms a protective layer around a flower in bud.
2) geotropism	b) the development of different leaf forms in a single plant depending on the environmental conditions.
3) calyx	c) a stem of a plant, especially a grass, bearing flower stalks at short intervals.
4) peduncle	d) a cymose inflorescence that produces two main axes.
5) rachis	e) a coordinated process of differential growth by a plant in response to gravity pulling on it.
6) carpel	f) the part of a flower that consists of the separate or fused petals and constitutes the inner whorl of the perianth
7) Heterophylly	g) the female reproductive organ of a flower, consisting of an ovary, a stigma, and usually a style.
8) gametophyte	h) the first leaf or one of the first pair or whorl of leaves developed by the embryo of a seed plant or of some lower plants
9) corolla	i) the haploid multicellular individual or generation of a plant or alga with alternation of generations that begins with a haploid spore, produces gametes by mitotic division, and ends with fertilization producing a diploid zygote
10) dichasia	j) the stalk bearing a flower or fruit, or the main stalk of an inflorescence.

Exercise 9. Fill in the blanks with the words given in the box.

lacks	**whorls**	**maintain**
floral	**enhance**	**attract**
flattened	**leaves**	**bud**

All floral organs are thought to have evolved from _____. In early angiosperms, these organs _____ the spiral phyllotaxy often found in leaves. The trend has been toward four distinct whorls. A complete flower has four _____ of parts (calyx, corolla, androecium, and gynoecium), while an incomplete flower _____ one or more of the whorls. In both complete and incomplete flowers, the calyx usually constitutes the outermost whorl; it consists of _____ appendages, called sepals, which protect the flower in the_____. The petals collectively make up the corolla and they may be fused. Petals function is to _____ pollinators. While these two outer whorls of _____ organs are sterile, they can _____ reproductive success.

Exercise 10. Fill in the types of inflorescence according their description.

Umbel, Thyrse, Raceme, Corymb, Capitulum, Spike, Panicle

_____ - an elongate, unbranched, indeterminate inflorescence with sessile flowers.

_____ - an elongate, unbranched, indeterminate inflorescence with pedicelled flowers.

_____ - a branched raceme.

_____ - a flat-topped raceme with elongate pedicels reaching the same level.

_____ - a flat-topped or rounded inflorescence with the pedicels originating from a common point.

_____ (or head) - a dense vertically compressed inflorescence with sessile flowers on a receptacle and subtended by an involucre of phyllaries, characteristic of the Asteraceae.

_____ - a many-flowered inflorescence with an indeterminate central axis and many opposite, lateral dichasia; a mixed inflorescence, with determinate and indeterminate shoots.

2.3. PHARMACEUTICAL BOTANY
Part 3

Exercise 1. Key words.

NOUN	VERB	ADJECTIVE	ADVERB
moss	relate	annual	Particularly
horsetail	mucify	biennial	vegetatively
fern		perennial	
buckwheat		trihedral	
ochrea		thorny	
foxglove		papilionaceous	
silique		comminuted	
pome		downy	

Exercise 2. Fill in the table.

NOUN	VERB	ADJECTIVE
	harm	
division		
		cultivated
	mucify	
vegetation		
		ascending
	present	
diagnosis		
		secretory

Plant Taxonomy

The Plantae Kingdom is united into three subkingdoms: *Rhodobionta, Phycobionta, Cormobionta.* The Pharmaceutical Botany studies closely the representatives of such their divisions as: *Phaeophyta* (brown algae), *Bryophyta* (mosses), *Lycopodiophyta* (club mosses), *Equisetophyta* (horsetails), *Polypodiophyta* (ferns), *Pinophyta* or *Gymnospermae* (conifers), *Magnoliphyta* or *Angiospermae* (flowering plants).

There are several hundred Plant Families (more then 600), but the most common ones used in medicine are listed below.

Exercise 3. Study the tests.

Polygonaceae – Buckwheat Family

1. A leaf of a plant under examination has a membranous ocrea that envelops the bottom of internode. Presence of such modified stipules is a diagnostic sign of the following family:
   A. Buckwheat; B. *Gramineae*; C. *Rosaceae*; D. Legumes; E. *Solanaceae*
2. A leaf has glumaceous ochrea. It clasps bottom of internode and is a modificated stipule. This is diagnostic sign of the following family:
   A. *Polygonaceae*; B. *Gramineae*; C. Rosaceae; D. Legumes; E. *Solanaceae*
3. A plant under study has stipules fused together and thus forming a tight tube ochrea, that is a diagnostic feature of the following family:
   A. *Polygonaceae*; B. *Gramineae*; C. *Rosaceae*; D. *Papaveraceae*; E. *Clusiaceae*
4. A food plant of *Polygonaceae* family is being studied. The plant has reddish stalk, cordate-sagittate leaves, its fruit is a trihedral nutlet. Name this plant:

A. *Fagopyrum esculentum*; B. *Persicaria bistorta*; C. *Persicaria hydropiper*; D. *Polygonum aviculare*; E. *Rumex confertus*

Brassicaceae - Cabbage Family

5. What inflorescences are characteristic of *Cruciferae (Brassicaceae)* family?
   A. Raceme or panicle; B. Capitulum or corymb; C. Capitulum or umbel; D. Corymb or spike; E. Spadix or panicle
6. Select a *Brassicaceae* family plant that contains glycosides similar in action to those obtained from foxglove:
   A. *Erysimum canescens*; B. *Arctostaphylos uva-ursi*; C. *Urtica dioica*; D. *Polygonum aviculare*; E. *Primula officinalis*
7. Among harvested plants there was *Capsella bursa-pastoris*, which can be characterized as follows:
   A. Annual plant, basal leaves - pinnatisected or pinnatipartite, fruit - small triangular heart-shaped silique;
   B. Biennial plant, basal leaves - pinnatilobate, fruit - small round silique;
   C. Perennial plant, basal leaves - entire-kind, fruit - cylindric silique;
   D. Annual plant, basal leaves - compound, fruit - segmented silique;
   E. Biennial plant, basal leaves - membranous, fruit - small winged heart-shaped silique

Rosaseae - Rose Family

8. One of the common characteristics of subfamily *Prunoidea* representatives (family *Rosaceae*) is that their fruit is:
   A. Drupe; B. Aggregate-accessory fruit; C. Bacca; D. Pome; E. Pepo
9. Which of the following plants has pome fruit?
   A. *Sorbus aucuparia*; B. *Prunus domestica L.*; C. *Amygdalus communis*; D. *Rosa majalis*; E. *Prunus padus*
10. Which representative of the Rosaseae family has spring bloom in form of white, fragrant flowers gathered in pendulous racemes at the ends of short shoots?

A. *Padus racemosa (P.avia)*; B. *Potentilla erecta*; C. *Sorbus aucuparia*; D. *Cerasus vulgaris*; E. *Crataegus sanquinea*

11. A fruit tree of *Rosaceae* family has short thorny shoots; the fruit is a distinctively shaped pome with stone cells in its pulp. Name this plant:
   A. *Pyrus communis*; B. *Malus sylvestris*; C. *Cerasus vulgaris*; D. *Prunus armeniaca*; E. *Prunus spinosa*
12. Herbarium specimens of medicinal plants are being studied. Which one of them belongs to *Rosaceae* family?
   A. *Crataegus sanguinea*; B. *Melilotus officinalis*; C. *Conium maculatum*; D. *Capsella bursa-pastoris*; E. *Polygonum persicaria*

Fabaceae, Mimosaceae, Papilionaceae
(formerly Leguminosae)- Bean Family

13. A plant under examination has papilionaceous flower. This plant belongs in the family:
   A. *Fabaceae*; B. *Scrofulariaceae*; C. *Ranunculaceae*; D. *Lamiaceae*; E. *Asteraceae*
14. Corolla of a zygomorphic hermaphroditic flower consists of 5 petals: the largest one is called the banner, the two lateral petals are called the wings, and the two fused petals forming the keel. Such corolla is characteristic of medicinal plants of *Leguminosae* family. Name the type of corolla:
   A. Papilionaceous; B. Labiate; C. Saucer-shaped; D. Funnelform; E. Tubular
15. When studying five herbarium specimen of medicinal plants, it was determined that one of them belongs to *Fabaceae* family. Which one is it?

A. *Ononis arvensis*; B. *Atropa belladonna*; C. *Hyoscyamus niger*; D. *Datura stramonium*; E. *Solanum dulcamara*

16. Examination of five herbarium specimens of medicinal plants showed that one of them belonged to the legume family, namely:

A. *Glycyrrhiza*; B. *Atropa belladonna*; C. *Hyoscyamus niger*; D. *Datura stramonium*; E. *Solanum dulcamara*

17. A cough tea contains comminuted roots of a plant. The roots are colored bright yellow and taste sweet. They were identified as roots of the following plant:

A. *Glycyrrhiza glabra*; B. *Althaea officinalis*; C. *Acorus calamus*; D. *Valeriana officinalis*; E. *Sanguisorba officinalis*

18. Both scientific and folk medicine uses medicinal plant Glycyrrhiza glabra. What part of the plant is harvested?

A. Roots and rhizomes; B. Foliage; C. Inflorescence; D. Grass; E. Seeds

19. One of the plants under examination has a zygomorphic flower and papilionaceous corolla. This plant is called:

A. *Melilotus officinalis*; B. *Mentha piperita*; C. *Valeriana officinalis*; D. *Urtica dioica*; E. *Rosa canina*

20. Among the trees of Fabaceae family there is an early-flowering melliferous plant with pinnately compound leaves, spine-shaped stipules, and white fragrant flowers arranged in hanging racemes. Name this plant:

A. *Robinia pseudoacacia*; B. *Armeniaca vulgaris*; C. *Aesculus hippocastanum*; D. *Aronia melanocarpa*; E. *Quercus robur*

21. In pharmaceutical manufacturing, rutin and quercetin are obtained from the flowers of a certain Fabaceae family plant. Name this plant.

A. *Styphnolobium japonicum*; B. *Robinia pseudoacacia*; C. *Caragana arborescens*; D. *Astragalus piletocladus*; E. *Acacia dealbata*

Apiaceae (formerly Umbelliferae) - Celery or Carrot Family

22. A plant under examination has a storage root; its stems are ribbed and channelled, hollow; leaves are many times pinnatisected, leafstalk has a boot; inflorescence is the compound umbel; fruit is the cremocarp with essential oil canaliculi in the pericarp. Such characteristics are typical for the plants of the following family:

A. *Apiaceae*; B. *Solanaceae*; C. *Fabaceae*; D. *Brassicaceae*; E. *Scrophulariaceae*

23. A plant under investigation has compound uniform monopodium inflorescence - compound umbel. What plant is it characteristic of?

A. *Anethum graveolens*; B. *Allium cepa*; C. *Sorbus aucuparia*; D. *Rosa canina*; E. *Centaurea cyanus*

Solanaceae - Potato Family

24. Bacca fruit is typical for the following representative of *Solanaceae* family:

A. *Atropa belladonna*; B. *Hyoscyamus niger*; C. *Datura stramonium*; D. *Nicotiana tabacum;* E. *Datura innoxia*

25. *Datura stramonium* has dry many-seeded fruits formed by syncarpous gynoecium that dehisce when the valves are broken off. Specify the fruit type:

A. Capsule; B. Follicle; C. Siliqua; D. Coenobium; E. Hesperidium

26. A cultivated plant has green berrylike fruit and underground sprout modifications – tubers. The described plant is:

A. *Solanum tuberosum*; B. *Convallaria majalis*; C. *Polygonatum odoratum*; D. *Atropa belladonna*; E. *Solanum lycopersicum*

27. During identification of fruits of *Datura* family they were determined to be a:

A. Thorned quadrivalve capsule; B. Glossy black berry; C. Urceolate capsule with a lid; D. Juicy globular cynarodium; E. Berry in an orange cup

Lamiaceae (formerly Labiatae) - Mint or Nettle Family

28. If aromatic secretory-downy plant has square in cross section stem, spike inflorescence made up from whorled dichasia, bilabiate corolla and its fruit consists of four nutlets, it probably belongs to the following family:
A. *Lamiaceae*; B. *Scrophulariaceae*; C. *Brassicaceae*; D. *Apiaceae*; E. *Solanaceae*
29. An essential oil plant has a tetraquetrous stem, flowers with bilabiate corolla, its fruit is coenobium. These signs are typical for the following family:
A. *Lamiaceae*; B. *Papaveraceae*; C. *Polygonaceae*; D. *Solanaceae*; E. *Scrophulariaceae*
30. A perennial herbaceous plant has ascending quadrangular stem and oppositely arranged leaves. The flowers with bilabiate corolla are zygomorphic, bisexual arranged in whorls in the leaf axils. The fruit type is coenobium. The described medicinal plant relates to the following botanic family:
A. *Lamiaceae*; B. *Asteraceae*; C. *Poaceae*; D. *Brassicaceae*; E. *Rosaceae*
31. Crop production includes cultivation of medicinal essential oil plants that don't grow in Ukraine wildly, namely *Mentha piperita*, *Ortosiphon stamineus*, and also:
A. *Salvia officinalis*; B. *Origanum vulgare*; C. *Leonurus cardiaca*; D. *Thymus serpyllum*; E. *Leonurus quinquelobatus*
32. Choose a plant whose apical sprouts are used in medical practice for sedative drug production:
A. *Leonurus cardiaca*; B. *Glycyrrhiza glabra*; C. *Digitalis purpurea*; D. *Ledum palustre*; E. *Fagopyrum sagittatum*

Asteraceae (formerly Compositae) - Daisy Family

33. You are studying the silvery downy plant of *Asteraceae* family, which is rich with essential oils and bitters. Harvested are apical sprouts with panicle of small round flower heads. This plant is:
A. *Artemisia absinthium*; B. *Arctium lappa*; C. *Bidens tripartite*; D. *Calendula officinalis*; E. *Chamomilla recutita*
34. *Calendula officinalis* as a representative of *Asteraceae* family can be characterized by the following type of inflorescence:
A. Anthodium; B. Umbel; C. Catkin; D. Capitulum; E. Corymb
35. Essential oil glandules that consist of 8 secretory cells placed in 2 lines and 4 tiers are typical for most plants of the following family:
A. *Asteraceae*; B. *Apiaceae*; C. *Lamiaceae*; D. *Rosaceae*; E. *Scrophulariaceae*
36. A herbaceous plant under examination has segmented lacticifers with anastomoses filled with white latex. This is typical for:
A. *Taraxacum officinale*; B. *Urtica dioica*; C. *Chelidonium majus*; D. *Anethum graveolens*; E. *Thymus vulgaris*
37. A perennial plant has white flower heads grouped in compound corymbs and bipinnatisected or tripinnatisected leaves. Name this plant:
A. *Achillea millefolium* ; B. *Melilotus officinalis*; C. *Potentilla erecta*; D. *Phaseolus vulgaris*; E. *Taraxacum officinale*
38. Which medicinal plant of the *Asteraceae* family has only disk flowers in the flowerhead?
A. Three-part beggarticks (*Bidens tripartita*); B. Dandelion (*Taraxacum officinale*); C. *Echinacea purpurea*; D. Cornflower (*Centaurea cyanus*); E. Common yarrow (*Achillea millefolium*)
39. One of the herbarium specimens of medicinal plants relates to the Asteraceae family. This plant is:
A. *Arctium lappa*; B. *Atropa belladonna*; C. *Cassia acutifolia*; D. *Urtica dioica*; E. *Rubus idaeus*

40. In the practice of harvesting herbal raw material of *Asteraceae* family the term "flowers" means both individual flowers and inflorescences. However, the notion of "flowers" is botanically correct only for:

A. *Centaurea cyanus*; B. Gnaphalium uliginosum; C. Arnica montana; D. *Echinops ritro*; E. *Bidens tripartite*

41. Representatives of *Asteraceae* family have various types of flowers EXCEPT FOR:

A. Bilabiate; B. Tubular; C. Funnelform; D. Ligulate; E. Pseudoligulate

42. Rhizome of a species belonging to the Asteraceae family is polycephalous, succulent, has lysigenous cavities, accumulates inulin. Such underground organ is characteristic of:

A. *Inula helenium*; B. *Hyoscyamus niger*; C. *Digitalis grandiflora*; D. *Sorbus aucuparia*; E. *Helianthus annuus*

43. A certain herbaceous plant grows on the meadows of the Carpathian Mountains. It has orange anthodium inflorescences, upright stem, and a rosette of basal leaves. Name this plant:

A. *Arnica montana*; B. *Cychorium intybus*; C. *Calendula officinalis*; D. *Echinacea purpurea*; E. *Centaurea cyanus*

44. In spring a perennial plant of Asteraceae family produces floral shoots with golden-yellow flowers. After blossom fall, shoots with large leaves appear. Name this plant:

A. *Tussilago farfara*; B. *Hipericum perforatum*; C. *Potentilla erecta*; D. *Petroselinum crispum*; E. *Datura stramonium*

45. Weeds can be harmful for populace's wellbeing. Particularly, allergic reactions are often caused by the following plant in its period of blossoming:

A. *Ambrosia artemisiifolia*; B. *Equisetum arvense*; C. *Stellaria media*; D. *Erigeron canadensis*; E. *Taraxacum officinale*

Medicinal flowering plants common in Ukraine

46. To make diaphoretic herbal tea the following inflorescences are used: 3-15 corymbose dichasia with light-yellow oblong wing-shaped membranous recaulescent squamella that fuses halfway with floral axis. Flowers are fragrant, yellowish. These inflorescences belong to:

A. *Tilia cordata*; B. *Viburnum opulus*; C. *Robinia pseudoacacia* ; D. *Mentha piperita*; E. *Padus avium*

47. A fruit is a capsule with oblate light brown smooth glossy seeds that mucify when moistened. This fruit belongs to:

A. *Linum usitatissimum*; B. *Hypericum perforatum*; C. *Ledum palustre*; D. *Linaria vulgaris*; E. *Digitalis purpurea*

48. During determination of fruit type *Hypericum perforatum* it was found that: the fruit is coebocarpous, dry, opens with valves and contains a big number of seeds. Therefore, the fruit of *Hypericum perforatum* is:

A. Fruitcase; B. Multifollicle; C. Follicle; D. Coenobium; E. Aggregate achene

49. A medicinal herb under examination has the capsule fruit with lacticifers and small openings. This herb is called:

A. *Papaver somniferum*; B. *Chelidonium majus*; C. Zea mays; D. *Mentha piperita*; E. *Sanquisorba officinalis*

50. Bark of a thornless xylophyte of the *Rhamnaceae* family has laxative effect. Name this plant:

A. *Frangula alnus*; B. *Aronia melanocarpa*; C. *Hippophaë rhamnoides*; D. *Rubus idaeus*; E. *Crataegus sanguinea*

51. A certain dioecious plant commonly grows at the forest edge. It is a shrub with thorned sprouts. Its fruit is a round black coenocarpous drupe (pyrenarium) with 3-4 seeds. Name this plant:

A. *Rhamnus cathartica*; B. Hippophae rhamnoides; C. Crataegus sanguinea; D. Rosa canina; E. Sambucus nigra

52. Some medicinal plants are poisonous. Select a poisonous plant from the list below:

A. *Digitalis purpurea*; B. *Origaum vulgare*; C. *Thymus serpilum*; D. *Salvia officinalis*; E. *Thymus vulgaris*

53. A gastric tea contains small oval brown lignified cone-shaped plant parts up to 1.5 cm in length that can be identified as:

A. Aggregate fruits of alnus; B. Larch cones; C. Cypress cones; D. Berry-like juniper cones; E. *Platycladus orientalis* cones

54. Prevailing plants of a foliage forest are monoecious high trees coated with thick dark-grey rind with deep cracks. Their leaves are short-petiolar, pinnatilobate. Their fruit is acorn. Therefore, the dominating species is:

A. *Quercus robur*; B. *Robinia pseudoacacia*; C. *Aesculus hippocastanum*; D. *Tilia cordata*; E. *Betula verrucose*

55. During identification of a perennial herb of *Ranunculaceae* family it was found to have: apical flowers of regular form up to 6 cm in diameter; 5 downy violet-green calyx lobes of irregular serrate form; up to 20 bright yellow glossy petals without nectaro-stigma. What plant is it?

A. *Adonis vernalis*; B. *Helleborus purpurascens*; C. *Ranunculus acris*; D. *Delphinium elatum*; E. *Aconitum napellus*

56. A herb under analysis relates to the *Malvaceae* family and is used as an expectorant and coating agent. The stem is erect, with simple palmate three to five lobed leaves, large pink flowers growing in short panicles. The herb has schizocarpic fruit - a capsule. Identify the plant:

A. *Althaea officinalis*; B. *Fragaria vesca*; C. *Potentilla erecta*; D. *Tussilago farfara*; E. *Thymus serpyllum*

57. The fruit is a bright-red juicy follicetum with a sweet-sour taste. The seeds are kidney- shaped and smell similar to lemon. Such fruits belong to:

A. Schizandra chinensis; B. *Citrus limon*; C. *Malus domestica*; D. *Viburnum opulus*; E. *Sorbus aucuparia*

58. The figwort family *Scrophulariaceae* includes a biennial plant up to 1,5 m high, with golden-yellow flowers gathered in spiked inflorescences. The flowers have five stamens. Specify this plant:

A. *Verbascum phlomoides*; B. *Digitalis purpurea*; C. *Digitalis grandiflora*; D. *Digitalis lanata*; E. *Digitalis Ferruginea*

Exercise 4. Answer the questions:

1. What subkingdoms does the Plantae Kingdom comprise?
2. What plant divisions are of particular interest in Pharmaceutical Botany studies?
3. What are the most common plant families?
4. What is a diagnostic feature of the Buckweet family?
5. What inflorescences are characteristic of the Cabbage family?
6. What type of corolla do the flowers of the Legume family possess?
7. What characteristics are typical for the plants of the Celery or Carrot Family?
8. What characteristics are typical for the plants of the Mint or Nettle Family?
9. What type of flowers don’t representatives of Asteraceae family have?
10. What type of fruit has opium poppy got?

Exercise 5. Find the tests the Latin equivalents to the common names of plants.

St. John's wort		rowan/mountain-ash	
motherwort		Japanese pagoda tree	
magnolia-vine		coltsfoot	

liquorice		cornflower or bachelor's button	
oak		dandelion	
small-leaved lime		potato	
greater burdock		dill	
common buckwheat		hawthorn	

Exercise 6. Match the terms with their definitions.

moss	1) a flowerless plant which has feathery or leafy fronds and reproduces by spores released from the undersides of the fronds
horsetail	2) a type of fruit (seed capsule) having two fused carpels with the length being more than three times the width
fern	3) a small flowerless green plant that lacks true roots, growing in damp habitats and reproducing by means of spores released from stalked capsules
ochrea	4) a fruit consisting of a fleshy enlarged receptacle and a tough central core containing the seeds, e.g., an apple or pear
silique	5) a plant structure formed of stipules fused into a sheath surrounding the stem, and is typically found in the Polygonaceae
pome	6) a nonflowering plant with a hollow jointed stem that bears whorls of narrow leaves, producing spores in cones at the tips of the shoots

Exercise 7. Fill in the blanks with the words given in the box.

vegetatively	gametophyte	lobules	sporophyte
pinnatisected	iodine	sporangia	Ascomycetes
dichotomous	tetrahedral	lamina	reticular
antibiotics	needles	alga	chromatophores

1. _____ produced by fungi belonging to Penicillium and Aspergillus genera are widely used in medicine. They belong to the class of_____.
2. A macroscopic _____ of brown colour with trunk, rhizoids and foliaceous part rich in alginates and _____ is ranked with genus of Laminaria.
3. It is known that cells of Chlorophyta division representatives have _____ of various shapes.
4. Representatives of Lichenes propagate _____ by special formations: isidia, soredia, _____.
5. A higher nonvascular plant has distinct alternation of dominant sexual (_____) and reduced asexual (_____) generations, which indicates that it belongs to Bryophyta.
6. Spore and pollen analysis revealed in the pollen some _____ spores with a semi-circular base and a _____ surface, which may belong to Lycopodiophyta.
7. A plant under examination has a rhizome, big _____ leaves with sori and _____ on their undersurface. According to this data the plant should be related to Polypodiophyta.
8. It is known that leaves of most gymnosperm species are represented by_____. Ginkgo biloba has macropodous leathery leaves with solid flabellate_____, _____venation and one or several notches along the upper margin.

Exercise 8. Fill in the table with Latin names of the plant kingdom divisions.

Division	***Common name***	***Description***
	Conifers	Includes Pinales, Taxales, Cupressaceae and hundreds of other species. Reproduce by producing seeds most often in cones, many have adaptations to tolerate water loss
	Flowering plants	Includes around 25,000 species divided into two main classes the monocotyledons and dicotyledons, produce seeds that are protected by fruits
	Mosses	No vascular system, distinctive vegetative structures, spores produced for reproduction require damp conditions for survival
	Horsetails	Identifiable root, leaf and stem systems but still produce spores instead of seed
	Ferns	Characterized by the alternation of asexual (sporophyte) and sexual (gametophyte) generations. The asexual generation is the more dominant. It is an herbaceous or treelike plant, usually having large, dissected leaves.
	Cub mosses and quillworts	Plants are small, green, leafy and have spores but no flowers. They are a little like mosses, they have a fully formed vascular system, with phloem and xylem.

3.1. PATHOPHYSIOLOGY
Part 1

Exercise 1. Read and translate the text.

Pathophysiology of Stroke

Stroke is a neurological disorder characterized by blockage of blood vessels. Clots are formed in the brain and interrupt blood flow, clogging arteries and causing blood vessels to break, leading to bleeding. Rupture of the arteries leading to the brain during stroke results in the sudden death of brain cells owing to a lack of oxygen. Stroke can also lead to depression and dementia.

Stroke is defined as an abrupt neurological outburst caused by impaired perfusion through the blood vessels to the brain. It is important to understand the neurovascular anatomy to study the clinical manifestation of the stroke. The blood flow to the brain is managed by two internal carotids anteriorly and two vertebral arteries posteriorly (the circle of Willis). Ischemic stroke is caused by deficient blood and oxygen supply to the brain; hemorrhagic stroke is caused by bleeding or leaky blood vessels.

Ischemic occlusions contribute to around 85% of casualties in stroke patients, with the remainder due to intracerebral bleeding. Ischemic occlusion generates thrombotic and embolic conditions in the brain. In thrombosis, the blood flow is affected by narrowing of vessels due to atherosclerosis. The build-up of plaque will eventually constrict the vascular chamber and form clots, causing thrombotic stroke. In an embolic stroke, decreased blood flow to the brain region causes an embolism; the blood flow to the brain reduces, causing severe stress and untimely cell death (necrosis). Necrosis is followed by disruption of the plasma membrane, organelle swelling and leaking of cellular contents into extracellular space, and loss of neuronal function. Other key events contributing to stroke pathology are inflammation, energy failure, loss of homeostasis, acidosis, increased intracellular calcium levels, excitotoxicity, free radical-mediated toxicity, cytokine-mediated cytotoxicity, complement activation, impairment of the blood–brain barrier, activation of glial cells, oxidative stress and infiltration of leukocytes.

Hemorrhagic stroke accounts for approximately 10–15% of all strokes and has a high mortality rate. In this condition, stress in the brain tissue and internal injury cause blood vessels to rupture. It produces toxic effects in the vascular system, resulting in infarction. It is classified into intracerebral and subarachnoid hemorrhage (ICH). In ICH, blood vessels rupture and cause abnormal accumulation of blood within the brain. The main reasons for ICH are hypertension, disrupted vasculature, excessive use of anticoagulants and thrombolytic agents. In subarachnoid hemorrhage, blood accumulates in the subarachnoid space of the brain due to a head injury or cerebral aneurysm.

In fact, the risk of stroke increases with age and doubles over the age of 55 years in both men and women. Risk is increased further when an individual has an existing medical condition like hypertension, coronary artery disease or hyperlipidemia. Nearly 60% of strokes are in patients with a history of transient ischemic attack (TIA). Some of the risk factors for stroke are modifiable, and some are non-modifiable.

Stroke prevention involves modifying risk factors within a population or individuals, while stroke management depends on treating its pathophysiology. Despite an enormous amount of research into stroke over the last two decades, no simple means of treating or preventing all the clinical causes of stroke has been established. The overall direction of current stroke research is to generate novel therapies that modulate factors leading to primary and secondary stroke.

Stroke is the second leading cause of death and contributor to disability worldwide and has significant economic costs. Thus, more effective therapeutic interventions and improved post-stroke management are global health priorities. The last 25 years of stroke research has brought considerable progress with respect to animal experimental models, therapeutic drugs, clinical trials and post-stroke rehabilitation studies, but large gaps of knowledge about stroke treatment remain. Despite our increased understanding of stroke pathophysiology and the large number of studies targeting multiple pathways causing stroke, the inability to translate research into clinical settings has significantly hampered advances in stroke research. Most research has focused on restoring blood flow to the brain and minimizing neuronal deficits after ischemic insult. The major challenges for stroke investigators are to characterize the key mechanisms underlying therapies, generate reproducible data, perform multicenter pre-clinical trials and increase the translational value of their data before proceeding to clinical studies.

Exercise 2. Answer the questions:

1. What are some of the risk factors for stroke?
2. What does stroke management depend on?
3. What is the definition of stroke?
4. What does rupture of the arteries leading to the brain during stroke results in?
5. What is important to understand to study the clinical manifestation of the stroke?
6. What is ischemic stroke caused by?
7. What is hemorrhagic stroke caused by?
8. What kind of conditions does ischemic occlusion generate in the brain?
9. What are other key events contributing to stroke pathology?
10. What are the main reasons for ICH?
11. What is the overall direction of current stroke research?
12. What has significantly hampered advances in stroke research?
13. What are the major challenges for stroke investigators?
14. What has most research focused on?

Exercise 3. Match the terms with their definitions:

1) **Dementia** 2) **Thrombosis** 3) **Atherosclerosis** 4) **Embolism** 5) **Necrosis** 6) **Homeostasis** 7) **Infarction** 8) **Hemorrhage**	a) the process by which the body reacts to changes in order to keep conditions inside the body b) a condition in which the blood supply to an area of tissue is blocked and the tissue dies c) the death of most or all of the cells in an organ or tissue caused by injury, disease or a loss of blood supply d) a brain condition, mostly affecting older people, in which a person has difficulties with memory, thinking, control of the body, etc. that are severe enough to affect daily life e) a medical condition in which there is severe loss of blood from a damaged blood vessel inside a person's body f) a serious condition caused by a blood clot forming in a blood vessel or in the heart g) a condition in which a blood clot or air bubble blocks an artery in the body h) a condition in which the walls of the arteries become thick and hard, making it difficult for blood to flow

Exercise 4. Form the nouns from the following verbs:

To interrupt, to depress, to perfuse, to manifest, to constrict, to reduce, to disrupt, to contribute, to activate, to produce, to accumulate, to prevent, to direct, to populate, to translate, to generate

Exercise 5. Complete the following sentences:

1) Stroke can also lead to _____ and dementia.
2) It is essential to understand the _____ anatomy to study the clinical manifestation of the stroke.
3) _____ **st**roke is caused by deficient blood and oxygen supply to the brain.
4) Hemorrhagic stroke is caused by _____ or leaky blood vessels.
5) In thrombosis, the blood flow is affected by narrowing of vessels due to _____.
6) Stress in the brain tissue and internal injury cause blood vessels to _____.
7) It produces _____ effects in the vascular system, resulting in infarction.
8) Stroke management depends on treating its _____.
9) Stroke is the second leading cause of death and contributor to _____ worldwide.
10) Most _____ has focused on restoring blood flow to the brain and minimizing neuronal deficits after ischemic insult.
11) In ICH, blood vessels rupture and cause abnormal _____ of blood within the brain.

Exercise 6. Make 15 two-word expressions connected with medicine by combining words from the two lists: A and B. Match each expression with the appropriate phrase. Use each word once. The first one has been done for you as an example.

A	B
clinical	occlusions
key	drugs
ischemic	rate
blood	aneurysm
intracerebral	effects
vascular	cells
therapeutic	studies
medical	injury
mortality	condition
ischemic	deficits
glial	insult
internal	**mechanisms**
toxic	chamber
cerebral	bleeding
neuronal	flow

Exercise 6. Read the statements and decide if they are True or False. Correct the wrong sentences.

1) The risk of stroke decreases with age.
2) Stroke is the first leading cause of death and contributor to disability worldwide.
3) In an embolic stroke, decreased blood flow to the brain region causes an embolism.
4) Ischemic stroke is caused by deficient glucose and oxygen supply to the brain.
5) Hemorrhagic stroke is caused by leaky blood vessels.
6) Necrosis is followed by disruption of the plasma membrane, organelle swelling and leaking of cellular contents into extracellular space, and loss of consciousness.
7) Almost 60% of strokes are in patients with a history of transient ischemic attack.
8) Stroke management depends on treating its pathophysiology.

9) Some simple means of treating and preventing all the clinical causes of stroke have been established.
10) In thrombosis, the blood flow is affected by narrowing of vessels due to atherosclerosis.
11) Ischemic occlusion generates thrombotic and embolic conditions in the heart.
12) In AIDS, blood vessels rupture and cause abnormal accumulation of blood within the brain.

Exercise 8. Match the beginnings and endings of the sentences.

Rupture of the arteries leading to the brain during stroke	the vascular system, resulting in infarction.
The build-up of plaque will eventually constrict	like hypertension, coronary artery disease or hyperlipidemia.
Hemorrhagic stroke accounts for	to generate novel therapies that modulate factors leading to primary and secondary stroke.
It produces toxic effects in	results in the sudden death of brain cells owing to a lack of oxygen.
Risk is increased further when an individual has an existing medical condition	modifiable, and some are non-modifiable.
The overall direction of current stroke research is	approximately 10–15% of all strokes and has a high mortality rate.
Most research has focused on restoring	blockage of blood vessels.
Some of the risk factors for stroke are	and doubles over the age of 55 years in both men and women.
Stroke is a neurological disorder characterized by	the vascular chamber and form clots, causing thrombotic stroke.
In fact, the risk of stroke increases with age	blood flow to the brain and minimizing neuronal deficits after ischemic insult.

3.2. PATHOPHYSIOLOGY

Part 2

Exercise 1. Active Vocabulary.

NOUN	VERB	ADJECTIVE	ADVERB
delivery	conduct	bilateral	eventually
focus	contain	dense	finely
jaundice	cover	distended	tightly
lumen	crunch	dull	significantly
margin	deflate	enlarged	
onset	detect	extreme	
plaque	diminish	irregular	
rash	discharge	marked	
shin	exacerbate	moist	
thigh	observe	pyogenic	
tumor	perforate	smooth	
tunic	retain	softened	
	suspect	suppurative	
		ulcerative	
		viscous	

Exercise 2. Read the tests.

1. After a collision of two cars, one of the drivers presents with a deformity in the middle third of the left shin. The driver feels extreme pain that exacerbates on attempts to move it. The ends of a broken bone protrude from the open wound, the bone is triangular on section, movements cause the bleeding to intensify. What bone was damaged?

A. Tibia
B. Fibula
C. Femur
D. Patella
E. Talus

2. A certain disease of infection-allergic or unknown origin leads to bilateral diffuse or focal non-suppurative inflammation of renal glomerular apparatus with characteristic renal and extrarenal signs. Name this disease:

A. Glomerulonephritis
B. Pyelonephritis
C. Nephrolithiasis
D. Polycystic renal disease
E. Nephrosclerosis

3. A patient presents with acute onset of the disease: high fever and enlarged painful spleen. On the 10th day since the onset the patient developed a maculopapular rash on the abdomen. On the 21st day the patient died of peritonitis. Postmortem study of the body shows deep ulcers in the area of necrotic aggregate lymphoid follicles (Peyer's patches) in the ileum of the deceased. One of the ulcers is perforated and diffuse fibrinopurulent peritonitis is observed. What disease can be suspected in this case?

A. Typhoid fever
B. Dysentery
C. Intestinal amebiasis
D. Cholera
E. Salmonellosis

4. An autopsy of a 42-year-old man, who suffered from chronic diffuse bronchitis and died of cardiopulmonary failure, shows large hyperinflated lungs that cover mediastinum with their edges. The lungs do not deflate, are colored pale gray, crunch on section; lung surface does not straighten out when pressed with a finger, resulting in a permanent depression. Mucopurulent exudate is produced from the bronchial lumen. What is the most likely diagnosis?

A. Chronic diffuse obstructive emphysema
B. Chronic focal emphysema
C. Interstitial emphysema
D. Primary idiopathic emphysema
E. Vicarious compensatory emphysema

5. Autopsy of a man with tuberculosis has revealed a 3x2 cm large cavity in the superior lobe of the right lung. The cavity was communicating with a bronchus, its wall was dense and consisted of three layers: the internal layer was pyogenic, the middle layer was made of tuberculous granulation tissue, and the external one was made of connective tissue. What is the most likely diagnosis?

A. Fibrous cavernous tuberculosis
B. Fibrous focal tuberculosis
C. Tuberculoma
D. Acute focal tuberculosis
E. Acute cavernous tuberculosis

6. The dentist examines a pregnant woman. There are 3 round lesions up to 1 cm in diameter on her oral mucosa. The lesions appeared 3 days ago, they have white-gray surface and red margin. The dentist can make the following diagnosis:

A. Aphthous stomatitis
B. Leukoplakia
C. Catarrhal stomatitis
D. Necrotizing ulcerative stomatitis
E. Gangrenous stomatitis

7. A 28-year-old patient presented with elevated blood pressure, hematuria, and facial edemas. Despite the treatment, the signs of renal failure were exacerbating. 6 months later the patient died of uremia. Microscopy of the kidneys shows proliferation of nephrothelium in the glomerular capsules and proliferation of podocytes that contributes to crescent formation. Sclerosis and hyalinosis of the glomeruli is observed. Make the diagnosis:

A. Subacute glomerulonephritis
B. Acute pyelonephritis
C. Nephrotic syndrome
D. Chronic glomerulonephritis
E. Acute glomerulonephritis

8. A 23-year-old man developed a perforation in his hard palate, a dense formation with clear margins was detected in this area. After a surgery, microscopy of the excised formation shows there a large focus of caseous necrosis surrounded with a granulation tissue with endovasculitis and a cellular infiltration consisting of lymphocytes and epithelioid cells with predominance of plasma cells. What is the most likely disease in this case?

A. Syphilis
B. Tuberculosis

C. Leprosy
D. Scleroma
E. Sarcoma

9. A 53-year-old woman complains of painful swelling in her left parotid area. The swelling appeared 5 days ago. Objectively the skin in this area is slightly hyperemic and tender. Excretory duct of the salivary gland produces a small amount of viscous turbid yellow-green liquid. Microscopy detects a diffuse infiltration of the gland with segmented neutrophils. Make the diagnosis:

A. Acute suppurative parotitis
B. Epidemic parotitis
C. Sjogren syndrome
D. Glandular adenoma
E. Acute serous parotitis

10. A 65-year-old man presents with acute mandibular osteomyelitis. 3 days after the disease onset he developed marked edema of skin and soft submandibular cervical tissues. Microscopically there is a diffuse infiltration with neutrophils. What complication of the main disease occurred in the patient's skin tissues?

A. Phlegmon
B. Abscess
C. Carbuncle
D. Furuncle
E. Actinomycosis

11. Mother of a 4-year-old child complains that the child developed elevated body temperature, tenesmus, diarrhea, and abdominal pain attacks. The child attends a preschool facility. Laboratory analysis detected mucus and blood admixtures in the child's feces. Name the changes that occur in the gastrointestinal tract during dysentery:

A. Colitis
B. Gastritis
C. Enterocolitis
D. Enteritis
E. Gastroenteritis

12. During autopsy of the patient, who died of cardiovascular failure, the patient's right foot is darkly colored. The vessels of the patient's thigh are partially obstructed by grayish-red clots. On the vessel walls there are yellowish-gray spots and fibrous plaques, some of which are of stony density. What clinicopathological type of atherosclerosis was complicated in the patient?

A. Atherosclerosis of lower extremities
B. Cerebral atherosclerosis
C. Atherosclerosis of aorta
D. Vascular intestinal atherosclerosis
E. Renal atherosclerosis

13. A 35-year-old man had been suffering from bronchial asthma for a long time. Eventually he developed a status asthmaticus that became lethal. Examination of section materials shows a bronchiolar spasm in the lungs. The bronchiolar walls show signs of cellular infiltration with predominance of eosinophilic leukocytes and lymphocytes, labrocytes with signs of degranulation are observed. What mechanism of hypersensitivity is the cause of these changes?

A. Reaginic reaction
B. Antibody-dependent
C. Immune complex
D. Cell-mediated cytotoxicity
E. –

14. Autopsy of a 60-year-old woman, who for a long time had been suffering from essential hypertension, shows significantly diminished kidneys (weight of both kidneys is 80 g) with finely granular surface. Uniform renal cortical thinning can be observed on section. Name the described changes in the kidneys:

A. Primary contracted kidney
B. Pyelonephritic contracted kidney
C. Secondary contracted kidney
D. Amyloid contracted kidney
E. Diabetic nephrosclerosis

15. Autopsy of a 3-year-old child shows a tumor in the cerebellum. The tumor has no clear margins separating it from the surrounding tissues. Histologically it is made of small atypical cells with hyperchromic nuclei. This tumor is most likely a:

A. Medulloblastoma
B. Medullary sarcoma
C. Cancer metastasis
D. Sarcoma metastasis
E. Glioblastoma

16. Autopsy revealed a large wedge-shaped patch of a dense dark red tissue with clear margins in the upper lobe of the right lung. Histological examination detected there necrosis of the alveolar walls; the alveolar lumen is tightly packed with erythrocytes. What process occurred in the lungs?

A. Hemorrhagic infarction
B. Carneous degeneration
C. Gangrene
D. Hemorrhage
E. Atelectasis

17. A patient has gradually developed a skin plaque on his face. In the center of this plaque there are necrotic patch and an ulcer. Histopathological analysis of the biopsy material reveals proliferation of atypical epithelial cells with large number of pathologic mitoses. What is the most likely diagnosis?

A. Skin cancer
B. Sarcoma
C. Papilloma
D. Trophic ulcer
E. Fibroma

18. A 63-year-old man, who has been suffering from chronic diffuse obstructive pulmonary emphysema for 15 years, died of progressive heart failure. Autopsy shows nutmeg liver cirrhosis, cyanotic induration of kidneys and spleen, ascites, and edemas of the lower limbs. What type of heart failure can be characterized by such changes in the internal organs?

A. Chronic heart failure
B. Acute right ventricular failure
C. Chronic atrial failure
D. Acute left ventricular failure
E. Acute global heart failure

19. A 6-year-old girl presents with acute onset of a disease. She developed sore throat and high temperature that were later accompanied by a punctate skin rash. Oral examination reveals acute pharyngeal hyperemia, raspberry tongue, and enlarged bright red tonsils with dull gray and yellow foci that spread to the peritonsillar tissues. The submandibular lymph nodes are enlarged. What disease are these changes characteristic of?

A. Scarlet fever
B. Measles
C. Pharyngeal diphtheria
D. Laryngeal diphtheria
E. Meningococcal nasopharyngitis

20. Autopsy of a man, who served on a nuclear submarine, revealed the following pathologies: bone marrow atrophy (panmyelophthisis), anemia, leukopenia, thrombocytopenia, lymphocytic disintegration in the lymph nodes, spleen, gastrointestinal lymphatic system, and hemorrhages into the adrenal glands. What disease had developed in this case?

A. Acute radiation sickness
B. Decompression sickness
C. Acute leukemia
D. Acute anemia
E. Vibration disease

21. A 9-month-old child presents with delayed tooth eruption, improper sequence of tooth eruption, and horizontal maxillary configuration (high-arched palate). Microscopically enamel mineralization pattern is irregular, enamel columns are wrinkled, some of them are vacuolated, predentin zones are widened, single denticles can be observed. What disease is it?

A. Early rickets
B. Late rickets
C. Osteomalacia
D. Gout
E. Hypervitaminosis *D*

22. Autopsy of a 58-year-old man, who for a long time has been drinking alcohol in large amounts and died at home, is being conducted. Macroscopically the right lung is dense and enlarged, its tissue is gray and homogeneous on section, its pleura is covered with grayish membranous deposits. Microscopically the alveolar cavities contain fibrin threads, neutrophils, and hemolysed erythrocytes. Make the diagnosis:

A. Croupous pneumonia
B. Focal pneumonia
C. Interstitial pneumonia
D. Primary pulmonary tuberculosis
E. Caseous pneumonia

23. Autopsy of a 49-year-old woman who died of chronic kidney failure shows small dense striated kidneys with areas of hemorrhages. Microscopically nuclei of epithelial channels contain hematoxylin bodies; glomerular capillaries resemble wire loops, have thickened basement membranes, and in places contain hyaline thrombi and foci of fibrinoid necrosis. What is the most likely diagnosis?

A. Systemic lupus erythematosus
B. Rheumatism
C. Arteriolosclerotic nephrosclerosis
D. Amyloidosis
E. Atherosclerotic nephrosclerosis

24. A 34-year-old man died in a comatose state. According to his family after a business trip to an African country, he developed periodical jaundice attacks. Autopsy shows the following: dense enlarged spleen with slate-black pulp; enlarged plethoric liver, gray-black on section; cerebral gray matter is brown-gray; cerebral white matter contains numerous small hemorrhages. What infectious disease can be suspected?

A. Malaria
B. Meningococcemia
C. Prion infection
D. Generalized herpetic infection
E. Generalized cryptococcosis

25. A 27-year-old woman has undergone a sector resection of mammary gland tissue. Macroscopy detects a dense white node, 4 cm in diameter, with clear margins in the excised tissue. Immediate histological analysis shows the tumor to consist of a large amount of fibrous stroma with stromal proliferation around the small canaliculi. Canalicular epithelium overlays the basement membrane and retains its polarity. Make the diagnosis:
A. Pericanalicular fibroadenoma
B. Adenocarcinoma
C. Sarcoma
D. Dyshormonal disorders
E. Cancer

26. In the course of an urgent surgery, the vermiform appendix of the patient was excised. The appendix was acutely distended and gray-black throughout its whole length. In the distal segment a defect of the appendix wall was detected, through which a foul-smelling gray-brown substance was being discharged from the appendix lumen. Histological analysis shows necrotization of the appendix wall with hemorrhagic foci; lumen of the mesenteric artery is filled with a trombus. What type of appendicitis is it?
A. Acute gangrenous
B. Acute phlegmonous
C. Acute simple
D. Acute superficial
E. Chronic

27. A 39-year-old man underwent a surgery for peptic ulcer disease of the stomach. He died 7 days after the surgery. On autopsy the peritoneal layers are plethoric, dull, and covered with massive yellow-green membranous deposits. The peritoneal cavity contains approximately 300 mL of thick yellow-green fluid. What pathologic process was detected in the peritoneal cavity?
A. Fibrinopurulent peritonitis
B. Serous peritonitis
C. Serofibrinous peritonitis
D. Peritoneal commissures
E. Fibrinohemorrhagic peritonitis

28. A man died 8 days after the beginning of the disease. He was diagnosed with dysentery. On autopsy it was found out a thickened wall of the sigma and rectum, fibrinous membrane on the surface of mucous membrane. Histologically: there is a deep necrosis of mucous membrane with infiltration of necrotic masses with fibrin. What kind of colitis does correspond to the changes?
A. Diphtheritic
B. Catarrhal
C. Ulcerative
D. Chronic
E. Gangrenous

29. A patient ill with diabetes mellitus felt acute pain in his right foot. Objectively: foot thumb is black, foot tissues are edematous, there are foci of epidermis desquamation, stinking discharges. What clinicopathological form of necrosis is it?
A. Moist gangrene

B. Bedsore
C. Sequestrum
D. Dry gangrene
E. Infarction

30. A patient died under conditions of cardiovascular insufficiency. Autopsy results: postinfarction cardiosclerosis, myocardium hypertrophy and dilatation of its cavities, especially of its right ventricle. Liver is enlarged, its surface is smooth, incision revealed that it was plethoric, with dark-red specks against the background of brownish tissue. Histologically: plethora of central parts of lobules; peritheral parts around portal tracts contain hepatocytes in a state of adipose degeneration. How are these liver changes called?

A. Nutmeg liver
B. Pseudonutmeg liver
C. Amyloidosis
D. Liver cirrhosis
E. Liver steatosis

31. On autopsy of the 40-year-old woman suffering from rheumatic arthritis, the enlarged solid spleen was revealed. On section its tissue is of the mahogany color with enlarged follicles, which look like semi-transparent grayish-whitish grains. What pathological process is the most likely?

A. Sago spleen
B. Glaze spleen
C. Waxy spleen
D. Hyaline spleen
E. Porphyric spleen

32. On microscopic examination of the enlarged neck gland of a 14-year-old girl it was revealed destruction of the tissue structure of the node, absence of the lymph follicles, sclerotic and necrosis parts. Cell constitution of the node is polymorphous; lymphocytes, eosinophils, atypical cells of the large size with multiple-lobule nuclei (Beresovsky-Shternberg cells) and one nucleus cells of the large size are present. What is the most likely diagnosis?

A. Lymphogranulomatous
B. Acute lympholeucosis
C. Chronic lympholeucosis
D. Berkitt's lymphoma
E. Fungous mycosis

33. A worker of a cattle farm fell acutely ill and then died from the progressing intoxication. Autopsy revealed enlarged, hyposthenic spleen of dark-cherry colour when dissected; excessive pulp scraping. At the base and fornix of brain pia maters are edematous, soaked with blood, dark-red ("scarlet hat"). Microscopic examination revealed serous haemorrhagic inflammation of brain tissues and tunics along with destruction of small vessel walls. What is the most likely diagnosis?

A. Anthrax
B. Tularemia
C. Brucellosis
D. Plaque
E. Cholera

34. Autopsy of a man who died from burn disease revealed brain edema, liver enlargement as well as enlargement of kidneys with wide light-grey cortical layer and plethoric medullary area. Microscopic examination revealed necrosis of tubules of main segments along with destruction of basal membranes, intersticium edema with leukocytic infiltration and haemorrhages. What is the most probable postmortem diagnosis?

A. Necrotic nephrosis
B. Tubulointerstitial nephritis
C. Pyelonephritis
D. Gouty kidney
E. Myeloma kidney

35. 6 months after delivery a woman had uterine bleeding. Gynecological examination revealed in the uterine cavity a dark-red tissue with multiple cavities that resembled of "sponge". Microscopic examination of the tumor revealed some atypic light epithelial Langhans cells and giant cells of syncytiotrophoblast in blood lacunas. What tumor is it?

A. Chorioepithelioma
B. Squamous cell nonkeratinous carcinoma
C. Adenocarcinoma
D. Fibromyoma
E. Vesicular mole

36. A 54-years old male with a history of ischemic heart disease presents at hospital with recurrent myocardial infarction. Few days later, he died due to cardiac failure. Post-mortem revealed an enlarged solid spleen of dark cherry color on the cut surface. Microscopically, pulp sclerosis and follicles atrophy were found out. What is the most likely term to define spleen's alterations?

A. Cyanotic induration of spleen.
B. Sago spleen.
C. Lardaceous spleen.
D. Porphyry spleen.
E. Septic splenitis

37. Autopsy of the body of a 48-year-old man shows that the bone marrow in the flat bones, as well as in the cylindrical bone diaphyses and epiphyses, is moist, colored gray-red or gray-yellow, and puriform (pyoid bone marrow). The spleen weight is 7 kg; it is dark red on section, with signs of ischemic infarctions. All the lymph nodes are enlarged, soft, and gray-red in color. In the liver there are signs of fatty degeneration and leukemic infiltrates. What is the most likely diagnosis?

A. Chronic myeloid leukemia
B. Lymphogranulomatosis
C. Acute lymphoid leukemia
D. Acute myeloid leukemia
E. Multiple myeloma

38. Purulent endometritis with fatal outcome was progressing in the woman after abortion performed not at the hospital. On autopsy multiple lung abscesses, subcapsule ulcers in the kidneys, spleen hyperplasia were revealed. What form of sepsis developed in the patient?

A. Septopyemia
B. Septicemia
C. Chroniosepsis
D. Lung sepsis
E. Urosepsis

Exercise 3. Make new words from given with the negative meanings with the help of:

a) prefix un-(in-, im-, il-, ir-)

different, possible, regular, necessary, resistible, reliable, reversible, mobile, relevant, human, visible, conscious, movable, pleasant, capable, correct, natural, curable, mobilization, coloured, familiar, stable, direct, responsible, active, success, coagulability, capability, organic, effective, equal,

affected, altered, anesthetized, broken, complicated, conditioned, cooled, delivered, infected, absorbed, immune, treated, crystallized, cured, contaminated.

b) prefix ab-

normal, mortal, irritation, normality, junction

c) prefix mis-

understand, translate, place, fortune, information, usage, guide, lead

d) prefix dis-

organize, approve, continue, integrate, place, connect, balance, charge, pleasure, true, ability, approval, order, illusion, function, infection, infectant, comfort, integration

e) prefix mal-

nutrition, formation, practice, occlusion, function, treat, adjusted, absorption, normal, junction, distribution, fixation, proliferation, assimilation, alignment, digestion.

Exercise 4. Find the synonyms from the tests.

purulent –
thrombus –
adipose –
change –
decompensation –

substance –
tunic –
edge –
childbirth –
investigation –

Exercise 5. Remember roots and suffixes pertaining to pathological processes and conditions. Explain the examples.

Root/Suffix	Meaning	Example
- cele	hernia	hydrocele
- ectasia	dilatation, extension	phlebectasia
- ectopia	abnormal position	angiectopia
necro-,- necrosis	death of tissue	nephronecrosis
penia-	deficiency	thrombopenia
patho-	disease	pathogenic
-rrhagia	bleeding, pathologic flow	rhinorrhagia
-rrhexia,-rrhexis	rupture	cardiorrhexia
-sclero-, -sclerosis	hardening	sclerodermia

Exercise 6. Read the definitions and choose the proper term given in brackets.

1. _____ is eosinophil cell deficiency in the blood
2. _____ is sugar in the blood

3. _____ is escape of blood from the blood vessels
4. _____ is disease with marked increase in white blood cells
5. _____ is deficient quantity and quality of blood
6. _____ is deficiency in the cells of the blood
7. _____ is presence of bile in the blood
8. _____ is hemorrhage from the ear
9. _____ is presence of toxic products in the blood
10. _____ is deficiency of thromboplastin in the blood
11. _____ is excessive bleeding during menstruation
12. _____ is lack of white blood cells

(Leukemia, glycemia, anemia, cholemia, toxemia, leucopenia, cytopenia, eosinopenia, thromboplastinopenia, hemorrhage, menorrhagia, otorrhagia)

Exercise 7. Match the terms with their definitions.

1. Scoliosis	a) is a medical condition, characterized by abnormal deposits of calcium salts in various tissues
2. Hidrosis	b) is a medical condition, characterized by abnormal dryness of the skin, mucous membranes, or conjunctiva
3. Onychosis	c) is a medical condition, produced by exposure to the sun, and marked by convulsions, coma, and a high temperature of the skin
4. Xerosis	d) is a medical condition, characterized by the excessive production of sweat
5. Toxoplasmosis	e) is a medical condition, characterized by chronic bad breath. it may be caused by gum disease, tooth decay, an oral infection, dry mouth, or other diseases
6. Heliosis	f) is a medical condition, characterized by a sideways curvature of the spine that occurs most often during the growth spurt just before puberty
7. Halitosis	g) is any disease, deformity, or malformation, of the nails
8. Calcinosis	h) is a disease is caused by the parasite, commonly seen in domesticated cats. it can infect the human brain and influence behavior

Exercise 8. Fill in the table.

NOUN	**VERB**	**ADJECTIVE**
	investigate	
		exudative
location		
		alterable
	feel	
dilatation		
		moist
	diminish	
	obstruct	
		communicative

3.3. PATHOPHYSIOLOGY

Part 3

Exercise 1. Key words.

NOUN	VERB	ADJECTIVE	ADVERB
adolescent	associate	brief	acutely
appearance	cause	dry	approximately
contraction	correspond	excessive	completely
deficiency	describe	exhausting	prominently
digestion	deteriorate	healthy	rapidly
disturbance	improve	impaired	
drop	irradiate	intense	
edema	suffer	itching	
eructation	undergo	lacerated	
failure		obliterating	
fluctuation		profuse	
intoxication		recurrent	
peptic ulcer		shallow	
permeability		slight	
probability		sour	
resection		total	
suppression		unconscious	
victim			

Exercise 2. Read the tests.

1. A patient was hospitalized in a comatose state. The patient has a 5-year-long history of diabetes mellitus type 2. Objectively respiration is noisy, deep, with acetone breath odor. Blood glucose is 15.2 mmol/L, ketone bodies - 100 micromol/L. These signs are characteristic of the following diabetes complication:

A. Ketoacidotic coma
B. Hepatic coma
C. Hyperglycemic coma
D. Hypoglycemic coma
E. Hyperosmolar coma

2. A 63-year-old man suffers from esophageal carcinoma, presents with metastases into the mediastinal lymph nodes and cancerous cachexia. What pathogenetic stage of neoplastic process is observed in the patient?

A. Progression
B. Promotion
C. Transformation
D. Initiation
E. –

3. After a prolonged attack of severe headache the patient lost mobility in his left arm and leg. Muscle tone is decreased in the affected limbs, the muscles are spasmed, spinal tendon reflexes are acutely intensified, reflex zones are increased. What nervous system disorder can be observed in this patient?

A. Central paralysis
B. Peripheral paralysis
C. Extrapyramidal paralysis
D. Flaccid paralysis
E. Reflex paralysis

4. Hematologic study shows the following pattern: erythrocytes - 2, 8 10^{12}/L, Hb - 80 g/L, color index - 0.85, reticulocytes - 0,1%, platelets - 160 thousand per microliter, leukocytes - 60 10^{9}/L. Basocytes - 2%,eosinophils - 8%, promyelocytes - 5%, myelocytes - 5%, juvenile - 16%, stab neutrophils - 20%, segmented neutrophils - 34%, lymphocytes - 5%, monocytes - 5%. This clinical presentation indicates the following blood pathology:

A. Chronic myeloleukemia
B. Acute myeloleukemia
C. Hypoplastic anemia
D. Undifferentiated leukemia
E. Hemolytic anemia

5. Antileukocytic antibodies are detected in the blood of a patient with leukopenia. What type of Coombs-Gell hypersensitivity reaction developed in this case?

A. Cytotoxic
B. Stimulating
C. Anaphylactic
D. Delayed-type hypersensitivity
E. Immune complex-mediated

6. A patient with obliterating endarteritis has undergone a ganglionic sympathectomy. Positive therapeutic effect of this surgery is associated with development of arterial hyperemia of the lower limbs, which can be described as:

A. Neuroparalytic
B. Neurotonic
C. Metabolic
D. Reactive
E. Working

7. In an experiment a laboratory rat was subjected to a stress factor (electric current), which resulted in muscular hypotonia, arterial hypotension, hypothermia, and hypoglycemia in the animal. What period of general adaptation syndrome is it?

A. Shock phase
B. Antishock phase
C. Resistance stage
D. Exhaustion stage
E. –

8. A 14-year-old adolescent has diphtheria. During the peak of the disease against the background of acute drop in body temperature and tachycardia the blood pressure is 70/50 mm Hg. What type of vascular tone disturbance is it?

A. Acute hypotension
B. -

C. Chronic hypotension
D. Somatoform autonomic dysfunction
E. Essential hypotension

9. 24 hours after an appendectomy the patient's blood test shows neutrophilic leukocytosis with a regenerative shift. What is the most likely mechanism of absolute leukocytosis development in the patient's peripheral blood?

A. Intensification of leukopoiesis
B. Leukocyte redistribution
C. Decreased leukocyte disintegration
D. Deceleration of leukocyte migration to the tissues
E. Immunity activation

10. A 59-year-old man, a business manager, developed intense burning retrosternal pain that irradiates to the left arm. The pain occurred in the evening after the tax audit. 15 minutes later the patient's condition normalized. What mechanism of angina pectoris development is leading in this patient?

A. Increased level of blood catecholamines
B. Coronary atherosclerosis
C. Intravascular aggregation of blood cells
D. Coronary artery thrombosis
E. Functional cardiac overload

11. A 30-year-old person has been stung by a bee. The stung area exhibits edema, hyperemia, and elevated temperature. What is the initial pathogenetic factor of inflammatory edema in this case?

A. Increase of microvascular permeability
B. Increase of osmotic pressure in the inflammation focus
C. Decrease of oncotic blood pressure
D. Increase of capillary blood pressure
E. Disturbed lymphatic efflux

12. A 30-year-old woman developed facial edemas. Examination detected proteinuria (5.87 g/L), hypoproteinemia, dysproteinemia, and hyperlipidemia. Such combination of signs is characteristic of:

A. Nephrotic syndrome
B. Nephritic syndrome
C. Chronic pyelonephritis
D. Acute kidney failure
E. Chronic kidney failure

13. An unconscious young man in the state of morphine intoxication has been brought into an admission room. The patient's respiration is slow and shallow due to suppression of the respiratory center. What kind of respiratory failure occurred in this case?

A. Ventilatory disregulation
B. Ventilatory obstruction
C. Ventilatory restriction
D. Perfusion
E. Diffusion

14. A man has been working for a long time in oil processing. What type of carcinogens does he encounter at his workplace?

A. Polycyclic aromatic hydrocarbons
B. Amino-azo compounds
C. Nitrosamines

D. Biological carcinogens
E. Amines

15. A young woman presents with a tumor along the auditory nerve. The tumor is node-shaped, 3 cm in diameter, soft and elastic, pink-white colored, and has homogeneous structure. Microscopically the tumor contains bundles of cells with oval nuclei. These cellular fibrous bundles form regular structures made up of parallel rows of regularly oriented cells arranged in the form of a palisade with acellular homogeneous area in between (Verocay bodies). Name this type of tumor:

A. Neurinoma
B. Malignant neurinoma
C. Ganglioneuroma
D. Neuroblastoma
E. Ganglioneuroblastoma

16. A married couple came for a genetic counseling. The husband suffers from insulin-independent diabetes mellitus, while the wife is healthy. What is the probability of their child developing insulin-independent diabetes mellitus?

A. Higher than in the population
B. The same as in the population
C. Lower than in the population
D. 100%
E. 50%

17. A laboratory rat with chronic kidney failure presents with osteoporosis, pathologic calcification of the internal organs, and arterial hypertension. These disturbances are associated with increased activity of the following hormone:

A. Parathyroid hormone
B. Thyroxin
C. Triiodothyronine
D. Calcitonin
E. Adrenaline

18. A patient is diagnosed with severe B_{12}- deficiency anemia resulting in disturbed hematopoiesis and appearance of atypical erythrocytes in the blood. The patient has a history of total gastric resection. This diagnosis can be confirmed if the following cells are present in the peripheral blood:

A. Megalocytes
B. Microcytes
C. Elliptocytes
D. Normocytes
E. Anulocytes

19. A patient with asphyxia after a brief respiratory arrest developed single infrequent respirations with passive expiration, after which he stopped breathing completely. What type of respiration was observed in this case?

A. Gasping respiration
B. Apneustic respiration
C. Kussmaul respiration
D. Cheyne-Stokes respiration
E. Biot respiration

20. A 3-year-old child has been brought by ambulance to the intensive care unit of the infectious diseases hospital. On examination the child is in severe condition, skin and mucosa are dry, tissue turgor is reduced. The patient's history states that profuse diarrhea

and recurrent vomiting were observed throughout the previous day after the child had eaten food products of poor quality. What type of salt and water imbalance is likely to have developed in the patient?

A. Hypoosmolar dehydration
B. Isoosmolar dehydration
C. Hyperosmolar hyperhydration
D. Isoosmolar hyperhydration
E. Hypoosmolar hyperhydration

21. A 48-year-old man is unconscious. He has a history of several syncopal episodes with convulsions. ECG shows deformed QRS complexes unconnected with P waves, atrial contractions are approximately 70/min., ventricular contractions - 25-30/min. Name the type of arrhythmia in this case:

A. Complete atrioventricular block
B. First-degree atrioventricular block
C. Second-degree atrioventricular block
D. Intraatrial block
E. Intraventricular block

22. A 40-year-old man with impaired venous patency in the lower limbs developed edemas. What mechanism plays the main role in the development of this disturbance?

A. Elevated filtration pressure
B. Positive fluid balance
C. Decreased gradient of osmotic pressure between blood and tissue
D. Disturbed humoral regulation of water- mineral balance
E. Hypoproteinemia

23. A pregnant woman developed severe toxemia with exhausting recurrent vomiting throughout a day. By the end of the day she developed tetanic convulsions and dehydration. The described changes were caused by the following type of acid-base imbalance:

A. Nongaseous excretory alkalosis
B. Gaseous alkalosis
C. Gaseous acidosis
D. Nongaseous metabolic acidosis
E. Nongaseous excretory acidosis

24. A 50-year-old man has been undergoing treatment for peptic ulcer disease of the stomach. His digestion normalized, pain disappeared, and general mood improved. However, several weeks later he again developed epigastric pain, heartburn, and sour eructation. How can this clinical course be characterized?

A. Relapse
B. Remission
C. Terminal state
D. Prodromal stage
E. Latent period

25. A patient with essential hypertension presents with circadian fluctuations in total peripheral vascular resistance to blood flow. What vessels will be the most affected in this case?

A. Arterioles
B. Aorta
C. Capillaries
D. Arteriolovenular anastomoses

E. Veins

26. On clinical examination a woman presents with excessive sweating, tachycardia, loss of weight, and tremor. What endocrine pathology can cause these signs?

A. Hyperthyroidism
B. Hypothyroidism
C. Hypergonadism
D. Hypogonadism
E. Hypoaldosteronism

27. A patient on the 2nd day after a cardiac infarction presents with acute decrease of systolic blood pressure down to 60 mm Hg with tachycardia 140/min., dyspnea, loss of consciousness. What mechanism is essential in the pathogenesis of shock developed in this case?

A. Decreased cardiac output
B. Increased myocardial excitability caused by products of necrotic disintegration
C. Decreased circulating blood volume
D. Development of paroxysmal tachycardia
E. Development of anaphylactic reaction to myocardial proteins

28. Lower limbs of a patient with varicose veins were examined. The patient's legs are cyanotic and pastose, skin temperature is low, single petechiae are observed. What disturbance of hemodynamics is it?

A. Venous hyperemia
B. Compression ischemia
C. Obstruction ischemia
D. Thromboembolism
E. Arterial hyperemia

29.A 36-year-old man traveled to the mountains for a vacation (altitude of 2000 meters above the sea level). He developed increased respiration rate, tachycardia, and slight dizziness. Two days later these signs disappeared. This process is called:

A. Adaptation
B. Compensation
C. Regeneration
D. Inhibition
E. Proliferation

30. 30 minutes after the dental treatment the patient developed red itching spots on the face and oral mucosa. The patient was diagnosed with urticaria. What bioactive substance with vasodilating and pruriginous effect is produced during this type of allergic reaction?

A. Histamine
B. Prostaglandin E2
C. Leukotriene B4
D. Interleukin-1
E. Bradykinin

31. The doctor stated the absence of respiration and cardiac activity in a traffic accident victim. This condition lasts for 1 minute already. This clinical presentation corresponds with the following terminal state:

A. Clinical death
B. Traumatic shock, erectile phase
C. Traumatic shock, torpid phase
D. Preagony
E. Agony

32. Due to an accident on board a nuclear submarine, a soldier received a radiation dose of 5 Gy. He complains of headache, nausea, and vertigo. What changes in leukocyte number can be observed in this soldier after the irradiation?

A. Neutrophilic leukocytosis
B. Agranulocytosis
C. Eosinophilia
D. Lymphocytosis
E. Leukopenia

33. A patient was brought to the hospital with a lacerated wound of the maxillofacial area. Profuse bleeding from the wound could not be stopped for a long time. What disturbance of total blood volume will be observed within the first hour after the blood loss occurred?

A. Normocythemic hypovolemia
B. Oligocythemic hypovolemia
C. Polycythemic hypovolemia
D. Hypervolemia
E. No disturbances in blood volume

34. A 54-year-old woman has a total thyroidectomy for papillary thyroid carcinoma. 11 hours after operation she complains of tingling around her mouth. On physical examination, the Trousseau's sign and Chvostek's sign are present. Her condition rapidly deteriorates with laryngospasm and focal seizures. The surgeon suggests surgical destruction of parathyroid glands. Which of the following is the most likely cause of this patient's neurologic abnormality?

A. Hypocalcemia
B. Hyponatremia
C. Hyperchloremia
D. Hypophosphatemia
E. Hyperkalemia

35. A 45-year-old woman comes to her physician with complaints of excessive fatigue and weakness. She says that these symptoms have been present for the past month. On further questioning, she admits having lost 3 kilograms in the last 2 weeks. On physical examination, she is a tired- appearing thin woman. Hyperpigmentation is present over many areas of her body, most prominently over the face, neck and back of hands (areas exposed to light). Increased production of which of the following hormones is the most likely cause of hyperpigmentation in this patient?

A. Melanocyte-stimulating hormone (MSH)
B. Growth hormone (GH)
C. Gonadotropins
D. β-Lipotropin
E. Thyroid-stimulating hormone (TSH)

36. A 65-year-old woman presents to the emergency department because of shortness of breath and chest pain that started a few hours ago. She did not have a fever, expectoration, or any accompanying symptoms. She has a history of right leg deep vein thrombosis that occurred 5 years ago. Some time later, she dies of severe respiratory distress. A pulmonary autopsy specimen reveals red loose mass that is lodged in the bifurcation of the pulmonary trunk with extensions into both the left and right main pulmonary arteries. Which of the following is the most likely diagnosis?

A. Thromboembolism
B. Pneumothorax
C. Myocardial infarction

D. Pneumonia
E. -

37. An autopsy of a 42-year-old man, who suffered from chronic diffuse bronchitis and died of cardiopulmonary failure, shows large hyperinflated lungs that cover mediastinum with their edges. The lungs do not deflate, are colored pale gray, crunch on section; lung surface does not straighten out when pressed with a finger, resulting in a permanent depression. Mucopurulent exudate is produced from the bronchial lumen. What is the most likely diagnosis?

A. Chronic focal emphysema
B. Vicarious compensatory emphysema
C. Interstitial emphysema
D. Chronic diffuse obstructive emphysema
E. Primary idiopathic emphysema

38. A 52-year-old man presents with fever and pain in the joints. Both of his first metatarsophalangeal articulations are deformed, swollen, and reddened. Blood urea is high. The patient is diagnosed with gout. What is the main developmental factor in the pathogenesis of this disease?

A. Hyperuricemy
B. Argininosuccinic aciduria
C. Hyperazotemia
D. Hyperaminoacidemia
E. Citrullinuria

39. Ionizing radiation or vitamin E deficiency affect the cell by increasing lysosome membrane permeability. What are the possible consequences of this pathology?

A. Partial or complete cell destruction
B. Intensive protein synthesis
C. Intensive energy production
D. Restoration of cytoplasmic membrane
E. Formation of maturation spindle

40. Autopsy of the body of an elderly man revealed yellow spots and streaks in the aortic intima and white-yellow protruding plaques in the area of aortic bifurcation. Microscopy (with hematoxylin and eosin staining) shows round cavities in the thickened aortic intima. The cavities color orange when stained with sudan 3 and are surrounded with overgrown connective tissue. What process developed in the aortic intima?

A. Metabolic disorder of cholesterol and cholesterol ethers
B. Local halitosis
C. Metabolic disorder of neutral fat
D. Systemic halitosis
E. Secondary amyloidosis

Exercise 3. Find the synonyms from the tests.

dizziness –
breathlessness –
complication –
insufficiency –
emesis –
perspiration –
fainting –
pruriginous –
injury –
belching

Exercise 4. Match the beginnings and the endings of the world combinations.

disseminated intravascular	with fibrin
activation of fibrinolytic	gangrene
transformation of prothrombin	with smooth wall
filled with hair	of blood cells
infiltration of necrotic masses	system
multirowed	and sebum
moist	of disease
an outbreak	epithelium
intravascular aggregation	into thrombin
vascular resistance	coagulation
multiple cavities	to the blood flow

Exercise 5. Fill in the blanks with the words given in the box.

myelin-producing cells	**tingling**	**ataxia**	**depression**
formation of lesions	**pronounced**	**numbness**	**sensory**
myelin sheaths	**blurred**	**demyelinating**	**multiple sclerosis**
life expectancy	**plaques**	**coordination**	**nystagmus**
sensitivity			

Multiple sclerosis (MS) is a _____ disease in which the insulating covers of nerve cells in the brain and spinal cord are damaged. This damage disrupts the ability of parts of the nervous system to communicate, resulting in a range of signs and symptoms, including physical, mental, and sometimes psychiatric problems.

While the cause is not clear, the underlying mechanism is thought to be either destruction by the immune system or failure of the _____. Proposed causes for this include genetics and environmental factors such as being triggered by a viral infection.

The three main characteristics of MS are the _____ in the central nervous system (also called _____), inflammation, and the destruction of _____of neurons.

A person with MS can have almost any neurological symptom or sign, with autonomic, visual, motor, and _____ problems being the most common. The specific symptoms are determined by the locations of the lesions within the nervous system, and may include loss of _____ or changes in sensation such as _____, pins and needles or _____, muscle weakness, _____ vision, very _____ reflexes, muscle spasms, or difficulty in moving; difficulties with _____ and balance (_____); problems with speech or swallowing, visual problems (_____, optic neuritis or double vision), feeling tired, acute or chronic pain, and bladder and bowel difficulties, among others. Difficulties thinking and emotional problems such as _____ or unstable mood are also common.

There is no known cure for _____. Treatments attempt to improve function after an attack and prevent new attacks. _____ is on average 5 to 10 years lower than that of an unaffected population.

Exercise 6. Fill in the table.

NOUN	VERB	ADJECTIVE
		thick
	odorize	
		connective
irradiation		
		reddish
exhaustion		
	disturb	
		enlarged
deterioration		
	improve	

Exercise 7. Change part of speech of the words given in the brackets and fill in the blanks.

Leukemias are (*malignancy*) _____ neoplasms of the hematopoietic stem cells (*character*) _____ by diffuse (*replace*) _____ of the bone marrow by neoplastic cells.

General characteristic of leukemia:

• In the major, the leukemic cells spill over into the blood, where they may be seen in large number. These cells may also (*infiltration*) _____ the liver, spleen, lymph nodes and other tissues throughout the body.

• Traditionally, leukemias are (*classification*) _____ on the basis of the cell type (*involvement*) _____ and the state of (*mature*) _____ of the leukemic cells. Thus, acute leukemias are characterized by the (*present*) _____ of very immature cells (called blasts) and by a (*rapid*) _____ fatal course in (*treatment*) _____ patients.

• On the other hand, chronic leukemias are (*associative*) _____, at least initially, with well-(*differentiation*) _____ leukocytes and with a relatively indolent course.

• The type of acute and chronic leukemia is (*establishment*) _____ on the basis of cytochemical peculiarities of tumor cells.

• Acute leukemias, despite (*different*) _____ in their cell of origin, share important

(*morphology*) _____ and (*clinic*)_____ features. They are associated with (*replace*) _____ of normal marrow elements by a sea of proliferating “blast cells” that do not seem to undergo normal matur

4.1. BIOCHEMISTRY
PART I

Exercise 1. Read the text.

Structures and Functions of Proteins. Enzymes

The major object of biochemistry is the complete understanding at the molecular level of chemical processes associated with living cells.

Living cells produce an impressive variety of macromolecules (proteins, nucleic acids, polysaccharides). These macromolecules are biopolymers constructed of monomer units, or building blocks. All proteins are high-molecular-weight polypeptides. Simple proteins contain only amino acids. Complex proteins contain additional, non-amino acid material, such as heme, vitamin derivatives, lipid, or carbohydrate.

Proteins are classified according to the shape: fibrous (e.g. a-keratin from hear, collagen) and globular (myoglobin, hemoglobin, ribonuclease, etc.); the functional properties; the solubility and functional properties.

By chemical structure amino acids are divided into two groups: 1. Acyclic, aliphatic amino-acids. 2. Cyclic amino-acids.

According to the solubility and functional properties proteins are divided into *Simple Proteins*: these are proteins which on complete hydrolysis yield only amino-acids. *Conjugated Proteins*: These are proteins which in addition to amino-acids contain a non-protein group in their structure. Major subclasses of **simple proteins** are as following:

Albumins

1. These are proteins which are soluble in water and dilute salt solutions.
2. They are coagulated by heat and turn to products that are insoluble in water and salt solutions.
3. The “albumins” may be precipitated in saturating solution with ammonium sulfate.
4. Albumins have low iso-electric pH of pH 4.7 and therefore they are acidic proteins at the pH 7.4.
5. They are generally deficient in glycine.

Globulins

1. Globulins are insoluble in water but soluble in dilute neutral salt solution.
2. They are also coagulable on heating.
3. Globulins are precipitated by half saturation with ammonium sulfate or by full saturation with sodium chloride.
4. Globulins bind with heme, lipids, metals, carbohydrates.

Protamines

1. These are small molecules soluble in water and non-coagulable on heating.
2. They do not contain cysteine, tryptophan and tyrosine, but they are rich in arginine.
3. Their iso-electric pH is about 7.4, and they exist as basic proteins in the body.
4. They combine with nucleic acids to form nucleoproteins.

Histones

1. These are rich in arginine and histidine.
2. They are basic proteins with alkaline iso-electric pH.
3. They are soluble in water, dilute acids and salt solutions but insoluble in ammonia.
4. They do not readily coagulate on heating.
5. They form conjugated proteins with nucleic acids (DNA) and porphyrins. They act as repressors of template activity of DNA in the synthesis of RNA.
6. The protein part of hemoglobin, globin is an atypical histone having a predominance of histidine and lysine instead of arginine.

Gliadins (Prolamines)

Alcohol soluble plant proteins are insoluble in water or salt solutions and absolute alcohol, but they dissolve in 50-80% ethanol.

They are very rich in proline, but poor in lysine.

Glutelins

These are plant proteins, insoluble in water or neutral salt solutions, but soluble in dilute acids or alkalies.

They are rich in glutamic acid.

They are large molecules and can be coagulated by heat.

Scleroproteins or Albuminoids

These are fibrous proteins with great stability and very low solubility and form supporting structures of animals. Keratins, collagens and elastins are found in this group.

Conjugated Proteins are simple proteins combined with a non-protein group called prosthetic group. Protein part is called apoprotein, and the entire molecule is called holoprotein.

Nucleoproteins are most abundant in tissues having large proportion of muscular material such as yeast, asparagus tips in plants and thymus, other glandular organs and sperm.

Mucoproteins or Mucoids are simple proteins combined with mucopolysaccharides. They are water soluble and hardly denatured on heating. Insoluble mucoproteins are found in egg white, vitreous liquor and submaxillary glands.

Glycoproteins include mucins, immunoglobulins, complements and many enzymes.

Chromoproteins are proteins that contain coloured substance, such as hemoprotein, hemoglobin, cytochromes, catalase, peroxidase and others.

Phosphoproteins are proteins with phosphoric acid.

Lipoproteins are formed in combination with lipids. Lipids are lecithin, cephalin, fatty acids, etc.

Metalloproteins contain a metal ion. Several enzymes contain metallic elements, such as Fe, Co, Mn, Zn, Cu, Mg, etc.

All **enzymes** are simple or complex proteins. According to these six kinds of chemical reactions all enzymes are divided into six classes:

1. Oxidoreductases are enzymes that catalyze the oxidation-reduction reactions.
2. Transferases are enzymes that catalyze the transfer of different groups of atoms from one substrate to others.
3. Hydrolases are enzymes catalyzing the splitting of the intramolecular bonds of organic substances by the use of a water molecule.
4. Lyases are enzymes that catalyze splitting of different groups from the substrate not in a hydrolytic way with the formation of the double bond or with joining some groups to the place of the double bond.
5. Isomerases are enzymes that catalyze different kinds of reactions of isomerization with the formation of different isomers: that is the substrate of the similar chemical composition and molecular mass but of different molecular structure and qualities.
6. Ligases are enzymes catalyzing the synthesis of organic substances from two initial molecules by the use of ATP's or other nucleoside triphosphates.

If genetically different subunits can exist in more than one form, the corresponding enzyme formed from two or several kinds of subunits combined in different proportions will be able to exist in several resembling but not equal forms. These kinds of enzymes were called **isozymes**.

The most studied isozymes are isozymes of lactate dehydrogenase catalyzing the reversible transformation of pyruvate into lactate. Five isozymes of LDH are formed from the subunits of two different kinds, that are conditionally marked as H-kind (from "heart") and M-kind (from "muscle").

Most enzymes are sensitive to inhibition by specific agents that interfere with the binding of a substrate at the active site or with conversion of the enzyme-substrate complex into product.

Inhibition of enzymes can be *reversible* and *irreversible* of an enzyme. If the molecule of inhibitor provokes stable changes or modification of enzyme functional groups, it is an irreversible inhibition. But reversible inhibitors are more common.

The *reversible* inhibition is divided into the *competitive* and *noncompetitive* ones, depending on the fact if the inhibition can overcome by the increase of substrate's concentration. If the increase of concentration doesn't change the degree of inhibition, it is a noncompetitive inhibition.

The competitive inhibition is caused by the substances having the same structure as the substrate, but they differ a little from true substrate.

Inhibiting Agents:

a) many enzymes are inhibited by the salts of mercury, silver, gold, and salts of heavy metals or fluorides;
b) oxidases are generally inhibited by cyanides;
c) certain preservatives such as chloroform, glycerol and thymol inhibit some enzymes;
d) toluene has no action on enzymes but is the best preservative for enzyme solution;
e) formaldehyde destroys enzymes;
f) the inhibitors present in an enzyme solution occupy the active sites of the enzyme leaving free active sites for substrates to combine.

Exercise 2. Answer the questions.

1. What is a macromolecule?
2. What do complex proteins contain?
3. How are proteins classified?
4. How are amino acids divided according to the chemical structure?
5. What is the division of proteins according to the solubility and functional properties?
6. What are the major subclasses of simple proteins?
7. Name the properties of globulins.
8. What are the properties of gliadins?
9. What proteins form conjugated proteins with DNA and porphyrins?
10. What proteins combine with nucleic acids to form nucleoproteins?
11. What group of simple proteins do keratins, collagen and elastins belong to?
12. What are conjugated proteins?
13. What conjugated protein is abundant in tissues and can be found in thymus and glandular organs?
14. What metallic elements do some enzymes contain?
15. What is enzyme?
16. How are enzymes divided according to the chemical reactions?
17. What are the isozymes?
18. What are the types of inhibition of enzymes?
19. What is the reversible inhibition divided into?
20. Name the inhibiting agents of enzymes.

Exercise 3. Remember roots and suffixes pertaining to biochemistry. Give the meaning of the terms.

Root/Suffix	**Meaning**	**Example**
cyto-	cell	cytology
lipo-	fat	adipocellular
glyco-	sugar	glycolipid, glucose
iso-	equal, similar	isoenzyme
poli-	multiple	polysaccharides
-ine	relating to, made of	glycine, lysine

-lysis	decomposition, breaking down	glycolysis, electrolysis
-cyte	cell	erythrocyte

Exercise 4. Read the definitions and choose the proper term given in brackets.
(Glycogenesis, gluconeogenesis, glycogenolysis, glycerol phosphate,galactose,glycolysis, glycogen, gluconeogenesis)

1. _____ is the splitting of glycogen in the liver and muscles to pyruvate and lactate in anaerobic conditions with the formation of ATP.
2. _____ is the splitting of glucose to pyruvate and lactate.
3. _____ is the synthesis of glycogen from glucose in the liver and muscles.
4. _____ is the formation of glucose from non-carbohydrate nature of substances.
5. _____ is produced by the hydrolysis in the intestine disaccharide - lactose.
6. _____ is the process of resynthesis of glucose from non-carbohydrate natural products.
7. _____ is formed in almost all cells of the organism, but the highest concentration detected in the liver.
8._____ is used for the biosynthesis of triglycerides and phospholipids.

Exercise 5. a) Make nouns from given verbs with the help of suffix -ion (-tion).
Absorb, prepare, activate, preserve, constrict, inhibit, denaturate, coagulate, irritate, agglutinate, ovulate, transfuse, indicate, concentrate, obstruct, dilate, inflame, aggravate, associate, digest.
b) Make nouns form given adjectives with the help of suffix -(i)ty.
Able, acid, severe, stable, proper, persist, capable, mortal, morbid, permeable, regular, stable, sensitive, reactive, pure, susceptible, major, soluble, compatible, irreversible.
Exercise 6. Find synonyms in the text to the following words and word combinations.
Dissoluble, elementary, compound, to consist of, deposit, infuse, to form clots, combine, resistance, iron-containing protein, alternative to, transmit, disintegration, convertible, suppression, characteristic, to cause, watered, to equate with, to give in, warming up.

Exercise 7. Match the terms with their definition.

1.Keratin	a) is the iron-containing oxygen-transport metalloprotein in the red blood cells;
2. Collagen	b) is a phosphoprotein found in milk and egg yolk;
3. Gelatin	c) is a characteristic constituent of epidermal tissue, such as horn, hair, nails, wool, hoofs and feathers;
4. Elastin	d) a specific protein that acts as biological catalysts;
5.Hemoglobin	e) it is not a complete protein as it lacks an amino acid tryptophan and forms a gel on cooling;
6. Casein	f) can be easily converted to gelatin by boiling and splitting off some amino-acids;
7. Enzyme	g) it presents in yellow elastic fibre of the connective tissue, ligaments, and tendons. It is formed in large amount in the uterus during pregnancy.

Exercise 8. Match the beginnings and endings of the sentences.

Monosaccharides are classified according to	an inability to convert galactose to glucose.
Carbohydrates are associated with the outer parts of the molecules of membrane proteins and lipids	anaerobic conditions, or when the metabolic machinery is absent for the further oxidation of pyruvate.
Galactosemia is a genetic disease characterized by	the chemical nature of their carbonyl group and the number of their C atoms.
Symptoms of galactosemia include	activity as the glucose concentration rises in

	diabetes.
The sorbitol pathway is responsible for fructose formation from glucose, and increases in	two molecules of pyruvate with the concomitant new generation of two ATPs.
Glycolysis is the metabolic pathway by which most life forms degrade glucose to	the liver in the period between the consumption of food.
Lactate is the end product of glycolysis under	to form glycoproteins and glycolipids.
Glucagon provides sufficient output of glucose from	failure to thrive, mental retardation, and in some instances death from liver damage.

Exercise 9. Say whether the following statements are true or false.

1. Cellulose, which is a part of the food, isn't digested by enzymes of saliva and small intestine.
2. Digestion of proteins in the stomach lasts for 6-8 hours.
3. Pepsin is produced by cells of intestinal mucosa.
4. Hypovitaminosis of vitamin C causes gout.
5. Organ rich in vitamin B12 is pancreas.
6. Hypovitaminosis of vitamin B12 is pernicious anemia.
7. Toxicity of high doses of folic acid is the same as in other B group vitamins.
8. Hypovitaminosis of vitamin B1 leads to the beri-beri disease.

4.2. BIOCHEMISTRY
PART 2

Exercise 1. Active Vocabulary

Nouns	Verbs	Adjectives
alteration	decrease	capable
disintegration	disturbe	durative
deviation	increase	following
dizziness	inhibit	frequent
indication	intend	instantaneous
insufficiency	maintain	intensified
Interrogation	prescribe	robable
lapse	reveal	spotty
necropsy	witness	strengthened
putrefaction		
starvation		

Exercise 2. Read and translate the tests.

1. Pain along large nervous stems and increased amount of pyruvate in the blood were revealed in the patient. Insufficiency of what vitamin can cause such change?
A B1 **B** B2 **C** PP **D** Pantothenic acid **E** Biotin

2. In case of enterobiasis acrihine - the structural analogue of vitamin B2 - is administered. The synthesis disorder of which enzymes does this medicine cause in microorganisms?
A FAD-dependent dehydrogenases
B Cytochromeoxidases
C Peptidases
D NAD-dependet dehydrogenases
E Aminotransferases

3. A 10-year-old girl often experiences acute respiratory infections with multiple spotty haemorrages in the places of clothes friction. Hypovitaminosis of what vitamin is present at the girl?
A C **B** B6 **C** B1 **D** A **E** B2

4. There is observed inhibited fibrillation in the patients with bile ducts obstruction, bleeding due to low level of absorption of some vitamin. What vitamin is in deficit?
A K **B** A **C** D **D** E **E** Carotene

5. During endotoxemia active forms of the oxygen including superoxide anion radical are formed in the human body. With help of what enzyme is this anion activated?
A Superoxide dismutase **B** Catalase **C** Peroxidase **D** Glutathioneperoxidase
E Glutathionereductase

6. A patient presents high activity of LDH1,2, aspartate aminotransferase, creatine phosphokinase. In what organ (organs) is the development of a pathological process the most probable?
A In the heart muscle (initial stage of myocardium infarction)
B In skeletal muscles (dystrophy, atrophy) **C** In kidneys and adrenals
D In connective tissue **E** In liver and kidneys

7. While examining the child the doctor revealed symmetric cheeks roughness, diarrhea, dysfunction of the nervous system. Lack of what food components caused it?
A Nicotinic acid, tryptophane **B** Lysine, ascorbic acid **C** Threonine, pantothenic acid **D** Methionine, lipoic acid **E** Phenylalanine, pangamic acid

8. A 13-year-old boy complains of general weakness, dizziness, tiredness. He is mentally retarded. Increased level of valine, isoleucine, leucine is in the blood and urine. Urine has specific smell. What is the diagnosis?
A Maple syrup urine disease **B** Addison's disease **C** Tyrosinosis **D** Histidinemia
E Graves' disease

9. Aspirin has antiinflammatory effect due to inhibition of the cyclooxygenase activity. Level of what biological active acids will decrease?
A Prostaglandins **B** Leucotriens **C** Catecholamines **D** Biogenic amines
E Iodinethyronyns

10. A 46 year old patient applied to a doctor complaining about joint pain that becomes stronger the day before weather changes. Blood examination revealed strengthened concentration of uric acid. The most probable cause of the disease is the intensified disintegration of the following substance:
A Adenosine monophosphate **B** Cytidine monophosphate **C** Uridine triphosphate
D Uridine monophosphate **E** Thymidine monophosphate

11. Marked increase of activity of MB-forms of CPK (creatinephosphokinase) and LDH1 were revealed on the examination of the patient's blood. What is the most likely pathology?
A Miocardial infarction **B** Hepatitis **C** Rheumatism **D** Pancreatitis **E** Cholecystitis

12. Laboratory examination of a child revealed increased concentration of leucine, valine, isoleucine and their ketoderivatives in blood and urine. Urine smelt of maple syrup. This disease is characterized by the deficit of the following enzyme:
A Dehydrogenase of branched amino acids **B** Aminotransferase **C** Glucose-6-phosphatase **D** Phosphofructokinase **E** Phosphofructomutase

13. 12 hours after an acute attack of retrosternal pain a patient presented a jump of aspartate aminotransferase activity in blood serum. What pathology is this deviation typical for?
A Myocardium infarction **B** Viral hepatitis **C** Collagenosis **D** Diabetes mellitus
E Diabetes insipidus

14. A woman who has been keeping to a clean-rice diet for a long time was diagnosed with polyneuritis (beriberi). What vitamin deficit results in development of this disease?
A Thiamine **B** Ascorbic acid **C** Pyridoxine **D** Folic acid **E** Riboflavin

15. Examination of a patient with frequent hemorrhages from internals and mucous membranes revealed proline and lysine being a part of collagene fibers. What vitamin absence caused disturbance of their hydroxylation?
A Vitamin C **B** Vitamin K **C** Vitamin A **D** Thiamine **E** Vitamin E

16. To prevent postoperative bleeding a 6 y.o. child was administered vicasol that is a synthetic analogue of vitamin K. Name post-translational changes of blood coagulation factors that will be activated by vicasol:
A Carboxylation of glutamin acid
B Phosphorylation of serine radicals

C Partial proteolysis
D Polymerization
E Glycosylation

17. According to clinical indications a patient was administered pyridoxal phosphate. What processes is this medication intended to correct?
A Transamination and decarboxylation of aminoacids
B Oxidative decarboxylation of ketoacids
C Desamination of purine nucleotide
D Synthesis of purine and pyrimidine bases
E Protein synthesis

18. As a result of posttranslative modifications some proteins taking part in blood coagulation, particularly prothrombin, become capable of calcium binding. The following vitamin takes part in this process:
A K **B** C **C** A **D** B1 **E** B2

19. A 3 year old child with symptoms of stomatitis, gingivitis and dermatitis of open skin areas was delivered to a hospital. Examination revealed inherited disturbance of neutral amino acid transporting in the bowels. These symptoms were caused by the deficiency of the following vitamin:
A Niacin **B** Pantothenic acid **C** Vitamin A **D** Cobalamin **E** Biotin

20. Surgical removal of a part of stomach resulted in disturbed absorption of vitamin B12, it is excreted with feces. The patient was diagnosed with anemia. What factor is necessary for absorption of this vitamin?
A Gastromucoprotein **B** Gastrin **C** Hydrochloric acid **D** Pepsin **E** Folic acid

21. A 65 year old man suffering from gout complains of kidney pain. Ultrasound examination revealed renal calculi. The most probable cause of calculi formation is the strengthened concentration of the following substance:
A Uric acid **B** Cholesterol **C** Bilirubin **D** Urea **E** Cystine

22. There is an increase of the pyruvate level in the patient's blood and urine. What kind of avitaminosis developed in this case?
A. B2 avitaminosis. **B**. E avitaminosis. **C**. B3 avitaminosis. **D**. B6 avitaminosis.
E. B1 avitaminosis.

23. A child manifests epileptic seizures caused by vitamin B6 deficiency. This is conditioned by the decrease of the gamma-aminobutyrate level in the nervous tissue which acts as an inhibiting neurotransmitter. The activity of which enzyme is decreased in this case?
A. Pyridoxal kinase **B**. Alanine aminotransferase **C**. Glutamate dehydrogenase
D. Glutamate decarboxylase**E**. Glutamate synthetase

24. During the necropsy of a 20-year old girl a pathologist concluded that the death of the patient had resulted from poisoning by cyanides. The activity of what enzyme is mostly inhibited by cyanides?
A. Malate dehydrogenase.
B. Cytochrome oxidase.
C. Heme synthase.
D. Aspartate aminotransferase.
E. Carbamoyl phosphate synthetase.

25. Potassium cyanide is a very dangerous poison that causes instantaneous death of a human organism. What mitochondrial enzyme is affected by potassium cyanide?
A. Cytochrome P450.
B. Flavine enzymes.
C. Cytochrome b.
D. NAD+-dependent dehydrogenases.
E. Cytochrome oxidase (cytochrome aa3)

26. Patient with encephalopathy was admitted to the neurological in-patient department. Correlation of increasing of encephalopathy and substances absorbed by the bloodstream from the intestines was revealed. What substances that are created in the intestines can cause endotoxemia?
A Indole **B** Butyrate **C** Acetacetate **D** Biotin **E** Ornithine

27. Examination of a patient suffering from cancer of urinary bladder revealed high rate of serotonin and hydroxyanthranilic acid. It is caused by excess of the following amino acid in the organism:
A Tryptophan **B** Alanine **C** Histidine **D** Methionine **E** Tyrosine

28. A 4 y.o. child with signs of durative protein starvation was admitted to the hospital. The signs were as follows: growth inhibition, anemia, edema, mental deficiency. Choose a cause of edema development:
A Reduced synthesis of albumins
B Reduced synthesis of globulins
C Reduced synthesis of hemoglobin
D Reduced synthesis of lipoproteins
E Reduced synthesis of glycoproteins

29. The concentration of albumins in human blood sample is lower than normal. This leads to edema of tissues. What blood function is damaged?
A Maintaining the oncotic blood pressure
B Maintaining the Ph level
C Maintaining the body temperature
D Maintaining the blood sedimentation system
E All answers are correct

30. Ammonia is a very toxic substance, especially for nervous system. What substance takes the most active part in ammonia detoxication in brain tissues?
A Glutamic acid **B** Lysine **C** Proline **D** Histidine **E** Alanine

31. A patient has pellagra. Interrogation revealed that he had lived mostly on maize for a long time and eaten little meat. This disease had been caused by the deficit of the following substance in the maize:
A Tryptophan **B** Tyrosine **C** Proline **D** Alanine **E** Histidine

32. A patient with serious damage of muscular tissue was admitted to the traumatological department. What biochemical urine index will be increased in this case?
A Creatinine **B** Common lipids **C** Glucose **D** Mineral salts **E** Uric acid

33. Nappies of a newborn have dark spots that witness of formation of homogentisic acid. Metabolic imbalance of which substance is it connected with?

A Thyrosine **B** Galactose **C** Methionine **D** Cholesterine **E** Tryptophane

34. A 1,5-year-old child presents with both mental and physical lag, decolorizing of skin and hair, decrease in catecholamine concentration in blood. When a few drops of 5% solution of trichloroacetic iron had been added to the child's urine it turned olive green. Such alterations are typical for the following pathology of the amino acid metabolism:
A Phenylketonuria **B** Alkaptonuria **C** Tyrosinosis **D** Albinism **E** Xanthinuria

35. The greater amount of nitrogen is excreted from the organism in form of urea. Inhibition of urea synthesis and accumulation of ammonia in blood and tissues are induced by the decreased activity of the following liver enzyme
A Carbamoyl phosphate synthetase **B** Aspartate aminotransferase **C** Urease
D Amylase **E** Pepsin

36. After a serious viral infection a 3-year-old child has repeated vomiting, loss of consciousness, convulsions. Examination revealed hyperammoniemia. What may have caused changes of biochemical blood indices of this child?
A Disorder of ammonia neutralization in ornithinic cycle
B Activated processes of amino acids decarboxylation
C Disorder of biogenic amines neutralization
D Increased putrefaction of proteins in intestines
E Inhibited activity of transamination enzymes

37. Albinos can't stand sun impact - they don't acquire sun-tan but get sunburns. Disturbed metabolism of what amino acid underlies this phenomenon?
A Phenilalanine **B** Methionine **C** Tryptophan **D** Glutamic acid **E** Histidine

38. Plasmic factors of blood coagulation are exposed to post-translational modification with the participation of vitamin K. It is necessary as a cofactor in the enzyme system of gammacarboxylation of protein factors of blood coagulation due to the increased affinity of their molecules with calcium ions. What amino acid is carboxylated in these proteins?
A Glutamate **B** Valine **C** Serine **D** Phenylalanine **E** Arginine

39. An oncological patient was prescribed methotrexate. With the lapse of time target cells of the tumour lost susceptibility to this drug. There is change of gene expression of the following enzyme:
A Dehydrofolatereductase **B** Thiaminase **C** Deaminase **D** Folate oxidase
E Folate decarboxylase

40. A patient diagnosed with carcinoid of bowels was admitted to the hospital. Analysis revealed high production of serotonin. It is known that this substance is formed of tryptophaneaminooacid. What biochemical mechanism underlies this process?
A Decarboxylation **B** Desamination **C** Microsomal oxidation **D** Transamination **E** Formation of paired compounds

Exercise 3. Find synonyms in the tests to the following words and word combinations.
Immediate death, high concentration, physical delay, vertigo, intensified breakdown, quantity, insufficiency of time, involvement of vitamins, stone formation, attack, malnourishment, specimen, intestine, blood clotting.

Exercise 4. Complete the abstract using the words and phrases below.

Isomerization, the transfer, the double bond, complex proteins, organic substances,

the splitting, the oxidation-reduction reactions.

All **enzymes** are simple or _____. According to these six kinds of chemical reactions all enzymes are divided into six classes:

1.Oxidoreductases are enzymes that catalyze _____.

2. Transferases are enzymes that catalyze _____ of different groups of atoms from one substrate to others.

3. Hydrolases are enzymes catalyzing _____ of the intramolecular bonds of organic substances by the use of a water molecule.

4. Lyasesare enzymes that catalyze splitting of different groups from the substrate not in a hydrolytic way with the formation of _____ or with joining some groups to the place of the double bond.

5. Isomerases are enzymes that catalyze different kinds of reactions of _____ with the formation of different isomers: that is the substrate of the similar chemical composition and molecular mass but of different molecular structure and qualities.

6. Ligases are enzymes catalyzing the synthesis of _____ from two initial molecules by the use of ATP's or other nucleoside triphosphates.

Exercise 5. Answer the questions:

1) What is the building-up aspect of metabolism (constructing molecules from smaller units) called?

2) What is the sequences of enzyme-catalyzed reactions by which relatively large molecules in living cells are broken down called?

3) What is a peptide hormone produced by beta cells of the pancreatic islets which regulates the metabolism of carbohydrates, fats and protein by promoting the absorption of glucose from the blood into liver, fat and skeletal muscle cells called?

4) What is the name of proteins that act as biological catalysts?

5) What is the common name for the sugars, starches and fibers found in fruits, grains, vegetables and milk products?

6) What are large biomolecules or macromolecules that are comprised of one or more long chains of amino acid residues called?

7) What are organic compounds that combine to form proteins called?

8) What is the name of an organic molecule that is an essential micronutrient which an organism needs in small quantities for the proper functioning of its metabolism?

Exercise 6. Fill the gaps in the text with the proper word combinations from the box:

to oppose the stimulus detect and oppose internal environment negative feedback loops the concentration of glucose target value increase heat production primarily nerve cells blood glucose activate effectors

The tendency to maintain a stable, relatively constant 1. …….. is called homeostasis. The body maintains homeostasis for many factors in addition to temperature. For instance, the concentration of various ions in your blood must be kept steady, along with pH and 2. …….... If these values get too high or lowthe results can be dangerous or even deadly.

Biological systems like those of a human body are constantly being pushed away from their balance points. For instance, when you exercise, your muscles 3……., nudging your body temperature upward. Similarly, when you drink a glass of fruit juice, your 4. …… goes up. Homeostasis depends on the ability of your body to 5. …….. these changes. Maintenance of homeostasis usually involves 6. ……..These loops act to oppose the stimulus, or cue, that triggers them. For example, if your body temperature is too high, a negative feedback loop will act to bring it back down towards the set point, or 7. ……...How does this work? First, high temperature will be detected by sensors—8. …….. with endings in your skin and brain—and relayed to a temperature-regulatory control center in your brain. The control center will process

the information and 9. ……..—such as the sweat glands—whose job is 10. …… by bringing body temperature down.

Exercise 7. Match the minerals in the box with their functions and sources:

Iodine Chromium Calcium Magnesium Sodium Fluoride Sulfur Copper Chloride Iron Potassium Phosphorus Zinc

Mineral	**Function**	**Sources**
	Needed for proper fluid balance, nerve transmission, and muscle contraction	Table salt, soy sauce; large amounts in processed foods; small amounts in milk, breads, vegetables, and unprocessed meats
	Needed for proper fluid balance, stomach acid	Table salt, soy sauce; large amounts in processed foods; small amounts in milk, meats, breads, and vegetables
	Needed for proper fluid balance, nerve transmission, and muscle contraction	Meats, milk, fresh fruits and vegetables, whole grains, legumes
	Important for healthy bones and teeth; helps muscles relax and contract; important in nerve functioning, blood clotting, blood pressure regulation, immune system health	Milk and milk products; canned fish with bones (salmon, sardines); fortified tofu and fortified soy milk; greens (broccoli, mustard greens); legumes
	Important for healthy bones and teeth; found in every cell; part of the system that maintains acid-base balance	Meat, fish, poultry, eggs, milk, processed foods (including soda pop)
	Found in bones; needed for making protein, muscle contraction, nerve transmission, immune system health	Nuts and seeds; legumes; leafy, green vegetables; seafood; chocolate; artichokes; "hard" drinking water
	Found in protein molecules	Occurs in foods as part of protein: meats, poultry, fish, eggs, milk, legumes
	Part of a molecule (hemoglobin) found in red blood cells that carries oxygen in the body; needed for energy metabolism	Organ meats; red meats; fish; poultry; shellfish (especially clams); egg yolks; legumes; dried fruits; dark, leafy greens; iron-enriched breads and cereals; and fortified cereals
	Part of many enzymes; needed for making protein and genetic material; has a function in taste perception, wound healing, normal fetal development, production of sperm,	Meats, fish, poultry, leavened whole grains, vegetables

	normal growth and sexual maturation, immune system health	
	Found in thyroid hormone, which helps regulate growth, development, and metabolism	Seafood, foods grown in iodine-rich soil, iodized salt, bread, dairy products
	Part of many enzymes; needed for iron metabolism	Legumes, nuts and seeds, whole grains, organ meats, drinking water
	Involved in formation of bones and teeth; helps prevent tooth decay	Drinking water (either fluoridated or naturally containing fluoride), fish, and most teas
	Works closely with insulin to regulate blood sugar (glucose) levels	Unrefined foods, especially liver, brewer's yeast, whole grains, nuts, cheeses

4.3. BIOCHEMISTRY
PART 3

Exercise 1. Active Vocabulary

Nouns	Verbs	Adjectives
aversion	confirm	abrupt
buffer	consume	additive
bile	delay	apparent
fracture	enhance	cellular
involvement	exhaust	congenital
lesion	feed	essential
sluggishness	suggest	flaccid
wound		improper
		nursing
		plentiful
		provisional
		significant

Exercise 2. Read and translate the tests.

1. An infant has apparent diarrhea resulting from improper feeding. One of the main diarrhea effects is plentiful excretion of sodium bicarbonate. What form of acid-base balance disorder is the case?
A Metabolic acidosis **B** Metabolic alkalosis **C** Respiratory acidosis
D Respiratory alkalosis **E** No disorders of acid-base balance will be observed

2. Buffer capacity of blood was decreased in the worker due to exhausting muscular work. Entry of what acid substance to the blood can this state be explained?
A Lactate **B** Pyruvate **C** 1,3-bisphosphoglycerate **D** alpha-ketoglutarate
E 3-phosphoglycerate

3. A 38 year old patient suffers from rheumatism in its active phase. What laboratory characteristic of blood serum is of diagnostic importance in case of this pathology?
A C-reactive protein **B** Uric acid **C** Urea **D** Creatinine **E** Transferrin

4. A 30 y.o. woman had been ill for a year when she felt pain in the area of joints for the first time, they got swollen and skin above them became reddened. Provisional diagnosis is rheumatoid arthritis. One of the most probable causes of this disease is a structure alteration of a connective tissue protein:
A Collagen **B** Mucin **C** Myosin **D** Ovoalbumin **E** Troponin

5. Examination of a 27-year-old patient revealed pathological changes in liver and brain. Blood plasma analysis revealed an abrupt decrease in the copper concentration, urine analysis revealed an increased copper concentration. The patient was diagnosed with Wilson's degeneration. To confirm the diagnosis it is necessary to study the activity of the following enzyme in blood serum:
A Ceruloplasmin **B** Carbonic anhydrase **C** Xanthine oxidase
D Leucineaminopeptidase **E** Alcohol dehydrogenase

6. A patient complains about dyspnea provoked by the physical activity. Clinical examination revealed anaemia and presence of the paraprotein in the zone of gamma-globulins. To confirm the myeloma diagnosis it is necessary to determine the following index in the patient's urine:

A Bence Jones protein **B** Bilirubin **C** Haemoglobin **D** Ceruloplasmin **E** Antitrypsin

7. A 62 y.o. woman complains of frequent pains in the area of her chest and backbone, rib fractures. A doctor assumed myelomatosis (plasmocytoma). What of the following laboratory characteristics will be of the greatest diagnostic importance?
A Paraproteinemia **B** Hyperalbuminemia **C** Proteinuria **D** Hypoglobulinemia
E Hypoproteinemia

8. Pathological changes of the liver and brain were revealed in a 27-year-old patient. The copper concentration is abruptly decreased in blood plasma and increased in the urine. Wilson's disease was diagnosed. Activity of what enzyme in the blood serum should be examined to prove diagnosis?
A Ceruloplasmin **B** Carboanhydraze **C** Xanthioxidase **D** Leucinamineopeptidaze
E Alcoholdehydrogenaze

9. A 50-year-old patient complains about general weakness, appetite loss and cardiac arrhythmia. The patient presents with muscle hypotonia, flaccid paralyses, weakened peristaltic activity of the bowels. Such condition might be caused by:
A Hypopotassemia **B** Hypoproteinemia **C** Hyperkaliemia **D** Hypophosphatemia
E Hyponatremia

10. A 63-year-old woman developed signs of rheumatoid arthritis. Increase of which indicated blood values level could be helpful in proving diagnosis?
A Additive glycosaminoglycans **B** Lipoproteids **C** Acid phosphatase
D General cholesterol **E** R-glycosidase

11. A 35 y.o. patient who often consumes alcohol was treated with diuretics. There appeared serious muscle and heart weakness, vomiting, diarrhea, AP- 100/60 mm Hg, depression. This condition is caused by intensified excretion with urine of:
A Potassium **B** Sodium **C** Chlorine **D** Calcium **E** Phosphates

12. A patient suffers from hepatic cirrhosis. Examination of which of the following substances excreted by urine can characterize the state of antitoxic function of liver?
A Hippuricacid **B** Ammonium salts **C** Kreatinine **D** Uric acid **E** Aminoacids

13. Products of some proteins hydrolysis and modification are the biologically active substances called hormones. Lipotropin, corticotropin, melanotropin and endorphins are synthesized in the hypophysis of the following protein:
A Proopiomelanocortin (POMC) **B** Neuroalbumin **C** Neurostromin
D Neuroglobulin **E** Thyreoglobulin

14. During examination of an 11-month-old infant a pediatrician revealed osteoectasia of the lower extremities and delayed mineralization of cranial bones. Such pathology is usually provoked by the deficit of the following vitamin:
A Cholecalciferol **B** Thiamin **C** Pantothenic acid **D** Bioflavonoids **E** Riboflavin

15. Desulfiram is widely used in medical practice to prevent alcoholism. It inhibits aldehyde dehydrogenase. Increased level of what metabolite causes aversion to alcohol?
A Acetaldehyde **B** Ethanol **C** Malonyl aldehyde **D** Propionic aldehyde
E Methanol

16. Index of pH of the blood changed and became 7,3 in the patient with diabetes mellitus. Detecting of the components of what buffer system is used while diagnosing disorder of the acid-base equilibrium?
A Bicarbonate **B** Phosphate **C** Hemoglobin **D** Oxyhemoglobin **E** Protein

17. Diabetes mellitus causes ketosis as a result of activated oxidation of fatty acids. What disorders of acid-base equilibrium may be caused by excessive accumulation of ketone bodies in blood?
A Metabolic acidosis **B** Metabolic alcalosis **C** Any changes woun't happen
D Respiratory acidosis **E** Respiratory alcalosis

18. Depressions and emotional insanities result from the deficit of noradrenalin, serotonin and other biogenic amines in the brain. Their concentration in the synapses can be increased by means of the antidepressants that inhibit the following enzyme:
A Monoamine oxidase **B** Diamine oxidase **C** L-amino-acid oxidase
D D-amino-acid oxidase **E** Phenylalanine-4-monooxygenase

19. A patient with suspected diagnosis "progressing muscular dystrophy" got his urine tested. What compound will confirm this diagnosis if found in urine?
A Kreatine **B** Collagen **C** Porphyrin **D** Myoglobin **E** Calmodulin

20. Dietary intake of a 30 year old nursing woman contains 1000 mg of calcium, 1300 mg of phosphorus and 20 mg of iron per day. It is necessary to change content of these mineral substances in the following way:
A To increase phosphorus content **B** To increase calcium content
C To reduce fluorine content **D** To increase iron content **E** To reduce iron content

21. Cardinal symptoms of primary hyperparathyroidism are osteoporosis and renal lesion along with development of urolithiasis. What substance makes up the basis of these calculi in this disease?
A Calcium phosphate **B** Uric acid **C** Cystine **D** Bilirubin **E** Cholesterol

22. Study of conversion of a food colouring agent revealed that neutralization of this xenobiotic takes place only in one phase - microsomal oxydation. Name a component of this phase:
A Cytochrome P-450 **B** Cytochrome B **C** Cytochrome C **D** Cytochrome A
E Cytochrome oxidase

23. A patient had hemorrhagic stroke. Blood examination revealed strengthened kinin concentration. The patient was prescribed contrical. It was administered in order to inhibit the following proteinase:
A Kallikrein **B** Pepsin **C** Trypsin **D** Chemotrypsin **E** Collagenase

24. Under different pathological states the level of active forms of oxygen rises, which results in the destruction of cellular membranes. In order to prevent the damage of membranes, antioxidants are used. The most powerful natural antioxidant is:
A.a-Tocoferol. **B**. Glucose. **C**. Vitamin A. **D**.Fatty acids. **E**. Glycerol.

25. A 4 year old child with hereditary renal lesion has signs of rickets, vitamin D concentration in blood is normal. What is the most probable cause of rickets development?
A Impaired synthesis of calcitriol **B** Increased excretion of calcium
C Hyperfunction of parathyroid glands **D** Hypofunction of parathyroid glands
E Lack of calcium in food

26. After consumption of rich food a patient has nausea and heartburn, steatorrhea. This condition might be caused by:
A Bile acid deficiency **B** Increased lipase secretion **C** Disturbed tripsin synthesis **D** Amylase deficiency **E** Disturbed phospholipase synthesis

27. Fatty of phospholipids is disordered due to fat infiltration of the liver. Indicate which of the presented substances can enhance the process of methylation during phospholipids synthesis?
A Methionine **B** Ascorbic acid **C** Glucose **D** Glycerin **E** Citrate

28. Increased amount of free fatty acids is observed in the blood of the patients with diabetes mellitus. It can be caused by:
A Increased activity of triglyceridelipase adipocytes m
B Storage of palmitatoil-CoA
C Activation of the ketone bodies utilization
D Activation of the synthesis of the apolipoproteins
E Decreased activity of phosphatidylcholine-cholesterol-acyltransferase blood plasma

29. A patient with high rate of obesity was advised to use carnitine as a food additive in order to enhance "fat burning". What is the role of carnitine in the process of fat oxidation?
A Transport of FFA (free fatty acids) from cytosol to the mitochondria
B Transport of FFA from fat depots to the tissues
C It takes part in one of reactions of FFA beta-oxidation
D FFA activation
E Activation of intracellular lipolysis

30. An experimantal animal that was kept on protein-free diet developed fatty liver infiltration, in particular as a result of deficiency of methylating agents. This is caused by disturbed generation of the following metabolite:
A Choline **B** DOPA **C** Cholesterol **D** Acetoacetate **E** Linoleic acid

31. Carnitine including drug was recommended to the sportsman for improving results. What process is activated most of all with help of carnitine?
A Transport of fatty acids to the mitochondria **B** Synthesis of steroid hormones
C Synthesis of ketone bodies **D** Synthesis of lipids **E** Tissue respiration

32. After intake of rich food a patient feels nausea and sluggishness; with time there appeared signs of steatorrhea. Blood cholesterine concentration is 9,2 micromole/l. This condition was caused by lack of:
A Bile acids **B** Triglycerides **C** Fatty acids **D** Phospholipids **E** Chylomicrons

33. Examination of a man who hadn't been consuming fats but had been getting enough carbohydrates and proteins for a long time revealed dermatitis, poor wound healing, vision impairment. What is the probable cause of metabolic disorder?
A Lack of linoleic acid, vitamins A, D, E, K
B Lack of palmitic acid
C Lack of vitamins PP, H
D Low caloric value of diet
E Lack of butiric acid

34. An experimental animal has been given excessive amount of carbon-labeled glucose for a week. What compound can the label be found in?

A Palmitic acid **B** Methionine **C** Vitamin A **D** Choline **E** Arachidonic acid

35. A sportsman was recommended to take a medication that contains carnitine in order to improve his results. What process is activated by carnitine the most?
A Fatty acids transport to mitochondrions **B** Synthesis of steroid hormones
C Synthesis of ketone bodies **D** Synyhesis of lipids **E** Tissue respiration

36. Examination of a patient suffering from chronic hepatitis revealed a significant decrease in the synthesis and secretion of bile acids. What process will be mainly disturbed in the patient's bowels?
A Fats emulsification **B** Protein digestion **C** Carbohydrate digestion
D Glycerin absorption **E** Amino acid absorption

37. A 6 year old child was delivered to a hospital. Examination revealed that the child couldn't fix his eyes, didn't keep his eyes on toys, eye ground had the cherry-red spot sign. Laboratory analyses showed that brain, liver and spleen had high rate of ganglioside glycometide. What congenital disease is the child ill with?
A Tay-Sachs disease **B** Wilson's syndrome **C** Turner's syndrome
D Niemann-Pick disease **E** MacArdle disease

38. NSAID blockade the utilization of arachidonic acid via cyclooxigenase pathway, which results in formation of some bioactive substances. Name them:
A Prostaglandins **B** Thyroxine **C** Biogenic amins **D** Somatomedins
E Insulin-like growth factors

39. Arachidonic acid, an essential component of a human diet, acts as a precursor of the vitally important physiologically active biomolecules. Which substances are synthesized via cyclooxigenase pathway from arachidonic acid?
A. Ethanolamine. **B**. Choline. **C**. Noradrenaline. **D**. Prostaglandins
E. Triiodothyronine.

40. A 1-year-old child with symptoms of muscle involvement was admitted to the hospital. Examination revealed carnitine deficiency in his muscles. What process disturbance is the biochemical basis of this pathology?
A Transporting of fatty acids to mitochodrions
B Regulation of Ca2+ level in mitochondrions
C Substrate phosphorylation
D Lactic acid utilization
E Actin and myosin synthesis

Exercise 3. Find the synonyms to the following words from the brackets. More than one is possible.
Assumption –
Additive –
Aversion –
Display –
Enhance –
Healing –
Lesion –
Secretion –
Significant –
Quantity –

(Increase, amount, therapy, sore, excretion, care, suggestion, rejection, number, raise, supplemental, demonstrate, ulcer, treatment, considerable)

Exercise 4. Fill in the gaps with the word combinations from the box below:

vitamin D; vitamins C and E; hormone calcitriol; cholesterol, phospholipids, and fatty acids; vitamin A; calcium absorption; vitamin E; iron absorption

1.Vitamin D promotes …… in the gut and regulates calcium levels in the blood.
2. In fact, without enough vitamin D the human body cannot form sufficient amounts of the … ……(the active form of vitamin D), which can, in turn, lead to insufficient calcium absorption and deficiency.
3. Magnesium is a cofactor for the biosynthesis and activation of …… and regulates the activity of critical enzymes involved in vitamin D metabolism.
4. Vitamin C (ascorbic acid) is similarly essential, and well-known for its antioxidant and immune-promoting functions. Another benefit of vitamin C is that it naturally enhances …….
5. For vitamin D to be absorbed, it needs to be emulsified into micelles that contain ……...
6. Zinc enhances the absorption of …….., contributing to its transformation in the retina.
7. Small amounts of ……. improve the absorption of vitamin A.
8. …….. protect vitamin A from oxidation.

Exercise 5. Complete the abstract using the words and phrases below.

Concentration, the degree, inhibition, structure, the molecule, stable

Most enzymes are sensitive to _____ by specific agents that interfere with the binding of a substrate at the active site or with conversion of the enzyme-substrate complex into product.

Inhibition of enzymes can be *reversible* and *irreversible* of an enzyme. If _____ of inhibitor provokes _____ changes or modification of enzyme functional groups, it is an irreversible inhibition. But reversible inhibitors are more common.

The *reversible* inhibition is divided into the *competitive* and *noncompetitive* ones, depending on the fact if the inhibition can overcome by the increase of substrate's _____. If the increase of concentration doesn't change _____ of inhibition, it is a noncompetitive inhibition.

The competitive inhibition is caused by the substances having the same _____ as the substrate, but they differ a little from true substrate.

Exercise 6. Fill in the gaps with the words from the box.

current	ribosomal	fever	synergistic
susceptible	bicuspid	shorten	intercostal
culture	p-aminobenzoic	murmur	DNA-dependent

A 67-year-old woman with congenital (1) _____ aortic valve is admitted to the hospital because of a 2-day history of (2) _____ and chills. (3) _____medication is lisinopril. Temperature is 38.0°C (100.4°F), pulse is 90/min, respirations are 20/min, and blood pressure is 110/70 mm Hg. Cardiac examination shows a grade 3/6 systolic (4) _____ that is bestheard over the second right (5) _____space. Blood (6) _____ grows viridans streptococci (7) _____ to penicillin. In addition to penicillin, an antibiotic (8) _____ to penicillin is administered that may help (9) _____ the duration of this patient's drug treatment. Which of the following is the most likely mechanism of action of this additional antibiotic on bacteria?
(A) Binding to (10) _____ RNA polymerase

(B) Binding to the 30S (11) _____ protein
(C) Competition with (12)_____acid
(D) Inhibition of dihydrofolate reductase
(E) Inhibition of DNA gyras

Exercise 7. Write down 5 manifestations to the following medical conditions which can affect people with diabetes. Use symptoms given below; some of them can be used more than once.

Hyperglycemia	Polyphagia	Ketonuria	Nitrogenemia	Nitrogenuria	Polydipsia	Acidosis	Dehydration

Headache; fatigue; weakness; exhaustion; confusion; lack of concentration; sleepiness; trouble sleeping; dizziness; blurry vision; vision disorders; frequent urination; decreased urine output; urine is low volume and more yellowish than normal; urine is foamy, bloody, or coffee-colored; jaundice; poor appetite; weight loss; swelling around the eyes or in the face, wrists, abdomen, thighs, or ankles; skin darkening in the folds of your neck, armpits, or other areas; chest pain, fast heartbeat or shortness of breath; rapid and shallow breathing; increased heart rate; pale skin; cold hands and feet; soreness of your tongue, brittle nails; dry mouth; dry skin; fruity smelling breath; nausea or vomiting; frequent sores or infections; slow healing of sores; increased thirst/hunger; electrolyte imbalance.

5.1. ANALITICAL CHEMISTRY
Part 1

Exercise 1. Read the text.

Analitical chemistry

Problems of analytical chemistry can be solved using different methods: chemical, physical and physico-chemical. In chemical methods of qualitative analysis, the determined element or ion is transferred to any compound by chemical means, which has certain properties, on the basis of which it is possible to establish that this particular compound was formed. A chemical transformation is called an analytical reaction, and a substance, its boldness, is called a reagent. An example of an analytical reaction is the reaction of chloride ions with silver cations, which results in the formation of a white cheesy precipitate AgCl ↓. It can be said that chlorides are a reagent for silver cations, and vice versa.

$$Cl^- + Ag + = AgCl \downarrow$$

Physical methods of analysis are methods that allow to determine the composition of a substance without resorting to the use of chemical reactions. Physical methods are based on the measurement of any system parameters (optical, electrical, magnetic, thermal), which are a function of composition. Physical methods of analysis include spectral, luminescent, X-ray structural, mass spectrometric methods of analysis. For example, spectral analysis investigates the spectra of radiation that occur when a substance is introduced into the flame of a burner, electric arc, and others. The presence of these elements in the test substance is judged by the presence in the spectrum of lines characteristic of these elements, and their quantitative content is judged by the brightness of the lines.

Physico-chemical methods of analysis are based on the study of physical phenomena that occur during chemical reactions. For example, colorimetry - uses the phenomenon of discoloration of the solution during chem. reactions, conductometry - change of electrical conductivity, etc. It is not always possible to draw a strict line between physical and physicochemical methods. Sometimes they are combined under the general name of "instrumental" methods, as for the performance of certain measurements require "tools" - devices that allow you to accurately measure the values of certain parameters that characterize certain properties of the substance. Depending on the quantities of the substance operated on when performing analytical reactions, there are: macro-, semi-micro-, micro- and ultramicromethods of qualitative analysis.

In macroanalysis, relatively large amounts of the substance (0.5-1 g) or 20-50 ml of solutions are examined. The reactions are carried out in ordinary test tubes (capacity 10-20 ml), beakers. In microanalysis usually deal with approximately 100 times smaller amounts of test substance, ie, with a few milligrams of solid or a few tenths of a milliliter solution. At the same time use highly sensitive reactions that allow to detect the presence of individual components, even with a small content of them in the test substance. The reactions are performed either by microcrystalline or drip methods.

In the analysis of microcrystalline reactions are usually carried out on a glass slide and the presence of the detected ion (element) is judged by the shape of the formed crystals, examined under a microscope.

The drip method uses reactions that are accompanied by a change in the color of the solution or the formation of colored precipitation. The reactions are most often performed on a strip of filter paper, applying to it in a certain sequence dropwise the test solution and reagents. As a result of

the reaction on paper, a colored spot is obtained, the color of which is judged by the presence of the detected ion in the test solution.

Semi-microanalysis occupies an intermediate position between macro- and microanalysis. The amount of test substance in this method is approximately 50 mg of solid or 1 ml of solution.

When working on the semi-micromethod, basically, the whole system of macroanalysis with sequential separation and detection of ions is preserved, but the operations are performed with small amounts of substance using special methods and equipment.

In ultramicroanalysis, less than 1 mg of the substance is tested. Almost all analysis operations are performed under a microscope.

Exercise 2. Answer the questions.

1. What is an analytical reaction?
2. What methods do allow to determine the composition of a substance without resorting to the use of chemical reactions?
3. What is investigated in spectral analysis?
4. What methods of analysis are based on the study of physical phenomena that occur during chemical reactions?
5. What can you tell about colorimetry?
6. What can you tell about conductometry?
7. What methods of qualitative analysis are distinguished depending on the amount of substance when performing analitical reactions?
8. What reactions are used in drip method?
9. What can you tell about semi-microanalysis?
10. What can you tell about ultramicroanalysis?

Exercise 3. Match the terms with their definitions.

1. Electrolytes	a) are in aqueous solutions dissociate only partially, and a dynamic equilibrium is established in the solution between undissociated molecules and ions.
2.Cations	b) are negatively charged ions
3.Anions	c) are positively charged ions
4. **Strong electrolytes**	d) is detection or "discovery" of individual elements or ions that are part of substances
5.Weak electrolytes	e) are substances that decompose in solutions or melts into ions
6. Salt effect	e) is determination of the quantitative content of individual components of the test substance.
7.Protolytic equilibrium	f) is equilibrium constant corresponding to the dissociation of a weak electrolyte
8.Qualitative analysis	g) are in aqueous solutions are dissociated almost completely
9.Quantitative analysis	h) is called increasing the solubility of salts in the system "sediment-solution" when adding to the system of other strong electrolytes.

10.Dissociation constant	i) is equilibrium in which the proton - hydrogen ion H + participates

Exercise 4. Say whether the following statements are true or false.

1) In this regard, electrolytes can be divided into two groups - strong and weak electrolytes.
2) The dynamic equilibrium between undissociated molecules and ions is subject to the law of passive masses.
3) The value of CD depends on the nature of the electrolyte, the nature of the solvent.
4) Strong electrolytes when dissolved in water completely dissociate into ions - the process of their dissociation is irreversible (α = 1 or 100%).
5) Ion pairs (ion associates), in contrast to molecules, retain ion charges, and the distance between ions isn't greater than the interatomic distance in molecules and ionic crystals
6) All chemical reactions can be divided into reversible and irreversible reactions.
7) The precipitation of sparingly soluble compounds with the joint reagent occurs stepwise.
8) The processes of ionization and dissociation of substances in solutions aren't explained by the interaction of the solute with solvent molecules.
9) In solutions of weak acids it is necessary to consider that all acid molecules break down into ions.
10) Buffer solutions are solutions that are able to maintain a constant pH value when adding small amounts of acids or bases, as well as when diluting them with water.
11) The minimum buffer capacity is observed in such solutions, which contain equal concentrations of weak acid and its salt or weak base and its salt.
12) The drip method uses reactions that are accompanied by a change in the color and smell of the solution or the formation of colored precipitation.

13) Analytical reactions can be performed "dry" and "wet".

Exercise 5. Complete the abstract using the words below.

base, gravimetry, formulas, acid, weights, volume, methods, titrant, reaction, titrimetry equilibria, factor

TITRIMETRIC METHODS OF ANALYSIS

Titrimetry, in which we measure the 1_____ of a reagent reacting stoichiometrically with the analyte, first appeared as an analytical method in the early eighteenth century. Unlike gravimetry, 2_____ initially did not receive wide acceptance as an analytical technique. Many prominent late-nineteenth century analytical chemists preferred gravimetry over titrimetry and few of the standard texts from that era include titrimetric methods. By the early twentieth century, however, titrimetry began to replace 3_____ as the most commonly used analytical method. Interestingly, precipitation gravimetry developed in the absence of a theory of precipitation. The relationship between the precipitates mass and the mass of analyte, called a gravimetric 4_____, was determined experimentally by taking known masses of analyte (an external standardization). Gravimetric factors could not be calculated using the precipitation reactions stoichiometry because chemical 5_____ and atomic 6_____ were not yet available! Unlike gravimetry, the growth and acceptance of titrimetry required a deeper understanding of stoichiometry, thermodynamics, and chemical 7_____. By the early twentieth century the accuracy and precision

of titrimetric 8_____ were comparable to that of gravimetry, establishing titrimetry as an accepted analytical technique.

Titrimetric methods are classified into four groups based on the type of 9_____ involved. These groups are acid–base titrations, in which an acidic or basic titrant reacts with an analyte that is a 10_____ or an 11_____; complexometric titrations involving a metal–ligand complexation reaction; redox titrations, where the 12_____ is an oxidizing or reducing agent; and precipitation titrations, in which the analyte and titrant react to form a precipitate.

Exercise 6. Choose the correct variant. Explain the underlined terms.

1.The drug determines the quantitative content of calcium chloride by the method direct complexometric titration. Select the indicator to lock titration endpoint:

A *Eriochrome black T* ***B*** *Starch* ***C*** *Fluorescein* ***D*** *Potassium chromate* ***E*** *Eosin.*

2.The study drug contains potassium nitrate and potassium chloride. Suggest a method quantitative determination of potassium chloride:

A *Argentometry.* ***B*** *Nitritometry.* ***C*** *Permanganatometry.* ***D*** *Iodimetry.* ***E*** *Iodchlorimetry.*

3.What method of analysis can a chemist-analyst use to determine the aluminum content in the drug alumag (maalox) by indirect titration:

A *Complexometry.* ***B*** *Dichromatometry.* ***C*** *Argentometry.* ***D*** *Mercurometry.* ***E*** *Iodometry.*

4. In the methods of redoximetry in the determination of oxidants and reducing agents fixing the point the end of the titration is carried out:

A *In all these ways.* ***B*** *Indicatorless method.****C*** *Using specific indicators.* ***D*** *Using redox indicators.* ***E*** *Using instrumental indication.*

5.In titrimetric analysis by oxidation-reduction to the reaction system add indicators that respond to change:

A *Redox potential of the system.* ***B*** *Concentrations of hydroxyl ions.* ***C*** *Ionic strength of the solution.* ***D*** *The degree of ionization of the test substance.* ***E*** *Concentrations of hydrogen ions.*

6.The Bouguer-Lambert-Behr law underlies molecular absorption analysis. According to this law, the optical density of the solution:

A *Directly proportional to the thickness of the layer and the concentration of the substance.* ***B*** *Directly proportional to the layer thickness and the absorption index.* ***C*** *Inversely proportional to the thickness of the layer and the concentration of the substance.* ***D*** *Directly proportional to the concentration, inversely proportional to the thickness of the layer.* ***E*** *Directly proportional to the concentration and inversely proportional to the absorption index.*

7.The chemical laboratory received a drug that is a mixture of glucose and mannose. For identification of these substances in the mixture, you can use the method:

A *Chromatography in a thin layer of sorbent.* ***B*** *Polarimetry.* ***C*** *Spectrophotometry.* ***D*** *Polarography.* ***E*** *Amperometric titration.*

8.To determine the mass fraction of sodium chloride in saline chemist-analyst applied the

method of Mora, the titrant of which is:

A *Argentum nitrate.* ***B*** *Ammonium thiocyanate.* ***C*** *Sodium tetraborate.* ***D*** *Mercury (I) nitrate.* ***E*** *Mercury (II) nitrate.*

Exercise 7. Explain and analyze the terms.

Titration	
Permanganatometry	
Cerimetry	
Photometric analysis	
Iodometry	

5.2. ANALYTICAL CHEMISTRY
Part 2

Exercise 1. Active Vocabulary

Verbs	Nouns	Adjectives	Adverbs	Conjunctions/ Prepositions
appear	acid	acid-base	easily	according to
determine	advantage	aqueous	sufficiently	both … and
disappear	sample	available		by means of
include	content	soluble		without
indicate	fraction	hydrochloric		
perform	investigation	rapid		
process	starch	obtainable		
require	potassium	potable		
consists of	precipitate	qualitative		
vanish	presence	quantitative		

Exercise 2. Read the tests:

1. What titrimetric method of analysis requires the use of both external and internal indicators?
A. Nitritometry
B. Alkalimetry
C. Complexometric titration
D. Permanganatometry
E. Argentometry

2. By means of photoelectrocolorimetric analysis the concentration of the following can be determined:
A. Colored solution
B. Turbid solution
C. Optically active substance
D. Colorless solution
E. Any type of solution

3. To determine qualitative content of a drug, the drug sample was processed with 2M solution of HCl. White precipitate soluble in aqueous ammonia solution was formed. This analytical effect indicates the presence of the following cations:
A. Silver(I)
B. Lead(II)
C. Mercury(I)
D. Mercury(II)
E. Tin(II)

4. In photometric analysis the series of 6-8 standard solutions is used:
A. To build a calibration curve
B. To assess determination method
C. To simplify working method
D. To choose cuvettes
E. To choose optical filter

5. Ammonium iron(III) sulfate can be used as an indicator in:

A. Argentometry, Volhard method
B. Argentometry, Mohr method
C. Alkalimetry
D. Acidimetry
E. Complexometric titration

6. Quantitative content of oxalic acid can be determined by means of permanganatometry. How to determine equivalence point for this kind of titration?
A. When titrate changes its color after another drop of process solution is added
B. With redox indicator diphenylamine
C. With pH indicator
D. With specific indicator
E. With adsorption indicator

7. Specify what method of redox titration requires the use of specific indicator – starch – to fix the end point:
A. Iodometry
B. Permanganatometry
C. Nitritometry
D. Cerimetry
E. Bromatometry

8. What solution can be used to determine the presence of chloride ions in the potable water?
A. Silver nitrate
B. Iodine
C. Potassium bromate
D. Sodium hydroxide
E. Ammonia

9. A specialist of the analytical laboratory performs direct iodometric determination of ascorbic acid. What indicator is used in this case?
A. Starch
B. Methyl orange
C. Diphenylamine
D. Phenolphthalein
E. Methyl red

10. What indicator is used for fixing the endpoint of mercurimetric titration?
A. Thiocyanate complexes of iron(III)
B. Fluorescein
C. Eosin
D. Murexide
E. Potassium chromate

11. How according to the Pharmacopoeia is pH determined?
A. Potentiometry
B. Spectrophotometry
C. Indicator
D. Conductometry
E. Polarography

12. Quantitative determination of iodides by Fajans method is performed with adsorption indicators. The following can be used as an adsorption indicator:
A. Eosin
B. Methyl orange
C. Phenolphthalein
D. Diphenylamine
E. Murexide

13. Pharmacopoeia reaction of potassium ferrocyanide with zinc cations produces:
A. White precipitate
B. Red precipitate
C. Violet precipitate
D. Yellow precipitate
E. Black precipitate

14. Rapid analysis of benzoate ions by means of Pharmacopoeia reaction with iron (III) chloride produces:
A. Pink-yellow precipitate
B. Green precipitate
C. Blue precipitate
D. Red precipitate
E. Black precipitate

15. Hydrochloric acid was added into the solution under investigation. The resulting precipitate was filtered, then this filter cake was processed with hot water; after the filtrate cooled, KI solution was added into it. What cation was present in the solution, if the precipitate was colored yellow?
A. Pb^{2+}
B. Ag^{+}
C. Hg^{2+}
D. Ca^{2+}
E. Ba^{2+}

16. The third analitycal group of cations (acid-base classification) includes Ca^{2+}, Sr^{2+}, Ba^{2+}. What acid can function as a precipitator agent (group reagent) for these cations?
A. H_2SO_4
B. HNO_3
C. HCl
D. CH_3COOH
E. $HClO_4$

17. Permanganatometry is used in determination of many organic and inorganic compounds. What are the main advantages of permanganatometry over the other oxidimetric methods?
A. Sufficiently high redox potential; it is possible to determine titration end-point without indicator
B. Sufficiently high stability of potassium permanganate and its solutions
C. High selectivity and sensitivity when determining compounds
D. Pure potassium permanganate is easily available and obtainable
E. Various types of indicators can be used; in some cases catalysts are necessary to accelerate the reaction

18. Silver nitrate solution was added into a solution with anions of the first analytical group. A yellow precipitate was produced as the result, which indicates that this solution contained:
A. Arsenite ions
B. Arsenate ions
C. Sulfate ions
D. Iodide ions
E. Bromide ions

19. To determine mass fraction of sodium chloride in a drug, the Fajans method should be applied. Titration is to be performed in the presence of the following indicator solution:
A. Fluorescein
B. Methyl red
C. Potassium chromate
D. Ammonium iron (III) sulfate
E. Phenolphthalein

20. Sulfanilamide drugs contain primary aromatic amides in their structure. Specify the method of quantitative determination of these compounds:
A. Nitritometry
B. Iodometry
C. Dichromatometry
D. Permanganatometry
E. Cerimetry

21. Chloroform and sodium nitrite solution were added into the acidulous investigated solution. The chloroform layer colored red-violet, which indicates the presence of:
A. Iodide ions
B. Carbonate ions
C. Chloride ions
D. Sulfate ions
E. Fluoride ions

22. Investigated solution contains potassium and ammonium ions. Specify the reagent that can indicate the presence of (potassium) ammonium ions in this solution:
A. Potassium tetraiodomercurate
B. Sodium chloride
C. Sodium acetate
D. Potassium hexacyanoferrate (II)
E. Uranyl zinc acetate

23. In the process of qualitative analysis to determine strontium ions, so-called “gypseous water” is used. This substance can be defined as:
A. Concentrated aqueous solution of $CaSO_4$
B. Solution of $Ca(OH)_2$
C. Concentrated aqueous solution of CO_2
D. Aqueous solution of $Ba(NO_3)_2$
E. Solution of $Ba(OH)_2$

24. Name the pH value, under which occurs the most intense color change of an indicator:
A. pT value
B. pK value
C. Color change interval

D. Equivalence point
E. Titration end point

25. What standard solution can be used to standardize the solution of I_2?
A. Sodium thiosulfate solution
B. Potassium iodide solution
C. Potassium dichromate solution
D. Potassium permanganate solution
E. Sodium nitrite solution

26. Choose the indicator and titration method to determine hydrogen carbonate ions in a drug:
A. Methyl-orange, acidimetry
B. Phenolphthalein, acidimetry
C. Methyl-orange, alkalimetry
D. Phenolphthalein, alkalimetry
E. Murexide, acidimetry

27. Pharmacopoeia reaction to determine phosphate ions is a reaction with magnesia mixture. It results in production of white crystalline precipitate $MgNH_4PO_4$. Magnesia mixture consists of the following:
A. $MgCl_2$, $NH_3 \cdot H_2O$, NH_4Cl
B. $MgCl_2$, NaOH, NaCl
C. $MnCl_2$, $NH_3 \cdot H_2O$, NaCl
D. $MgCl_2$, $MnSO_4$, NH_4Cl
E. $MgCl_2$, NH_4Cl

28. Direct titration CANNOT be applied for quantitative determination of calcium chloride by means of permanganatometry, because:
A. The investigated substance does not interact with the titrant
B. The reaction runs very quickly
C. It is impossible to select the indicator to determine titration end point
D. Side reactions are possible
E. The reaction runs slowly

29. During mercurimetric titration of halogenide ions in the presence of diphenylcarbazone, at the titration end point the precipitate is produced. This precipitate will be colored:
A. Blue
B. Red
C. Yellow
D. Green
E. Brown

30. When determining oxidizing agents by means of iodometry in the presence of starch the following phenomenon can be observed at the titration end point:
A. Blue coloring disappears
B. Red coloring appears
C. Green coloring of precipitate appears
D. Green coloring of solution disappears
E. White precipitate occurs

Exercise 3. Find synonyms of the following words in the tests:

vanish		next	

carry out		plus point	
demand		show	
occur		research	

Exercise 4. Fill the table with the missing parts of speech:

verb	**noun**	**adjective**	**adverb**
			easily
		direct	
	presence		
indicate			
require			
		various	
perform			
include			
		following	

Exercise 5. Read the definitions and choose the proper term given in brackets:

amide; colorimetry; evaporation; permanganatometry; qualitative analysis; quantitative analysis; titration end point; titrimetric method

1. _____ – the point during a titration when an indicator shows that the amount of reactant necessary for a complete reaction has been added to a solution.
2. _____ any member of either of two classes of nitrogen-containing compounds related to ammonia and amines.
3. _____ – the detection or "discovery" of individual elements or ions that are part of substances.
4. _____ is the process of a substance in a liquid state changing to a gaseous state due to an increase in temperature and/or pressure.
5. _____ – uses the phenomenon of discoloration of the solution during chemical reactions.
6. _____ is a method of quantitative analysis based on the measurement of the volume of a solution with a precisely known concentration of a reagent (the titrant) required for reaction with a given amount of a substance being determined (the analyte).
7. _____ is a redox titration that involves the use of permanganates to measure the amount of analyte present in unknown chemical samples.
8. _____ – determination of the quantitative content of individual components of the test substance.

Exercise 6. Complete the abstract using the words and phrases below.

an analytical reaction; chemical methods; conductometry; physical methods; physico-chemical methods; a reagent; spectral analysis.

In _____ of qualitative analysis, the determined element or ion is transferred to any compound by chemical means, which has certain properties, on the basis of which it is possible to establish that this particular compound was formed. A chemical transformation is called _____, and a substance, its boldness, is called _____.

_____ of analysis are methods that allow to determine the composition of a substance without resorting to the use of chemical reactions. These methods are based on the measurement of any system parameters (optical, electrical, magnetic, thermal), which are a function of composition. They include spectral, luminescent, X-ray structural, mass spectrometric methods of analysis. For example, _____ investigates the spectra of radiation that occur when a substance is introduced into the flame of a burner, electric arc, and others.

_____ of analysis are based on the study of physical phenomena that occur during chemical reactions. For example, _____ - change of electrical conductivity, etc.

5.3. ANALYTICAL CHEMISTRY
Part 3

Exercise 1. Active Vocabulary

verbs	nouns	adjectives
carry out	aim	acetic
decolorize	alkali	analytical
define	bond	carmine-red
dissolve	compound	emerald-green
lead	flame	insoluble
reduce	sedimentation	neutral
separate	solubility	resulting
suffice	solution	standardized

Exercise 2. Read the tests:

1. Reaction of sodium ions with potassium hexahydroxoantimonate (V) in neutral medium produces precipitate. Specify the color of this precipitate:
A. White **B.** Red **C.** Yellow **D.** Green **E.** Blue

2. Reaction with potassium permanganate is used to detect reducing anions. Specify the anion that decolorizes potassium permanganate:
A. Sulfite **B.** Carbonate **C.** Tetraborate **D.** Sulfate **E.** Arsenate

3. Specify the substance that can be determined by means of polarimetry:
A. Glucose
B. This method will suffice for any substance
C. Sulfuric acid
D. Sodium chloride
E. Benzene

4. A solution of hydrogen peroxide in an acid medium was added into investigated solution, leading to blue coloring of the resulting solution. This analytical effect indicates the presence of the following anion:
A. $Cr_2O_7^{2-}$ **B**. MnO_4^- **C.** $C_2O_4^{2-}$ **D.** NO_3^- **E.** Cl^-

5. Total content of chloride, bromide, and iodide ions in the investigated solution can be quantitatively determined with the following titrant:
A. Silver nitrate solution
B. Potassium dichromate solution
C. Sodium thiosulfate solution
D. Potassium permanganate solution
E. Sodium nitrite solution

6. Gravimetry (precipitation method) is used for quantitative determination of sulfates in potable water. What substance should be used as precipitator for sulfates?

A. $BaCl_2$ **B.** KCl **C.** $MgCl_2$ **D.** NaCl **E.** NH_4NO_3

7. Solution under analysis received chloroform and, drop by drop, chlorine water. Chloroform layer colored orange, which indicates the presence of:
A. Bromide ions
B. Iodide ions
C. Sulfite ions
D. Sulfate ions
E. Nitrate ions

8. In titration analysis aimed at determining the substances by means of mercurimetry the following substance can be used as the indicator:
A. Diphenylcarbazide
B. Potassium chromate
C. Eriochrome black T
D. Starch
E. Tropeolin OO

9. The Mohr method is used to determine mass concentration of sodium chloride in an isotonic solution. Titration is carried out with the following indicator:
A. Potassium chromate
B. Fluorescein
C. Ammonium iron (III) sulfate
D. Diphenylcarbazone
E. Ferroin

10. In the qualitative analysis that involves precipitation of sulfates of the third analytical group cations (Ca^{2+}, Sr^{2+}, Ba^{2+}) the solubility of sulfates can be reduced by adding:
A. Ethyl alcohol
B. Distilled water
C. Benzene
D. Chloroform
E. Amyl alcohol

11. Potassium dichromate solution was added into a solution obtained after the precipitate consisting of group II chloride cations was processed with hot water. Yellow precipitate was produced; the precipitate is insoluble in acetic acid, but soluble in alkali. What cations were present in the solution under investigation?
A. Lead (II)
B. Mercury (II)
C. Barium
D. Silver (I)
E. Calcium

12. Thiocyanatometric titration method requires secondary standard solution of potassium thiocyanate. This solution is standardized with standard solution of:
A. Silver nitrate
B. Hydrochloric acid
C. Sulfuric acid

D. Iron (II) sulfate
E. Copper (II) nitrate

13. In potentiometric titration the following indicator electrode is used for quantitative determination of chloride and borate acids in their mixture:
A. Glass
B. Silver-chlorine
C. Silver
D. Platinum
E. Calomel

14. During reaction of silver cations identification first HCl and then ammonia solution have been added to the solution. What compound was produced as the result?
A. $[Ag(NH_3)_2]Cl$
B. $[Ag_2(NH_3)_3]Cl$
C. AgOH
D. AgCl
E. $[Ag(NH_3)_3]Cl$

15. In a chemical analytical laboratory a chemist investigates a solution of anion mixture. When antipyrin solution is added it colors emerald-green. This analytical effect signifies presence of the following anions:
A. Nitrite **B.** Nitrate **C.** Acetate **D.** Tartrate **E.** Citrate

16. Specify the standard solutions that are used in permanganatometry to quantify the oxidants by means of back titration:
A. Potassium permanganate, iron (II) sulfate
B. Potassium dichromate, sodium thiosulfate
C. Potassium bromate, sodium thiosulfate
D. Potassium iodate, sodium thiosulfate
E. Cerium (IV) sulfate, iron (II) sulfate

17. The Volhard method is used to define mass concentration of sodium chloride. Name the titrant of this method:
A. Ammonium thiocyanate
B. Mercury (I) nitrate
C. Sodium tetraborate
D. Mercury (II) nitrate
E. Sodium hydroxide

18. What cation of the 4th analytical group is present in a solution, if its reaction with the group reagent results in formation of yellow precipitate?
A. Cr^{3+} **B.** Zn^{2+} **C.** Sn^{2+} **D.** Al^{3+} **E.** Sn(IV)

19. Specify the reagent allowing to determine barium cations in the presence of calcium and strontium cations:
A. Potassium dichromate
B. Potassium chloride
C. Potassium iodide

D. Potassium nitrate
E. Sodium hydroxide

20. Analysis of a dry substance always begins with preliminary tests. Sample under investigation is green in color, which allows to conclude the presence of:
A. Chrome (III)
B. Manganese (II)
C. Cobalt (II)
D. Iron (III)
E. Barium (II)

21. An analytical chemist performs qualitative analysis of cations of the II analytical group. The following solution is used to separate silver and mercury chlorides:
A. Ammonia
B. Hydrochloric acid
C. Sodium hydroxide
D. Sodium nitrate
E. Potassium chloride

22. Burner's flame colors carmine-red in the presence of salts of an unknown cation. Name this cation:
A. Strontium **B.** Ammonium **C.** Sodium **D.** Potassium **E.** Iron

23. Choose the pair of electrodes for potentiometric pH measurement of a solution:
A. Glass and silver chloride
B. Calomel and silver chloride
C. Quinhydrone and antimonial
D. Mercury sulphate and silver chloride
E. Glass and antimonial

24. Given the ability of iodine to dissolve in nonpolar solvents, determine the type of chemical bond in an I_2 molecule:
A. Nonpolar covalent
B. Ionic
C. Polar covalent
D. Metal
E. Intermolecular interaction

25. Calomel electrode is listed in the State Pharmacopoeia of Ukraine as auxiliary electrode for pH measurement. What type of electrodes is it?
A. Second kind
B. First kind
C. Gas
D. Redox
E. Ion-selective

26. In the process of silver cations identification reaction HCl and then ammonia solution have been added to the solution. What compound has been produced as a result?
A. $[Ag(NH_3)_2]Cl$

B. $[Ag_2(NH_3)_3]Cl$
C. AgOH
D. AgCl
E. $[Ag(NH_3)_3]Cl$

27. Mass fraction of Fe^{2+} ions in Mohr's salt can be determined by gravimetric sedimentation method using:
A. NH_4OH **B**. Na_2S **C**. K_3PO_4 **D**. $BaCl_2$ **E**. $ZnCl_2$

28. Mass fraction of pharmaceutical preparations that contain aromatic amino groups is determined through nitrite titration. What external indicator is used in this case?
A. Starch-iodide paper
B. Methylene red
C. Eriochrome Black T
D. Phenolphthalein
E. Eosin

29. Nitrite ions in presence of nitrate ions can be detected by means of:
A. Crystalline antipyrine in presence of dilute HCl
B. Crystalline sodium thiosulfate
C. Dimethylglyoxime
D. Crystalline iron (III) sulfate
E. Diphenylcarbazone

30. What anions form brown ring with iron (II) salts in the presence of concentrated sulfuric acid?
A. Nitrate ions
B. Acetate ions
C. Bromate ions
D. Citrate ions
E. Thiocyanate ions

Exercise 3. Find synonyms of the following words in the tests:

divide		be enough	
notice		goal	
obtain		cumulative	
diminish		combination	

Exercise 4. Write formulas in words:

Ca^{2+}		Cl^-	
Sr^{2+}		$BaCl_2$	
H_2SO_4		KCl	
HNO_3		$MgCl_2$	
HCl		NH_4NO_3	
CH_3COOH		$HClO_4$	

Exercise 5. Read the definitions and choose the proper term given in brackets:

Chemical bond; gravimetric analysis; indicator; iodimetry; oxidant; polarimetry; precipitate; titrant.

1. _____ – titration in order to quantitatively analyse iodine in a sample.
2. _____ **–** a compound that changes color at a particular pH, or over a particular narrow range of pH, used to show titration end points.
3. _____ – a chemical agent that oxidizes.
4. _____– the reagent of known concentration.
5. _____– the connection between two atoms in a molecule.
6. _____ – a type of quantitative analysis in which the amount of a species in a material is determined by converting the species to a product that can be isolated completely and weighed.
7. _____ – an insoluble solid compound formed during a chemical reaction in solution.
8. _____ – measurement of the angle of rotation of the plane of polarized light that results upon its passage through certain transparent materials.

Exercise 6. Complete the abstract using the words and phrases below.

Aqueous; dissociation; dynamic; Greek; molecules; organic; percentage; weak.

The degree of dissociation of the electrolyte is the ratio of the number of its _____, decomposed in this solution into ions, to the total number of its molecules in solution.

In this regard, electrolytes can be divided into two groups - strong and weak electrolytes. Strong electrolytes in _____ solutions are dissociated almost completely. The concept of the degree of is not applied to them. _____ electrolytes in aqueous solutions dissociate only partially, and a equilibrium is established in the solution between undissociated molecules and ions. Strong electrolytes include almost all salts; of acids and bases they include HNO3, HCIO4, HCI, HBr, HI, KOH, NaOH, Ba (OH) 2 and Ca (OH) 2.
Weak electrolytes include most _____ acids, and the most important inorganic compounds include H2CO3, H2S, HCN, H2SiO3 NH4OH. The degree of dissociation is denoted by the _____ letter ά and expressed either in fractions of a unit or as a _____.

6.1. ORGANIC CHEMISTRY

Part 1

Exercise 1. Learn the key words

NOUN	VERB	ADJECTIVE	ADVERB
ability	allow	antispasmodic	widely
associate	break up	excessive	biologically
bond	convert	explicit	exclusively
bone marrow	exhibit	liquid	nevertheless
chain	explore	planar	
correspond	involve	simple	
disorder	mention	simultaneous	
enzyme	obtain	solid	
ester	participate in	structural	
gout	promote	unsaturated	
heating	result from		
interface	result in		
oxidation			
rearrangement			
reduction			
sodium			
starch			
strength			
substitution			
uric acid			

Exercise 2. Read the text.

Alkanes

Hydrocarbons are called alkanes aliphatic molecules in which carbon atoms are linked by only simple covalent bonds (σ-bonds). Synonyms - limit or saturated hydrocarbons, paraffin.

The general formula of alkanes – C_nH_{2n+2}, founder of the homologous series - methane CH_4. Since S_4N_{10} hydrocarbons, alkanes can be as non-hardened and branched chain. The first is called normal or n-alkanes. The first four members of the homologous series of alkanes are trivial names - methane, ethane, propane, butane, the names of these hydrocarbons with n carbon chain formed from the Greek. or Latin. numerals (indicate the number of carbon atoms in the molecule) with the addition of the suffix -an, such as pentane, hexane. The names of alkanes branched carbon chain formed according substitution nomenclature IUPAC.

Structure Carbon atoms in alkanes are tetrahedral configuration (sp3-hybridization) valence angles between the bonds equal 109º28. In cases where the carbon atom linked with different rulers multiple angles deviate from tetrahedral. The length of the C-C bond in alkanes 0.154 nm, the C-H - 0.110 nm. According to RSA alkanes n 'structure in the crystalline state with a zigzag conformation most advantageous in energy terms.

Structural isomerism alkane (chain isomerism) is possible, starting with butane S4N10 (isomers - n-butane and isobutane). Since hydrocarbon S7N16 for alkanes possible *optical isomers.*

Methods of obtaining The main natural sources - oil (a complex mixture of organic compounds with a predominance of alkanes) and natural gas (gaseous alkanes, mainly methane (95%), ethane, propane and butane).

Natural gas is separated into bonding components followed by fractional distillation.

Physical and chemical properties Under normal conditions, four first member of the homologous series of alkanes - gaseous substances, n-alkanes from C5 - C17 - fluid> C17 - solids. With increasing M homologous series increases try melting and boiling points, t bp. isomers branched chain lower than that of n-alkanes. All alkanes lighter than water and practically insoluble in it; readily soluble in nonpolar organic solvents ($(S_2N_5)_2O$, CCl_4, benzene, etc.), and with increasing N solubility decreases.

Under normal conditions, alkanes unreactive resistant to acids, alkalis and oxidants, due to the high strength σ-bonds C-C and C-H. C-C bonds and C-H virtually non-polar and is not prone to rupture heterolytic, but able to homolysis the formation of free radicals, ie alkanes typical substitution reaction taking place on the radical mechanism (SR).

Halogenation. For reactivity relative to alkanes halogens are arranged in series: F_2> Cl_2> Br_2. The reaction of fluorine is in the nature of the explosion and rupture accompanied by C-C bonds. Therefore fluorination of alkanes using special techniques (eg, nitrogen dilution of reagents). Less exothermic reaction chlorination, takes place with UV irradiation or heating by free radical mechanism.

Catalytic oxidation. Takes place in the presence of catalysts (salts of manganese, chromium, lead, etc.) at 150 - 200 ° C to form mostly carboxylic acids, aldehydes, ketones and alcohols such:

$$CH_3–CH_2–CH_3 \xrightarrow{O_2} CH_3COOH + HCOOH + CH_3COH + (CH_3)_2CO + CH_3OH.$$

The oxidation is used in industry to produce methanol, formaldehyde, acetaldehyde and acetic acid from propane and butane, as well as fatty acids from alkanes with chain length > C_{25}.

Cracking alkanes There are thermal cracking (at t ≥ 800 º C) and catalytic cracking (at t = 450 - 550 C in the presence of silica-alumina catalysts), such as:

$$2CH_4 \xrightarrow{1400–1500°C} HC{\equiv}CH + 3H_2.$$

Higher alkanes in terms of thermal cracking decompose to form a complex mixture of lower alkanes and alkenes; the reaction proceeds by a radical mechanism.

In catalytic cracking (flowing through ion mechanism) cleavage of C-C bonds usually accompanied by isomerization of n-alkanes to branched chain alkanes:

$CH_3(CH_2)_4CH_3 \rightarrow CH_3–CH(CH_3)–CH(CH_3)–CH_3 + (CH_3)_3CCH_2CH_3$.

Cracking process is of great commercial importance and is widely used to produce high-octane gasoline, unsaturated and aromatic hydrocarbons.

Exercise 3. Answer the questions

1. What are alkanes?
2. Name four members of the homologous series.
3. What are physical and chemical properties?
4. Oxidation is used in industry to produce what?
5. What is used to produce high-octane gasoline, unsaturated and aromatic hydrocarbons.
6. What are examples of catalysts?
7. How the natural gas is separated?
8. What is the general formula of alkanes?

Exercise 4. Match the words to make word combinations

catalytic	importance
commercial	series
produce	distillation
normal	configuration
fractional	methanol
homologous	cracking
tetrahedral	mixture
complex	conditions

Exercise 5. Fill in the text to make definitions.

Organic chemistry is a branch of chemistry that studies the structure, properties and reactions of organic _____, which contain carbon-carbon covalent bonds. Study of structure determines their structural formula. Study of properties _____physical and chemical_____, and evaluation of chemical reactivity to understand their behavior. The study of organic reactions includes the chemical ____of natural products, drugs, and polymers, and study of individual organic _____ in the laboratory and via theoretical (in silico) study.

In organic chemistry, an ***alkane***, or paraffin (a historical trivial name that also has other meanings), is an acyclic saturated_____. In other words, an alkane consists of _____ and carbon atoms _____ in a tree structure in which all the carbon–carbon ____are single. Alkanes have the general chemical formula

Carbon (from Latin: carbo "coal") is a chemical element with the symbol C and atomic number 6. It is nonmetallic and tetravalent—its atom making four _____ available to form covalent chemical bonds. It belongs to group 14 of the periodic table. Carbon makes up only about 0.025 percent of Earth's crust. Three _____ occur naturally, 12C and 13C being stable, while 14C is a radionuclide, decaying with a half-life of about 5,730 years. Carbon is one of the few _____ known since antiquity.

Includes, arranged, synthesis, molecules, elements, electrons, properties, compounds, hydrogen, hydrocarbon, bonds, isotopes

Exercise 6. Find synonyms in the texts (ex2 and ex5)

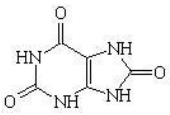
natural	
breaking, fracturing	
backdrop setting	
outspread, split	
chain	
inflexibly	
considerable	
complete, regulate	
brusque	
medicine, remedy	

Exercise 7. Make your sentences in Active and Passive Voice forms.

Methane	
Reactivity	
Periodic table	
Natural products	
Oxidation	
Conditions	
Cracking	
Founder	
Available	
Synthesis	
Hydrogen	

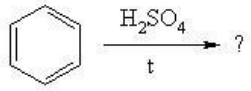
Exercise 8. Discuss the tests, find the correct answers.

1. Patients with gout have an increased concentration of acid, the chemical formula of which is presented below, in the blood. Also, increased level of this acid promotes the formation of stones in the kidneys and leads to a number of pathological medical conditions. What substance is the precursor to the described acid?

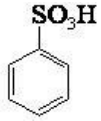


A. Purine
B. Indole
C. Pyrazine
D. Pyrazole
E. Pyridine

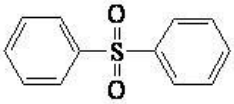
2. Sulfurization of benzene, as well as other aromatic hydrocarbons, is one of the most important reactions in organic chemistry, since its products are widely used in industry. Which of the following are the possible products of benzene sulfation reaction?



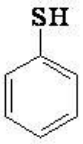
A.



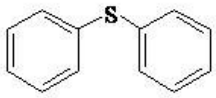
B.



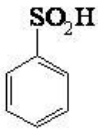
C.



D.



E.



3. In practical classes the group of students have to explore the chemical structure of glucose molecule. Which of the following suits most for simultaneous detection of aldehyde group and glycol fragment in previously mentioned molecule?

A. $Cu(OH)_2$
B. Br_2
C. $AlCl_3$
D. $FeCl_3$
E. $KMnO_4$

4. During hemoglobin catabolism iron is released. Then it enters the bone marrow and is again used for the synthesis of hemoglobin. Which of the following proteins helps in iron transportation?

A. Transferrin
B. Transcobalamin
C. Haptoglobin
D. Ceruloplasmin
E. Albumin

5. Specify the substance that results from the following reaction:

$HOH,\ Hg^{2+}$

$CH \equiv CH \longrightarrow ?$

A. Ethanal

B. Ethanol
C. Propanal
D. Propanone
E. Acetic acid

6. A lot of peptides involved in the regulation of various biological processes are produced in the human body. They have high physiological activity. Which biologically active peptide is one of the main antioxidants and performs coenzyme function?

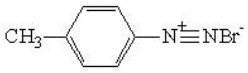
A. Glutathione
B. Bradykinin
C. Oxytocin
D. Liberin
E. Anserine

7. Surfactants are compounds that lower the surface tension (or interfacial tension) between two liquids, between a gas and a liquid, or between a liquid and a solid. Which of the following substances exhibits the properties of a surfactant at the air-water interface?

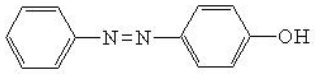
A. Valeric acid
B. *HCl*
C. *NaOH*
D. Urea
E. –

8. Select the formula of diazoniumsalt:

A.



B.



C. $C_6H_5-N=O$
D. $C_6H_5-NH-C(O)-CH_3$
E. $(CH_3)_2N-N=O$

9. Salts and esters of oxalic acid arecalled:

A. Oxalates
B. Adipates
C. Succinates
D. Malonates
E. Urates

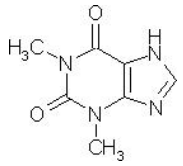
10. What test is used for identification of uric acid and other compounds with purine nucleus?

A. Murexide reaction
B. Silver mirror reaction
C. Lucasre agent
D. Fehling reagent

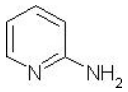
E. Copper mirror reaction

11. Select the compound with both pyrrole and pyridine nitrogen atoms from those given below:

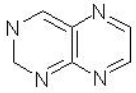
A. The ophyl line



B. 2-Aminopyridine



C. Pteridine



D. Pyrimidine

E. Pyridazine

12. What reagent allows distinguishing between maltose (a reducing disaccharide) and sucrose (a non-reducing disaccharide)?

A. Tollens reagent
B. *NaOH*
C. $FeCl_3$
D. Br_2
E. $K_4[Fe(CN_6)]$

13. What reagent allows distinguishing between maltose (a reducing disaccharide) and sucrose (a non-reducing disaccharide)?

F. Tollens reagent
G. *NaOH*
H. $FeCl_3$
I. Br_2
J. $K_4[Fe(CN_6)]$

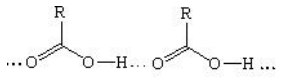
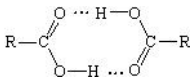
13. Cellulose hydrolysis produces the following disaccharide:

A. Cellobiose
B. Maltose
C. Sucrose
D. Glucose
E. Lactose

14. Transformation C_2H_4 (alkene) C_2H_6(alkane) occurs during the following reaction:

A. Hydrogenation
B. Dehydrogenation
C. Dehydration
D. Hydration
E. Dimerization

15. What type of bonds participates in creation of both linear and cyclic carboxylic acid associate sin the form of dimers?

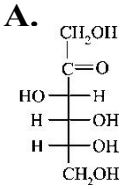



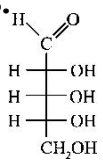
A. Hydrogenbonds
B. Ionicbonds
C. Polar covalentbonds
D. Nonpolar covalentbonds
E. Donor-acceptorbonds

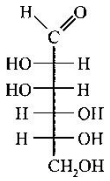
16. Which of the listed monosaccharides is a ketose?

A. Fructose
B. Mannose
C. Glucose
D. Galactose
E. Ribose

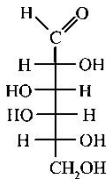
17. Fructose is a monosaccharide, glucose isomer. In medicine it is used in treatment of hepatic disorders and as a part of special diets. Which formula corresponds with *D*- fructose?

A.


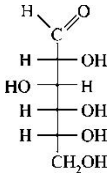
B.


C.


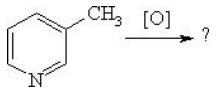
D.



E.



18. What compound is synthesized by means of beta-picoline oxidation?



A. Nicotinic acid
B. Benzoic acid
C. Uric acid
D. Barbituric acid
E. Ascorbic acid

19. Name the product of starch hydrolysis:
A. Glucose
B. Fructose
C. Mannose
D. Ribose
E. Galactose

20. Dibazol (Bendazol) is a hypotensive antispasmodic drug. Its mechanism of action is based on its ability to block phosphodiesterase type 4 enzyme activity. This drug contains the following heterocycliccompound:

A. Benzimidazole
B. Benzene
C. Thiazole
D. Pyridine
E. Pyrimidine

21. What compounds break up into ammonia, carbon dioxide, and water in the human body?
A. Amino acids (амінокислоти)
B. Monosaccharides
C. Monohydric alcohols
D. Fatty acids
E. Keto acids

22. According to Hueckel's rule an organic compound will have aromatic properties if

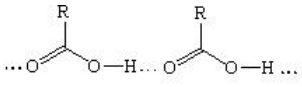
A. Its molecular structure contains a planar cycle with a closed conjugated system that contains(4n+2) of pielectrons, wheren= 0,1,2,3, etc.
B. Its molecules are composed exclusively of carbon and hydrogen atoms that forma linear carbonc hain
C. There is only one substituent in the molecule
D. There are condensed nuclei in the molecule
E. There is a cyclohexanering in the molecule

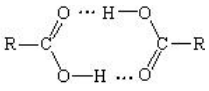
23. Heating of sodium phenolatein CO2 stream results in production of a certain carboxylicacid. Name the resulting compound:
A. Salicylic acid
B. Ethyl salicylate
C. Phenylsalicylate
D. Benzoicacid
E. Aminophenol

24. Which alkadiene of those listed below is a diene with cumulated double bonds?

A. CH2 = C = CH2
B. CH3 − CH = CH − CH2 − CH = CH2
C. CH2 = CH − CH2 − CH = CH2
D. CH2 = CH −CH2 −CH2 −CH = CH2
E. CH2 = CH − CH = CH2

25. What bonds participate in creation of both linear and cyclic dimeric carboxylic acid associates?





A. Hydrogen bonds
B. Ionicbonds
C. Polarcovalentbonds
D. Non-polarcovalentbonds
E. Donor-acceptorbonds

26. Transformation C2H4 (alkene) into C2H6 (alkane*)* occurs during the following reaction:
A. Hydrogenation
B. Dehydrogenation
C. Dehydration
D. Hydration
E. Dimerization

27. Specify the products obtained as the result of formic acid being heated with concentrated sulfuric acid:

A. CO + H2O

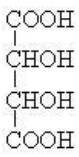
B. CO2 + H2O
C. CO + CO2 + H2O
D. CO2 + H2
E. CO + H2

28. Specify the substance that results from the following reaction:

$$CH \equiv CH \xrightarrow{HOH,\ Hg^{2+}} ?$$

A. *Ethanal*
B. Ethanol
C. Propanal
D. Propanone
E. Aceticacid

29. How many asymmetric carbon atoms and stereoisomers are there in tartaric acid?



A. Two asymmetric atoms and three stereoisomers
B. One asymmetric atom and two stereoisomers
C. Two asymmetric atoms and four stereoisomers
D. No asymmetric atoms and no stereoisomers
E. Two asymmetric atoms and two stereoisomers

30. Introduction of an electron acceptor substitute into molecule is known to increase acid strength. What substance demonstrates the most explicit acidic properties?

A. Trichloracetic acid
B. Dichloroacetic acid
C. Chloroacetic acid
D. Acetic acid
E. Propionic acid

31. Barium carbonate sol has been obtained from the reaction of excessive amount of barium chloride solution with ammonium carbonate solution. The micelle aggregate consists of the following microcrystals:

A. $BaCO_3$
B. NH_4Cl
C. $(NH_4)_2CO_3$
D. $BaCl_2$
E. Mixture of $BaCO_3$ with NH_4Cl

32. Optical activity of monosaccharides can be explained by their:

A. Asymmetric carbon atoms in a molecule
B. Asymmetric crystal
C. Complicated rotation around σ-bond
D. Aldehyde or ketone group
E. Number of hydroxyl groups in a molecule

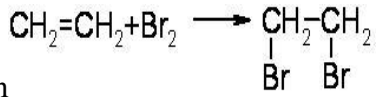
33. What compound has no carboxyl group but nevertheless is called an acid?

A. Picric acid
B. Valeric acid
C. Tartaric acid
D. Lactic acid
E. Malic acid

34. What reagent will allow for unsaturated organic compounds reduction under the conditions given below?

A. H_2, $N\,i$, t
B. $H\,N\,O_3$, p, t
C. $NaOH$, H_2O
D. $K_2Cr_2O_7$, H^+
E. H_2O, $H\,g^{2+}$, H^+

35. Ethane is the product of the following reaction:



A. Addition
B. Substitution
C. Reduction
D. Oxidation
E. Rearrangement

36. Specify the number of electrons involved into formation of the isolated conjugated system in the pyrimidine molecule:

A. 6
B. 4
C. 10
D. 2
E. 8

37. Aniline can be converted into the water-soluble salt through the treatment with a solution of:

A. Hydrochloric acid
B. Sodium hydroxide
C. Sodium sulfate
D. Ethanol
E. Dimethylamine

38. What substance is surface-inactive regarding water-air interface?

A. Saccharose
B. Acetic acid
C. Ethanol
D. Methylamine

E. Acetone

39. Insulin production in β-cellsinvolves many substances. What substance gives the main signal for insulin synthesis is when its concentration changes?

A. Glucose (глюкози)
B. Carbon dioxide
C. Heparin
D. Hemoglobin
E. Urea

40. A structural analogof vitamin *PP* (nicotinicacid) issue das an antituberculous medicine. Name this medicine:

A. Isoniazid
B. Streptocide
C. Riboflavin
D. Tetracycline
E. Aspirin

Exercise 9. Find the synonyms from the tests.

contribute –
result in –
suit–
elevate–
point out–
get–
show–
take part in –
consist of–

6.2. ORGANIC CHEMISTRY

Part 2

Exercise 1. Learn the key words

NOUN	VERB	ADJECTIVE	ADVERB
appearance	administer	acute	daily
appointment		crimson	eventually
complaint	consume	cyanotic	mainly
condition		diluted	radially
development		external	sharply
exertion		intraocular	
	determine	low	
feature	disrupt		
infiltration	equal	respiratory	
inflorescence		saponated	
inoculation		secretory	
interaction	sell	severe	
lavage		subsequent	
		thick	
pregnancy		thin	
pressure		thready	
research		virological	
solution			
suppression			

Exercise 2. Translate the tests.

1. Calculation of chemical reactions thermal effects at pharmaceutical production is based on the Hess law, stating that reaction thermal effect is determined by:

A. Initial and final state of system
B. Mechanism by which the chemical change occurs
C. Route by which the chemical change occurs
D. Number of intermediate stages
E. Process duration

2. Dobutamine has been administered to the 49-year-old-patient with acute cardiac failure and cardiac glycoside intolerance. What is this drug's mechanism of action?

A. Stimulation of β_1-adrenoreceptors
B. Stimulation of α_1-adrenoreceptors
C. Blockade of K^+-, Na^+- adenosinetrip hosphatase
D. Suppression of phosphodiesterase activity
E. Stimulation of *M*-cholinergic receptors

3. During calculous cholecystitis attack the patient has developed the following symptoms: saponated feces and steatorrhea. What stage of fats metabolism is disrupted according to those symptoms?

A. Fat digestion, absorption and secretion
B. Fat absorption
C. Intermediary metabolism of fats
D. Fats metabolism in adipose tissue
E. Depositing disruption

4. If aromatic secretory-downy plant has square in cross section stem, spike inflorescence made up from whorled dichasia, bilabiate corolla and its fruit consists of four nutlets, it probably belongs to the following family:

A. *Lamiaceae*
B. *Scrofulariaceae*
C. *Brassicaceae*
D. *Apiaceae*
E. *Solanaceae*

5. When root is studied under microscope, one leading bundle is detected in its maturation zone, where xylem and phloem areas interchange radially. It can be concluded that this bundle type is:

A. Radial
B. Collateral
C. Bicollateral
D. Amphicribal
E. Amphivasal

6. In large intestine microorganisms synthesize vitamins that participate in organism's biochemical processes. What vitamins are mainly synthesized by microflora?

A. K,B_{12}
B. A,C
C. E,PP
D. B_1,B_2
E. B_6,E

7. Parentsofthe10-year-oldchildhave made an appointment with endocrinologist due to complaints of child's low height. The child's appearance is corresponding with that of 5-year-old child. What hormone secretion disorder causes such physical development changes?

A. Somatotropic hormone
B. Adrenocorticotropic hormone
C. Thyroxin
D. Testosterone
E. Insulin

8. The 55-year-old patient has been hospitalized due to chronic cardiac failure. Objectively: skin and mucosa are cyanotic, tachycardia, tachypnea. What kind of hypoxia does the patient have?

A. Circulatory
B. Anemic
C. Hemic
D. Tissue
E. Hypoxic

9. The patient has been hospitalized with pneumonia. What kind of respiratory failure does the patient have?

A. Restrictive
B. Obstructive
C. Central
D. Peripheral
E. Thoracicdiaphragm

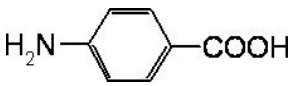
10. What naloxone indications are there?

A. Narcotic analgetics acute poisoning
B. Heavy metals poisoning
C. Cardiac glycosides poisoning
D. Ergot alkaloids poisoning
E. Atropine sulphate poisoning

11. During gastric secretory function research decrease of hydrochloric acid concentration in gastric juice was detected. What enzyme will be less active in such acondition?

A. Pepsin
B. Amylase
C. Lipase
D. Dipeptidase
E. Hexokinase

12. What reagent does p-aminobenzoic acid amino group react with?



A. *HCl*
B. NH_4OH
C. *NaOH*
D. CH_3COONa
E. *KCN*

13. The patient with hepatic colic has been prescribed spasmolytic of muscarinic receptor antagonists group as a part of his complex therapy. What drug is it?

A. Atropine
B. Proserin
C. Galantamine
D. Dithylin
E. Benzohexonium

14. In the course of plant cells treatment with phloroglucinol with concentrated sulfuric acid their cell walls became crimson-red, which means:

A. Lignification
B. Suberization
C. Mucification
D. Cutinization
E. Mineralization

15. When root was being studied under microscope, root hairs were detected, which are cell growths of:

A. Epiblema
B. Epidermis
C. Endoderm
D. Exoderm
E. Mesoderm

16. Pharmacy sells glaucine hydrochloride to the patient with chronic bronchitis. What common side effect should he be warnedabout?

A. Decrease of arterial pressure
B. Excitation of central nervous system
C. Disruption of cardiac rate
D. Increase of intraocular pressure
E. Allergic skin rashes

17. Potassium iodide solution has been added to the solution containing cations of the sixth analytical group (acid- base classification). It resulted in red precipitate soluble in excess of reagent. What cations are present in the solution?

A. Mercury(II)
B. Nickel
C. Cobalt(II)
D. Bismuth
E. Cadmium

18. The Mohr method is used to define sodium chloridemass concentration in isotonic solution. Titration is carried out with the following indicator present:

A. Potassiumchromate
B. Fluorescein
C. Ammonium iron (III)sulfate
D. Diphenylcarbazone
E. Ferroin

19. The student with cold has been prescribed antipyretic medicine. Name this medicine.

A. Paracetamol
B. Ascorbicacid
C. Oxytocin
D. Famotidine
E. Cyanocobalamin

20. Name the drug that causes miosis and lowers intraocular pressure.

A. Pilocarpine hydrochloride
B. Fenofibrate
C. Nitrazepam
D. Atropinesulphate
E. Suxamethoniumchloride

21. The patient with acute cardiac failure has developed dyspnea,

tachycardiaandcyanosisduringphysicalexertion.Namethetypeofhypoxia.

A. Circulatory
B. Respiratory
C. Hemic
D. Hypoxic
E. Tissue

22. Research of reaction rate dependance from various factors allows to intensify technological processes. What factor **HASNO** effect on reaction rate constant?

A. Reacting agents concentration
B. Temperature
C. Reagentsnature
D. Solventnature
E. Solid substance dispersion degree

23. What substance is surface-inactive regarding water-air interface?

A. Saccharose
B. Aceticacid
C. Ethanol
D. Methylamine
E. Acetone

24. Medicines used in treatment of dental caries contain sodium fluoride. Which one of the compounds given below does *NaF* react with?

A. H_2SO_4
B. CO_2
C. *NaCl*
D. *KI*
E. CH_3COOH

25. Epinephrine is used to prolong the effect of novocaine during infiltration anesthesia. What epinephrine action is this effect caused by?

A. Vasoconstriction
B. Potentiation of novocaine action at CNS level
C. Suppression of nerve endings and conductors functioning
D. Vasodilatation
E. Suppression of tissue esterases

26. Potentiometric method of *pH* measuring isused during pharmaceutical substances research. What electrode can be used as indicator (working electrode) in solution *pH* measuring?

A. Glass
B. Standardhydrogen
C. Zinc
D. Calomel
E. Silver-chlorine

27. What analytical effect is observed when titrationend point in the Volhard method is

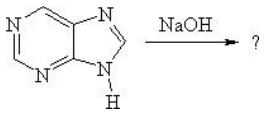
registered?

A. Red coloration of solution
B. Red precipitate
C. Yellow coloration of solution
D. Brown precipitate
E. Yellow precipitate

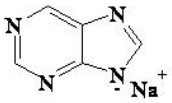
28. Information transfer from peptide hormones to intracellular second messengers occurs involving adenylate cyclase. What reaction is catalyzed by adenylatecyc lase?

A. Cyclic adenosine monophosphate production
B. ATP breakdown into ADP and inorganic phosphate
C. ATP synthesis from adenosine monophosphate and pyrophosphate
D. ADP breakdown with adenosine monophosphate and inorganic phosphate production
E. ATP breakdown into adenosine monophosphate and pyrophosphate

29. Point out the product resulting from interaction of purine with sodium hydroxide:



A.



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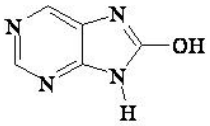

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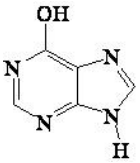
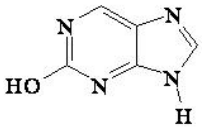
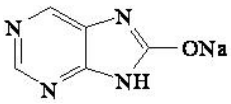


D.



E.



30. At the sixth month of pregnancy the female patient has been diagnosed with severe iron-deficiency anemia. Diagnostic character was the appearance of the following in blood:

A. Hypochromic erythrocytes
B. Macrocytes

C. Megalocytes
D. Reticulocytes
E. Erythroblasts

31. Botulism agent causes severe food toxicoinfection. Point out the most characteristic morphologic feature of botulism agent.

A. Gram-positive spore-forming bacilli with subterminal spore
B. Thick gram-positive non-spore- forming bacilli
C. Gram-positive spore-forming bacilli with terminal spore
D. Thin mobile spore-forming bacilli with central spore
E. Thick gram-positive non-spore- forming non-filament-forming bacilli

32. What reagent is used to separate *AgCl* precipitate from *AgI* precipitate?

A. Aqueous solution of ammonia
B. Concentrated nitric acid
C. Diluted nitric acid
D. Concentrated solution of potassium

E. Sulfuric acid solution

33. 1 minute after the patient had been administered penicillin the patient's arterial pressure sharply dropped, pulse became thready, cold sweating and clonic convulsions began. Name this condition.

A. Anaphylactic shock
B. Traumatic shock
C. Cardiogenic shock
D. Septic shock
E. Burn shock

34. Choose the colloid surfactant out of the substances listedbelow:
A. Potassiumoleate
B. Iodine
C. Sodiumchloride
D. Polyethylene
E. Gelatin

35. Virological laboratory has received patient's nasopharyngeal lavage. What can be used to single out influenza virus from the patient's lavage?
A. Chickembryo
B. Meat infusionagar
C. Meat infusionbroth
D. Endo'smedium
E. Lowenstein–Jensenmedium

36. When hydrogen peroxide solution is administered to bleeding wounds, it is broken up by one of the blood enzymes. Point out this enzyme.
A. Catalase
B. Monoamineoxidase
C. Cytochromeoxidase
D. Aspartateaminotransferase
E. Lactatedehydrogenase

37. Water solution of $CaCl_2$ with chloride 10% mass concentration is used for intravenous injections. What is the maximum value of $CaCl_2$ isotonic coefficient in water solution?

A. 3
B. 4
C. 2
D. 5
E. 1

38. Staphylococci grow well in ordinary media but inoculation of blood and egg-yolk salt agar should be done to separate pure bacterial cultures from diseased tissue. What is the purpose of those media?

A. To define disease-producing factor
B. To define tinctorial properties
C. To study antigenic properties
D. To define bacterial mobility
E. To define antibiotic susceptibility

40. Nitrite ions can be detected in the presence of nitrate ions using the following:

A. Crystalline antipyrine in the presence of diluted *HCl*
B. Crystalline sodium thiosulfate
C. Dimethylglyoxime
D. Crystalline iron (III)sulfate
E. Diphenylcarbazone

41. Catabolism of body's own tissue proteins is intensified during such diseases as thyrotoxicosis and tuberculosis. This process is attended by intensive synthesis in liver and subsequent excretion with urine of the following:

A. Urea
B. Glucose
C. Acetonebodies
D. Fattyacids
E. Nucleotides

42. Natural peptides can carry out various functions. What biologically active peptide is one of the main antioxidants and carries out coenzyme functions?

A. Glutathione
B. Bradykinin
C. Oxytocin
D. Releasing hormone(Liberine)
E. Anserine

43. The patient has been prescribed oral drug to treat diarrhea. In accordance with WHO and Pharmacopoeia demands 1 g (ml) of drug has to contain the following number of microorganisms:

A. 1000bacteriaand100moldfungi
B. 100bacteriaand10moldfungi
C. 10 bacteria and no mold fungi
D. No bacteria and no mold fungi
E. 1000 bacteria and 200 mold fungi

44. Microbiological purity of tableted drugs had been tested at factory. Samples cultivation in mannitol salt agar resulted in growth of golden- yellow colonies, microscopic examination of colonies detected gram- positive globular bacteria positioned in clusters; microorganisms had plasma coagulation prorerties. What pure bacterial culture was obtained?

A. Staphylococcusaureus

B. Enterobacteriaceae
C. Staphylococcusepidermidis
D. Staphylococcussaprophyticus
E. Pseudomonasaeruginosa

45. Leaves damage by mosaic discoloration has been detected at medical plantations. What microorganisms are the cause?
A. Plant-pathogenic viruses
B. Plant-pathogenic bacteria
C. Plant-pathogenic fungi
D. Protozoa
E. Rickettsia

46. Bacteria eventually become resistant to antibacterial agents. What enables gram-positive bacteria's resistance to penicillin antibiotics?
A. Beta-lactamases production
B. Cell wallperme ability
C. Active synthesis of peptidoglycane
D. Active transport of antibiotics
E. Protein synthesis

47. The following have been detected in hand lavage of the kindergarten chef: coli bacilli, ray fungi, staphylococci, bacilli, mold fungi. What microbes are evidential of fecal contamination of hands?
A. Coli bacilli
B. Ray fungi
C. Staphylococci
D. Bacilli
E. Mold fungi

48. A person has been in contact with influenza patient. What drug should be administered for specific passive influenza prophylaxis?
A. Antigrippalimmunoglobulin
B. Vaccine influenza virus inactivated
C. Leukocyticinterferon
D. Amizon
E. Anaferon

49. Which one of the listed substances causes formation of acquired artificial passive immunity?
A. Tetanusserum
B. BCG vaccine
C. Tetanusanatoxin
D. DPT vaccine
E. -

50. Reaction rate constant numerically equals reaction rate, if molar concentrations of:
A. Reagents equal1
B. Reagents differ by1
C. Products areidentical
D. Products differ by1
E. -

51. Tetanic spasms of skeletal muscles occur under low calcium concentration in blood. What endocrine disorder can this condition be associated with?
A. Hypofunction of parathyroid glands
B. Hyperfunction of adrenal cortex

C. Hypofunction of adrenal cortex
D. Hyperthyroidism
E. Hypothyroidism

52. Eicosanoids, - hormone-like compounds, - are used to stimulate labor and for contraception. What substances have such aneffect?
A. Prostaglandines
B. Interleukines
C. Endorphines
D. Angiotensines
E. Enkephalines

53. When studying *whitemistletoe*, - perennial medicinal semiparasite plant, - it was revealed that its embryonic root buries into higher plant stem tissue and reaches vascular tissue system. This type of roots is called:
A. Haustorialroots
B. Photosyntheticroots
C. Aeratingroots
D. Contractileroots
E. Aerialroots

54. During practical field session students have detected plant with diversity of leaves that differ by their placement on stem, parts development, size, shape, lamina division. This phenomenon is called:
A. Heterophylly
B. Phyllotaxy
C. Metamorphosis
D. Leafmosaic
E. Venation

55. Thepatient with acute cardiac insufficiency has decreased urine excretion caused by reduction of filtering taking place in glomerules. What causes this drop infiltration?
A. Decrease of arterial pressure
B. Increase of hepatic blood flow
C. Exsiccosis
D. Duct lumen obstruction
E. Decrease in number of functioning glome rules

56. Mass fraction of pharmaceutical preparations that contain aromatic amino groups is defined through nitrite titration. What external indicator is used in this case?
A. Starch-iodide paper
B. Methylenered
C. Eriochrome Black T
D. Phenolphthalein
E. Eosin

57. The poultry factory worker, who has been consuming 5 or more raw eggs daily, complains of weakness, drowsiness, muscle pain, loss of hair, seborrhea. What vitamin deficiency causes suchcondition?
A. *H*(biotin)
B. *C* (ascorbicacid)
C. *A* (retinol)
D. B_1(thiamine)
E. B_2(riboflavin)

58. A student analyses plant organ with radial symmetry, unlimited growth and positive geotropism, which provides nourishment, vegetative reproduction and plant fastening in soil.

This organ is:

A. Root
B. Stem
C. Leaf
D. Rhizome
E. Seed

59. Capsuliferous bacteria has been detected during microbiological inspection of crude drugs. What method of staining has been used to detect capsules?

A. Burri-Gins
B. Ziehl–Neelsen
C. Neisser
D. Gram
E. Aujeszky

60. In the process of chemical solution preparation laboratory assistant's forearm was exposed to concentrated hydrochloric acid. There are burning pain, hyperemia and swelling of the damaged area. What pathologic process are these symptoms evidential of?

A. Inflammation
B. Tumor
C. Embolism
D. Thrombosis
E. Lymphostasis

Exercise 6. Put questions to sentences below

1. In the large intestine, microorganisms synthesize vitamins that participate in the body's biochemical processes.
2. Epinephrine is used to prolong the effect of novocaine during anesthesia.
3. Natural peptides can perform various functions.
4. Hormone-like compounds are used to stimulate childbirth and for contraception.
5. Tetanic spasms of skeletal muscles occur with a low concentration of calcium in the blood.
6. The child's parents made an appointment with an endocrinologist because of complaints about the child's short stature.
7. A certain staining method is used to identify capsular bacteria.
8. The patient was brought to the hospital with iron deficiency anemia.
9. The student analyzes the plant organ that provides nutrition, vegetative reproduction and anchoring of plants in the soil.
10. Students should point out the features of oxidation.

Exercise 4. Find the synonyms from the tests.

Stone -
contraction, shortening -
obstruction -
cardiac failure -
discharge, eliminate -
state -
aim -
delivery -
specimen -
feature -

Exercise 5. Fill in the table.

NOUN	VERB	ADJECTIVE
immunity		

		definite
	exert	
indicator		
	contain	
		treated
action		
		dividable
	dilute	
infection		

Exercise 6. Match the terms with their definitions.

1. Reduction	j) is a chemical reaction in which two molecules come together to make a bigger one.
2. Addition	k) is a process that leads to the chemical transformation of one set of chemical substances to another.
3. Hydroliss	l) is a chemical reaction that involves the gaining of electrons by one of the atoms involved in the reaction between two chemicals.
4. Chemical reaction	m) is a chemical reaction that involves the loss of electrons.
5. Chemical bond	n) is a chemical reaction in which one group replaces the other.
6. Rearrangement	o) is any chemical reaction in which a molecule of water ruptures one or more chemical bonds.
7. Oxidation	p) is a chemical reaction in which an atom or group migrates from one carbon atom to another.
8. Substitution	q) is a lasting attraction between atoms, ions or molecules that enables the formation of chemical compounds.

7.1. PHYSICAL AND COLLOIDAL CHEMISTRY
Part 1

Exercise 1. Active Vocabulary

Noun	Verb	Adjective	Adverb
amount	belong to	concerted	extremely
calculation	differ	dispencing	freshly
constant	equal	disperse	numerically
degree	extract	high	towards
duration	refine	initial	widely
production	state	mutual	
rate	treat	rare	
route		thermal	
scattering			
solvent			
stage			
wetting			

Exercise 2. Read the tests:

1. Calculation of chemical reactions thermal effects at pharmaceutical production is based on the Hess law, stating that reaction thermal effect is determined by:
A. Initial and final state of system
B. Mechanism by which the chemical change occurs
C. Route by which the chemical change occurs
D. Number of intermediate stages
E. Process duration

2. Research of reaction rate dependence on various factors allows intensification of technological processes. What factor **HAS NO** effect on the reaction rate constant?
A. Reacting agents concentration **B.** Temperature **C.** Reagents nature
D. Solvent nature **E.** Solid substance dispersion degree

3. Potentiometric method of pH measuring is used during pharmaceutical substances research. What electrode can be used as indicator (working electrode) in solution pH measuring?
A. Glass **B.** Standard hydrogen **C.** Zinc **D.** Calomel **E.** Silver-chlorine

4. Water solution of $CaCl_2$ with 10% mass concentration is used for intravenous injections. What is the maximum value of $CaCl_2$ isotonic coefficient in water solution?
A. 3 **B.** 4 **C.** 2 **D.** 5 **E.** 1

5. Pharmaceutical synthesis requires studying complex reaction kinetics. If the first stage product is the second stage initial substance, then such reaction is called:
A. Consecutive **B.** Inverse **C.** Concerted **D.** Second order **E.** Parallel

6. Reaction rate constant numerically equals the reaction rate, if molar concentrations of:
A. All reagents equal to 1 **B.** Reagents differ by 1 **C.** Products are identical
D. Products differ by 1 **E.** -

7. In potentiometric titration the following indicator electrode is used for chloride and borate acids quantitative determination in their mixture:
A. Glass **B.** Silver-chlorine **C.** Silver **D.** Platinum **E.** Calomel

8. In pharmaceutical production oxyethylated derivatives of fatty acid esters (FAEs) are used. They undergo colloid dissolution in sufficiently concentrated solutions. This process is called:
A. Solubilization **B.** Sensitization **C.** Synergism **D.** Colloid protection **E.** Syneresis

9. The dispensing chemist has been studying properties of certain disperse system classes, namely, aerosols. What optical phenomenon is characteristic of this disperse system class?
A.Light scattering **B.**Light absorption **C.**Opalescence **D.**Light reflection **E.**Light refraction

10. Selective solvents are used in laboratories and factories to isolate and refine essential oils, alkaloids, antibiotics and other pharmaceutical substances. This process is called:
A. Extraction **B.** Sedimentation **C.** Coagulation **D.** Flocculation **E.** Flotation

11. When liquid dosage forms are produced, colloid surfactants are added to increase certain components solubility. What physicochemical phenomenon is this process based on?
A. Solubilization **B.** Coagulation **C.** Extraction **D.** Diffusion **E.** Sedimentation

12. A pharmacist has been adding several small portions of electrolyte to silver chloride sol, which resulted in coagulation occurring at a higher electrolyte concentration than that occurring at adding same electrolyte by a single portion. This phenomenon is called:
A. Sol acclimatization **B.** Antagonism **C.** Synergism **D.** Additivity **E.** Desensitization

13. If an amount of high-molecular substance added to the given sol is extremely small, it is possible that its stability decreases instead of increase. What is this phenomenon called?
A. Sensitization **B.** Solubilization **C.** Syneresis **D.** Sedimentation **E.** Synergism

14. A method of removal of low-molecular impurities from the colloidal systems and high-molecular compound solutions by the diffusion through semi-permeable membrane is called:
A.Dialysis **B.**Electrodialysis **C.**Ultrafiltration **D.**Decantation **E.**Compensatory dialysis

15. Which aqueous solutions of the drugs having same molarity will be characterized by the highest boiling temperature:
A. Sodium sulfate **B.** Promedol (Trimeperidine) **C.** Nicotinamide **D.** Resorcin **E.** Iodine

16. Thermodynamic calculations allow us to determine the possibility and direction of spontaneous processes. In an isolated system the change of the following thermodynamic function is used for this purpose:
A. Entropy **B.** Gibbs energy **C.** Helmholtz energy **D.** Internal energy **E.** Enthalpy

17. Organisms of plants and animals belong to biological systems that perform substance and energy exchange with their environment. These systems are:
A. Open, heterogeneous **B.** Isolated, heterogeneous **C.** Closed, homogeneous
D. Closed, heterogeneous **E.** Open, homogeneous

18. Essential oils are used both in pharmaceutical and cosmetic industry. To extract essential oils from herbal raw material the following technology is used:

A.Steam distillation **B.**Calorimetry **C.**Colorimetry **D.**Potentiometry **E.**Conductionmetry

19. Colloid silver preparations Protargolum and Collargolum are widely used in medical practice as bactericidal drugs. In addition to the active ingredients, these drugs contain protein compounds. What is the function of proteins in these preparations?
A. Prevention of coagulation of the colloidal solution **B.** Prolongation of shelf-life
C. Reduction of the side effects **D.** Improvement of the drug technology
E. Potentiation of the bactericidal action of silver

20. An electrode made according to the scheme Red, Ox, H^+ | Pt belongs to the following type:
A. Complex redox electrode **B.** Ion-selective electrode **C.** Electrode of the second type **D.** Electrode of the first type **E.** Gas electrode

21. A micelle of some colloid surfactant will have the following structure in a certain solvent: polar groups are turned towards the solvent, while radicals are facing the micelle center. What is the solvent?
A. Water **B.** Toluene **C.** Benzene **D.** Tetrachloromethane **E.** Hydrogen sulfide

22. Enzymes are widely used as drugs in pharmacy. What is the main difference between enzymes and non-biological catalysts?
A. High specificity and selectivity **B.** High universality **C.** Low universality
D. High dispersion **E.** High homogeneity

23. Reaction rate constant values allow to draw conclusions regarding processes of synthesis of various drugs. What factor affects the reaction rate constant?
A. Temperature **B.** Pressure **C.** Volume **D.** Concentration **E.** Reaction time

24. When preparing a solution, an analytical pharmacist converted a freshly formed precipitate into a sol by treating it with an electrolyte solution. What method of obtaining disperse systems was used by the pharmacist?
A. Peptization **B.** Physical condensation **C.** Chemical condensation
D. Solvent exchange **E.** Condensation from steam

25. Blood contains erythrocytes sized 10^{-6} m as its constituent part. What type of disperse system is blood?
A. Microheterogeneous **B.** Homogeneous **C.** Coarse dispersion
D. Colloidal dispersion **E.** Heterogeneous

26. If the amount of a high-molecular substance added to the sol is very small, it may not increase but decrease its stability. This phenomenon is called:
A. Sensitizing **B.** Solubilization **C.** Mutual coagulation
D. Colloidal protection **E.** Sol adaptation

27. A drop of oil-water emulsion had been applied to a plate cowered with paraffin; no wetting was observed. Such phenomenon characterizes this emulsion as:
A. Direct **B.** Concentrated **C.** Diluted **D.** Stable **E.** Invert

28. Barium carbonate sol has been obtained by the reaction of excessive amount of barium chloride solution with ammonium carbonate solution. The micelle aggregate of obtained sol consists of the following microcrystals:

A. $BaCO_3$**B.** NH_4Cl **C.** $(NH_4)_2CO_3$**D.** $BaCl_2$**E.** Mixture of $BaCO_3$ and NH4Cl

29. Synthesis of a medicinal substance occurs in an isolated system. What is a direction criterion for the spontaneous processes?
A.Entropy change **B.**Gibbs energy **C.** Helmholtz energy
D. Intrinsic energy **E.**Enthalpy

30. Catalysts are widely used in production of drugs. How can acceleration of a reaction in the presence of a catalyst be explained?
A. Activation energy decreases **B.** Total collision frequency increases
C. Activation energy increases **D.** Collision frequency decreases **E.** Molecule speed increases

Exercise 3. Find synonyms of the following words in the tests:

influence		increase in size	
transform		need	
to experience something		purify	
be a part of		get	
Happen		remove	

Exercise 4. Fill the table with the missing parts of speech:

Noun	**Verb**	**Adjective**
Extraction		
Reduction		
Research		
Solvent		
Wetting		
Removal		
protection		
Point		

Exercise 5. Read the definitions and choose the proper term given in brackets:

Coagulation; colloid; dialysis; flocculation; potentiometric titration; reaction rate; surfactant; syneresis.

1. _____ – the speed at which reactants are converted into products in a chemical reaction.
2. _____ – a surface-active substance, such as a detergent or soap, that lowers the surface tension of a solvent (usually water).
3. _____ – the clumping of particles in order to settle out impurities; often induced by chemicals such as lime or alum.
4. _____ – the process of separating suspended solids from wastewater by chemical creation of a coagulated or flocculent masses.
5. _____ is a phase separated mixture in which one substance of microscopically dispersed insoluble or soluble particles is suspended throughout another substance.
6. _____ is a volumetric method in which the potential between two electrodes is measured (referent and indicator electrode) as a function of the added reagent volume.
7. _____ is the process of separating molecules in solution by the difference in their rates of diffusion through a semipermeable membrane.

8. _____ – the contraction of a gel accompanied by the exudation of liquid.

Exercise 6. Complete the abstract using the words and phrases below.

Colloidal; gel; mechanical; network; physically; polymer; precipitates; solvated .

_____ particles are usually _____, often to the extent of about one molecular layer, and this tightly bound solvent must be treated as a part of the particle. Sometimes much greater amounts of solvent can be immobilised by _____ entrapment within particle aggregates. This occurs when voluminous flocculent hydroxide _____ are formed. In solutions of long thread-like molecules the _____ chains may cross-link, chemically or _____, and/or become mechanically entangled to such an extent that a continuous three-dimensional network is formed. If all of the solvent becomes mechanically trapped and immobilised within this _____, the system as a whole takes on a solid appearance and is called a _____.

7.2. PHYSICAL AND COLLOIDAL CHEMISTRY

Part 2

Exercise 1. Active Vocabulary:

Noun	Verb	Adjective	Adverb
composition	assess	auxiliary	among
curve	build	coarse	positively
droplet	introduce	colourless	
interaction		cooling	
maldigestion		necessary	
parchment		osmotic	
purity		semipermeable	
response			
rotation			
surfactant			
venom			
volume			

Exercise 2. Read and translate the tests:

1. Choose the colloid surfactant among the substances listed below:
A. Polyethylene
B. Iodine
C. Sodium chloride
D. Gelatin
E. Potassium oleate

2. In snake venom there is a substance that causes erythrocyte hemolysis when it is introduced into a human organism. Blood test revealed a large amount of lysolecithin (lysophosphatidylcholine). What enzyme leads to accumulating lysolecithin in blood?
A. Phospholipase A2 **B.** Phospholipase A1 **C.** Phospholipase C **D**. Phospholipase D
E. Neuraminidase

3. Suspension is a form of pharmaceuticals used in medical practice. Which pair of substances is able to form suspension?
A. Ethanol-diethyl ether
B. Water-oil
C. Ethanol-ethyl acetate
D. Water-clay
E. Water-ethanol

4. Structure of proteins includes proteinogenic amino acids. What is the position of the amino group in the structure of these amino acids?
A. α-position **B.** β-position **C.** γ-position **D.** δ-position **E.** -position

5. Osmotic pressure is an important characteristic of biological fluids. Semipermeable membranes are necessary for penetration of solvent molecules. What substance **CANNOT be** used as a semi-permeable membrane?
A. Parchment
B. Biological membrane
C. Collodion film
D. Gelatine
E. Glass

6. Thermal analysis is used in pharmacy to identify drugs and determine drug purity. What coordinates are necessary to build a cooling curve?
A. Volume-temperature
B. Pressure-time
C. Temperature-volume
D. Temperature-time
E. Volume-time

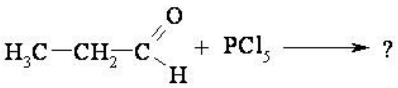
7. In the qualitative analysis which involves precipitation of sulphates of the third analytical group cations (Ca^{2+}, Sr^{2+}, Ba^{2+}) the solubility of sulphates can be reduced by adding:
A. Ethyl alcohol
B. Distilled water
C. Benzene
D. Chloroform
E. Amyl alcohol

8. Optical activity of monosaccharides can be explained by their:
A. Asymmetric carbon atoms in a molecule
B. Asymmetric crystal
C. Complicated rotation around σ-bond
D. Aldehyde or ketone group
E. Number of hydroxyl groups in a molecule

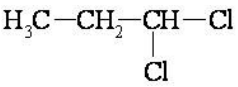
9. In terms of water-air interface, the following substance acts as a surface-active substance:
A. Valeric acid **B**. *HCl* **C.** *NaOH* ***D***.Urea E.-

10. Given the ability of iodine to dissolve in non-polar solvents, determine the type of chemical bond in an I_2 molecule:
A. Nonpolar covalent
B. Ionic
C. Polar covalent
D. Metal
E. Intermolecular interaction

11. What product results from propionic aldehyde and PCl_5 interaction?



A.



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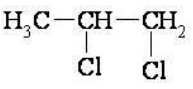
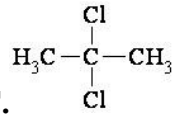
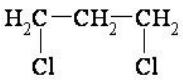


. C.



D.



E.

12. During assessment of air purity in an aseptic unit of a pharmacy, sedimentation analysis had been applied. Test resulted in growth of the small colonies with areas of hemolysis. What medium was used for inoculation?

A. Blood agar
B. Levine's formulation (Eosin Methylene Blue agar)
C. Endo agar
D. Ploskirev's agar
E. Egg-yolk salt agar

13. What enzyme allows for synthesis of various genes from template-RNA to DNA in genetic engineering (this enzyme catalyzes the process detected in RNA-viruses)?

A. Reverse transcriptase
B. Exonuclease
C. DNA-ligase
D. Helicase
E. Endonuclease

14. According to van't Hoff rule, when the temperature is raised by 10 degrees, the reaction rate increases by:

A. 2-4 times
B. 1,5 times
C. 5 times
D. 10 times
E. Temperature does not affect reaction rate

15. Specify the precipitating agent to be used in gravimetric determination of calcium salts:

A. $(NH_4)_2C_2O_4$
B. $K2C2O4$
C. $Na_2C_2O_4$
D. Na_2CO_3

E. K_2CO_3

16. Chromatin contains positively charged histone proteins. What amino acid is contained in histone proteins in large amounts?
A. Lysine
B. Alanine
C. Valine
D. Threonine
E. Serine

17. After application of chlorine-zinciodine to the thick colourless cell membranes of collenchyme they became violet. That means the membranes are:
A. Cellulose
B. Lignificated
C. Cutinized
D. Mineralized
E. Suberinized

18. Calomel electrode is listed in the State Pharmacopoeia of Ukraine as auxiliary electrode for pH measurement. What type of electrodes is it?
A. Second kind
B. First kind
C. Gas
D. Redox
E. Ion-selective

19. Dosage forms produced as coarse dispersion systems with the liquid dispersion medium and the solid phase are called:
A. Foam
B. Powder
C. Suspension
D. Emulsion
E. Aerosol

20. To identify a drug by thin-layer chromatography the following parameter is used:
A. R_f
B. n
C. E, mV
D. I, A
E. K_p

21. The primary structure of nucleic acids is a polynucleotide chain that has a certain composition and order of the nucleotides. What bonds stabilize this structure?
A.3’,5’-phosphodiester
B.Peptide

C.Glycosidic
D.Disulfide
E.Amide

22. A dry-heat box is used for sterilization of various materials and instruments in a bacteriological laboratory. This sterilization method can be applied to the following objects:
A. Glass test tubes
B. Rubber gloves
C. Simple nutrient medium
D. Wire inoculating loops
E. Physiological solution

23. In the process of silver cations identification reaction *HCl* and then ammonia solution have been added to the solution. What compound has been produced as a result?
A. $[\ g(N_3)_2]\ l$
B. $[\ g_2(N_3)_3]\ l$
C. g
D. $g\ l$
E. $[\ g(N_3)_3]\ l$

24. Microscopic study of soybean seeds stained with Sudan III revealed droplets of various sizes. They are:
A. Proteins
B. Starch
C. Inulin
D. Glycogen
E. Lipids

25. In a chemico-analytical laboratory a dispensing chemist studies the solution of anion mixture. When antipyrin solution is added to the solution, it becomes emerald-green in colour. This analytical effect signifies presence of the following anions:
A. Nitrite
B. Nitrate
C. Acetate
D. Tartrate
E. Citrate

26. Selective solvents are used in laboratories and factories to isolate and refine essential oils, alkaloids, antibiotics and other pharmaceutical substances. This process is called:
A. Extraction
B. Sedimentation
C. Coagulation
D. Flocculation
E. Flotation

27. Silver nitrate solution has been added to the solution containing anions of the first analytical group. It resulted in yellow precipitate. That means the following are present in the solution:
A. Arsenite ions
B. Arsenate ions
C. Sulphate ions
D. Iodide ions
E. Bromide ions

28. Inhibition of the synthesis of bile acids from cholesterol in liver of an experimental animals has caused maldigestion of lipids. What is the role of these acids in the enteral lipidic metabolism?
A. They emulsify dietary lipids
B. They keep balance of alkaline environment in the intestines
C. They participate in the synthesis of lipids
D. They are part of LDL
E. They activate the formation of chylomicrons

29. A patient with atherosclerosis has been prescribed Linaetholum containing essential fatty acids. Which of the following acids is an essential part of the preparation?
A. Linolenic **B.**Palmitic **C.**Crotonic **D.**Stearic **E.**Oleic

30. Aqueous solution of the following substance will have the smallest surface tension, if all the liste solutions are taken in the same concentration:
A. Sodium hydroxide
B. Ethanol
C. Sodium chloride
D. Sucrose
E. Sodium stearate

Exercise 3. Find synonyms of the following words in the tests:

Lack		Important	
environment		Coloured	
evaluation		Answer	
additional		lead to	
stomach		identification	

Exercise 4. Form Adjectives using the Nouns and Verbs given below.

Essence		allergy	
hyperemia		symmetry	
development		botany	
bacteria		provision	
Specify		culture	

Exercise 5. Read the definitions and choose the proper term given in brackets:

Chromatography; extraction; inoculation; monosaccharide; nutrient medium; ph scale; polynucleotide; sedimentation.

1. _____ – a substance, either solid or liquid, used for the cultivation, isolation, identification, or storage of microorganisms.
2. _____ – a biopolymer comprised of a long, linear series of nucleotides joined together by ester linkages between the phosphoryl group of nucleotide and the hydroxyl group of the sugar component of the next nucleotide.
3. _____ – the act of introducing microorganism or suspension of microorganisms (e.g. bacteria) into a culture medium.
4. _____ – the range of values from 0 to 14 that describes the acidity or basicity of a solution.
5. _____ is a separation process consisting in the separation of a substance from a matrix.
6. _____ – technique of separating molecules or components in a mixture according to the differential absorption and elution.
7. _____ – the deposition of suspended matter carried by water, wastewater, or other liquids, by gravity.
8. _____ – a carbohydrate that does not hydrolyze, as glucose, fructose, or ribose, occurring naturally or obtained by the hydrolysis of glycosides or polysaccharides.

Exercise 6. Complete the abstract using the words and phrases below.

Average; colloidal; molecular; molecules; monodispersed; particle; polydispersed; relative.

The terms *relative* _____ *mass* and *particle size* can only have well-defined meanings when the system under consideration is _____ - i.e. when the molecules or particles are all alike. _____ systems are generally of a _____ nature - i.e. the molecules or particles in a particular sample vary in size. By virtue of their stepwise build-up, colloidal particle and polymer molecular sizes tend to have skew distributions, as illustrated in Figure 1.2, for which the Poisson distribution often offers a good approximation. Very often, detailed determination of _____ molecular mass or _____ size distribution is impracticable and less perfect experimental methods, which yield average values, must be accepted. The significance of the word _____ depends on the relative contributions of the various _____ or particles to the property of the system which is being measured.

8.1. MICROBIOLOGY
Part 1

Exercise 1. Active Vocabulary.

NOUNS	VERBS	ADJECTIVES	ADVERBS
cytotoxicity	invade	coccoid	asexually
fission	reproduce	hematogenous	
host	transmit	inapparent	
incubation		motile	
pathogenicity		nonmotile	
species		resistant	
virulence		subcellular	
		transverse	
		ultramicroscopic	

Exercise 2. Read the text. Answer the questions to the text.

PATHOGENS

Infectious diseases are caused by subcellular infectious entities (prions, viruses), prokaryotic bacteria, eukaryotic fungi and protozoans, metazoan animals, such as parasitic worms (helminthes), and some arthropods.

Subcellular Infectious Entities

- ***Prions (proteinaceous infectious particles).*** The evidence indicates that prions are protein molecules that cause degenerative central nervous system (CNS) diseases such as Creutzfeldt-Jakob disease, kuru, scrapie in sheep, and bovine spongiform encephalopathy (BSE) (general term: transmissible spongiform encephalopathies [TSE]).
- ***Viruses.*** Ultramicroscopic, obligate intracellular parasites that: — contain only one type of nucleic acid, either DNA or RNA, — possess no enzymatic energy-producing system and no protein-synthesizing apparatus, and — force infected host cells to synthesize virus particles.

Prokaryotic and Eukaryotic Microorganisms

The world of living things is classified in the three domains: Bacteria, Archaea, and Eukaryota or Eukarya (Archaea were initially classified as bacteria, receiving the name **archaebacteria** (in the Archaebacteria kingdom), but this classification is outmoded). In this system, each domain is subdivided into kingdoms. Pathogenic microorganisms are found in the domains Bacteria and Eucarya.

The main differences between prokaryotic (bacteria and archaea) and eukaryotic pathogens.

Characteristic	Prokaryotes (bacteria)	Eukaryotes (fungi, protozoans)
Nuclear structure	Circular DNA molecule not covered with proteins	Complex of DNA and basic proteins
Localization of nuclear structure	Dense tangle of DNA in cytoplasm; no nuclear membrane; nucleoid or nuclear equivalent	In nucleus surrounded by nuclear membrane
DNA	Nucleoid and plasmids	In nucleus and in mitochondria

Cytoplasm	No mitochondria and no endoplasmic reticulum, 70S ribosomes	Mitochondria and endoplasmic reticulum, 80S ribosomes
Cell wall	Usually rigid wall with murein layer; exception: mycoplasmas	Present only in fungi: glucans, mannans, chitin, chitosan, cellulose
Reproduction	Asexual, by binary transverse fission	In most cases sexual, possibly asexual

Bacteria

- ***Classic bacteria***. These organisms reproduce asexually by binary transverse fission. They do not possess the nucleus typical of eucarya. The cell walls of these organisms are rigid (with some exceptions, e.g., the mycoplasma).
- ***Chlamydiae***. These organisms are obligate intracellular parasites that are able to reproduce in certain human cells only and are found in two stages: the infectious, nonreproductive particles called elementary bodies (0.3 lm) and the noninfectious, intracytoplasmic, reproductive forms known as initial (or reticulate) bodies (1 lm).
- ***Rickettsiae***. These organisms are obligate intracellular parasites, rod-shaped to coccoid, that reproduce by binary transverse fission. The diameter of the individual cell is from 0.3–1 lm.
- ***Mycoplasmas.*** Mycoplasmas are bacteria without rigid cell walls. They are found in a wide variety of forms, the most common being the coccoid cell (0.3–0.8 lm). Thread-like forms also occur in various lengths.

Fungi and Protozoa

- ***Fungi.*** Fungi (Mycophyta) are nonmotile eukaryotes with rigid cell walls and a classic cell nucleus. They contain no photosynthetic pigments and are carbon heterotrophic, that is, they utilize various organic nutrient substrates (in contrast to carbon autotrophic plants). Of more than 50 000 fungal species, only about 300 are known to be human pathogens. Most fungal infections occur as a result of weakened host immune defenses.
- ***Protozoa.*** Protozoa are microorganisms in various sizes and forms that may be free-living or parasitic. They possess a nucleus containing chromosomes and organelles such as mitochondria (lacking in some cases), an endoplasmic reticulum, pseudopods, flagella, cilia, kinetoplasts, etc. Many parasitic protozoa are transmitted by arthropods, whereby multiplication and transformation into the infectious stage take place in the vector

Animals

- ***Helminthes.*** Parasitic worms belong to the animal kingdom. These are metazoan organisms with highly differentiated structures. Medically significant groups include the trematodes (flukes or flatworms), cestodes (tapeworms), and nematodes (roundworms).
- ***Arthropods.*** These animals are characterized by the external chitin skeleton, segmented bodies, jointed legs, special mouthparts, and other specific features. Their role as direct causative agents of diseases is a minor one (mites, for instance, cause scabies) as compared to their role as vectors transmitting viruses, bacteria, protozoa, and helminths.

Host–Pathogen Interactions

The factors determining the genesis, clinical picture and outcome of an infection include complex relationships between the host and invading organisms that differ widely depending on the pathogen involved. Despite this variability, a number of general principles apply to the interactions between the invading pathogen with its aggression factors and the host with its defenses. Since the pathogenesis of bacterial infectious diseases has been researched very thoroughly, the following summary is based on the host–invader interactions seen in this type of infection.

The determinants of ***bacterial pathogenicity and virulence*** can be outlined as follows:

- Adhesion to host cells (***adhesins***).
- Breaching of host anatomical barriers (***invasins***) and colonization of tissues (***aggressins***).
- Strategies to overcome nonspecific defenses, especially antiphagocytic mechanisms (***impedins***).
- Strategies to overcome specific immunity, the most important of which is production of IgA proteases (***impedins***), molecular mimicry, and immunogen variability.
- Damage to host tissues due to direct bacterial cytotoxicity, exotoxins, and exoenzymes (***aggressins***).
- Damage due to inflammatory reactions in the macroorganism: activation of complement and phagocytosis; induction of cytokine production (***modulins***).

The above bacterial pathogenicity factors are confronted by the following host defense mechanisms:

- ***Nonspecific defenses*** including mechanical, humoral, and cellular systems. Phagocytosis is the most important process in this context.
- ***Specific immune responses*** based on antibodies and specific reactions of T lymphocytes.

The response of these defenses to infection thus involves the correlation of a number of different mechanisms. Defective defenses make it easier for an infection to take hold. Primary, innate defects are rare, whereas acquired, secondary immune defects occur frequently, paving the way for infections by microorganisms known as "facultative pathogens" (opportunists).

The terms ***pathogenicity*** and ***virulence*** are not clearly defined in their relevance to microorganisms. They are sometimes even used synonymously. It has been proposed that pathogenicity be used to characterize a particular species and that virulence be used to describe the sum of the disease-causing properties of a population (strain) of a pathogenic species. Pathogenicity and virulence in the microorganism correspond to ***susceptibility*** in a host species and ***disposition*** in a specific host organism, whereby an individual may be anywhere from highly disposed to resistant.

Exercise 3. Answer the questions.

1) What kinds of subcellular infectious entities are there?
2) What group of diseases can prions cause?
3) What does the abbreviation *TSE* mean?
4) What are viruses characterized by?
5) How do eukaryotes and prokaryotes differ in their nuclear structure?
6) What is the difference between the cytoplasm of eukaryotes and that of prokaryotes?
7) How do eukaryotes and prokaryotes reproduce?
8) What are the main groups of bacteria?
9) What are *Classic bacteria* characterized by?
10) What are *Chlamydiae* characterized by?
11) What are *Rickettsiae* characterized by?
12) What are *Mycoplasmas* characterized by?
13) Which microorganisms have no photosynthetic pigments and are carbon heterotrophic?
14) What are the morphological features of *Protozoa*?
15) What human pathogens belong to the animal kingdom?
16) Which types of helminthes are medically significant?
17) What does host non-specific defense mechanism include?
18) What are specific immune responses based on?
19) What do *pathogenicity* and *virulence* mean?

Exercise 4. Explain the following words and word-combinations.

Metazoan animals; arthropods; encephalopathy; obligate intracellular parasites; 80S ribosome; transmissible; bacterial pathogenicity; cytotoxicity; phagocytosis; nonmotile eukaryotes; facultative pathogens; susceptibility; strain

Exercise 5. Match the terms to the definitions

a) Basic Infectiological Terminology (Pathogen)

Term	Explanation
a) Saprophytes	1) Classic disease-causing pathogens
b) Parasites	2) Smallest number of pathogens sufficient to cause an infection
c) Commensals	3) Can cause disease in immune-compromised individuals; these are frequently germs of the normal flora or occasionally from the surrounding environment, animals, or other germ carriers
d) Pathogenic microorganisms	4) Unicellular or metazoan organism living in or on an organism of another species (host) on the expense of the host Classic disease-causing pathogens
e) Opportunists or facultatively pathogenic microorganisms	5) Normal inhabitants of skin and mucosa; the normal flora is thus the total commensal population
f) Pathogenicity	6) The totality of host species "susceptible" to infection by a given pathogen
g) Virulence	7) Method or pathway used by pathogen to invade host
h) Incubation period	8) A parasitological term: time between infection and first appearance of products of sexual reproduction of the pathogen (e.g., worm eggs in stool of a host with helminthosis)
i) Prepatency	9) Sum of the disease-causing properties of a strain of a pathogenic species
j) Infection spectrum	10) Time between infection and manifestation of disease symptoms; this specific disease characteristic can be measured in hours, days, weeks, or even years
k) Minimum infective dose	11) These microorganisms are nonpathogenic; their natural habitat is dead organic matter
l) Mode of infection	12) Capacity of a pathogen species to cause disease

b) Basic Infectiological Terminology (Host)

Term	Explanation
a) Contamination	1) Infection arising from invasion of host by microorganisms from sources external to it
b) Colonization	2) Infection that remains restricted to the portal of entry and surrounding area
c) Infection	3) Brief presence of microorganisms in the bloodstream
d) Inapparent (or subclinical) infection	4) Lymphogenous and/or hematogenous spread of invading pathogen starting from the portal of entry; infection of organs to which pathogen shows a specific affinity

	(organotropism); three stages: incubation, generalization, organ manifestation
e) Infectious disease (or clinical infection)	5) Occurrence of a second infection in the course of a first infection
f) Probability of manifestation	6) Series of infections by different pathogens
g) Endogenous infection	7) Series of infections by the same pathogen
h) Exogenous infection	8) Frequency of clinical manifestation of an infection in disposed individuals (%)
i) Nosocomial infection	9) Infection acquired during hospitalization (urinary tract infections, infections of the respiratory organs, wound infection, sepsis)
j) Local infection	10) Infection arising from the colonizing flora
k) Generalized infection	11) Infection without outbreak of clinical symptoms
l) Sepsis	12) Systemic disease caused by microorganisms and/or their toxic products; there is often a localized focus of infection from which pathogens or toxic products enter the bloodstream continuously or in intermittent phases
m) Transitory bacteremia/ viremia/parasitemia	13) Infection with outbreak of clinical symptoms
n) Superinfection	14) Presence of microorganisms on skin or mucosa; no penetration into tissues; typical of normal flora; pathogenic microorganisms occasionally also show colonization behavior
o) Relapses	15) Invasion of a host organism by microorganisms, proliferation of the invading organisms, and host reaction
p) Reinfection	16) Microbiological presence of microorganisms on objects, in the environment, or in samples for analysis

Exercise 6. In Exercise 4, find synonyms to the words/word combinations below.
Similarity, harmless, virulent, asymptomatic, outer, specimen, temporary, onset, feces, poisonous, likelihood, discontinuous, recurrence

Exercise 7. True or false? Correct false statements.
1) Reinfections can be defined as those occurring within 48 hours of hospital admission, 3 days of discharge or 30 days of an operation. They affect 1 in 10 patients admitted to hospital.
2) Superinfections are illnesses that occur more frequently and are more severe in people with HIV.
3) Commensalism is a relationship between individuals of two species in which one species obtains food or other benefits from the other without either harming or benefiting the latter.
4) In transient bacteremia, bacteria, viruses or parasites are present in the bloodstream for minutes to a few hours before being cleared from the body, and the result is typically harmless in healthy people.
5) Prepatency is the period between infection with a parasite and the demonstration of the parasite in the body especially as determined by the recovery of an infective form (as oocysts or eggs) from the blood or feces

Exercise 8. Complete the table with correct Plural/Singular forms.

Singular	Plural

	bacteria
bacillus	
(culture) medium	
alga	
	species
spirillum	
nucleus	
	cocci
	chlamydiae
Analysis	
	rickettsiae
focus	
flagellum	
	fungi
	cilia
mitochondrion	
clostridium	

Exercise 9. Give the synonyms to the terms and expressions below (you may use the text and exercises above).

hospital-acquired infection (HAI)
asymptomatic infections
trematodes
nematodes
cestodes
patients with weakened immune system
direct contact infection
epidemic parotitis
Hansen's disease (HD)

(immune-compromised patients, whooping cough, roundworms, weakened patients, leprosy, nosocomial infection, subclinical infection , flatworms, smear infection, tapeworms, mumps)

Exercise 10. Read the text below. Use the word given in brackets to form a word that fits in the gap.

Specific Immune Defenses

The specific, adaptive … *(immunity)* defenses include both the humoral system (antibody- … *(produce)* B cells) and the cellular system (T helper cells and … *(cytotoxicity)* T lymphocytes). In general, viruses the antigens of which are expressed on the surface of the … *(infection)* cells tend to induce a cellular immune response and viruses that do not change the … *(antigen)* of their host cells tend to …*(activation)* the humoral system.

Humoral immunity. Antibodies can only attack viruses outside of their host cells, which means that once an infection is … *(establishment)* within an organ it can hardly be further influenced by antibodies, since the viruses spread … *(direct)* from cell to cell. In principle, the humoral immune system is thus only capable of … *(prevent)* a … *(general)* infection, but only if the antibodies are … *(presence)* at an early stage (e.g., induced by … *(vaccinate).* Class IgG and IgM antibodies are active in the bloodstream and class IgA is active on the mucosal surface. The … *(effectiveness)* of the antibodies on the viral particles ("neutralization") is based on steric hindrance of virus adsorption to the host cells by the

antibodies … *(attachment)* to their surfaces. The … *(neutralize)* effect of antibodies is strongest when they react with the receptor-binding sites on the capsids so as to block them, rendering the virus … *(incapability)* of combining with the cellular receptors.

Cellular immunity. This type of immune … *(defend)* is far more important when it comes to fighting viral infections. T lymphocytes (killer cells) recognize virus- … *(infectious)* cells by the viral antigens on their surfaces and … *(destruction)* them. The … *(observe)* that patients with defective humoral … *(immune)* generally fare better with virus infections than those with a defective cellular … *(responsibility)* underlines the fact that the cellular immune defense system is the more … *(importance)* of the two.

8.2. MICROBIOLOGY
Part 2

Exercise 1. Active Vocabulary.

NOUNS	VERBS	ADJECTIVES	ADVERBS
assay	infest	arcuate	previously
feces	inoculate	curved	provisionally
leprosy	specify	immature	
medium	stain	lumpy	
plague		monotrichous	
precursor		ovoid	
protozoa		raw	
rodent		rod-shaped	
staining		stillborn	

Exercise 2. TESTS

1. From the feces of a patient with acute gastroenteritis a pure culture of microorganisms was obtained. The microorganisms are small mobile slightly curved gram-negative bacilli that within 6 hours grow into a light blue film on the 1% alkaline peptone water. Such properties are characteristic of the following microorganism:

A Vibrio **B** Spirochaete **C** Clostridium **D** Bacillus **E** Spirillum

2. A patient was brought into the infectious diseases hospital on the 8th day after the disease onset. The patient complains of headache, malaise, and weakness. A sample of blood was taken for the serological test. Widal agglutination test results with blood sample diluted 1:200 and typhoid fever O-diagnosticum were positive. What diagnosis can be made based on the results of this test?

A Dysentery **B** Typhoid fever **C** Cholera **D** Leptospirosis **E** Tuberculosis

3. A patient presented with indigestion, stomachaches, and excessive salivation. Similar symptoms had already been observed in this patient previously. Laboratory analysis detected oval eggs covered with lumpy capsules in the patient's feces. What is the most likely cause of the patient's disorder?

A Enterobiasis
B Trichocephaliasis
C Diphyllobothriasis
D Ascariasis
E Fascioliasis

4. In a township there was registered an outbreak of hepatitis, which had supposedly spread through the water supply. What hepatitis virus could be the cause of the outbreak in this township?

A Hepatitis B virus
B Hepatitis C virus
C Hepatitis D virus
D Hepatitis G virus
E Hepatitis E virus

5. A medical student was hospitalized into the infectious diseases unit on the 2nd day after the disease onset; the patient is suspected to have infectious mononucleosis. What results of laboratory analysis can confirm this diagnosis immediately on the day of the hospitalization?

A Herpes virus was isolated
B IgM antibodies to herpes simplex virus were detected
C Fourfold increase in number of antibodies to Epstein-Barr virus was detected
D IgM antibodies to Epstein-Barr virus were detected
E Cytomegalovirus antibodies were detected

6. A 40-year-old man developed skin redness and swelling in the neck area, where eventually a small abscess appeared. On section the focus is dense and yellow-green colored. In the purulent masses there are white granules. Histologically there are fungal druses, plasma and xanthome cells, and macrophages detected. Specify the most correct etiological name of this pathological process:

A Actinomycosis **B** Furuncle **C** Carbuncle **D** Syphilis **E** Leprosy

7. A patient was hospitalized into the infectious diseases unit on the 11th day since the disease onset and provisionally diagnosed with typhoid fever. What biological material should be collected from the patient for the analyses at this stage?

ABlood serum **B** Urine **C** Feces **D** Bile **E** Roseola secretion

8. General structure of eukaryotic genes is as follows: exon-intron-exon. Such functional structure of a gene leads to certain specifics of the transcription process. What sequence will correspond with precursor mRNA (immature)?

A Intron-exon
B Exon-exon-intron
C Exon-exon
D Exon-intron-exon
E Exon-intron

9. A patient with clinical signs of a primary immunodeficiency has functionally disturbed mechanism of antigen-presentation to the immunocompetent cells. What cells are likely to have structural defects?

A T-lymphocyte
B Macrophages, monocytes
C B-lymphocyte
D Fibroblasts
E O-lymphocytes

10. A toxin neutralized with 0.4% formaldehyde under 37-40oC for 4 weeks is used for vaccination. This preparation was first used by Gaston Ramon for diphtheria prevention. Name this preparation:

A Antitoxic serum
B Immunoglobulin
C Anatoxin
D Adjuvant
E Inactivated vaccine

11. Sanitary bacteriological research on water by the membrane filter method revealed two red colonies on a membrane filter (Endo agar) through which 500 ml of analyzed water were passed. Calculate the coli index and coli titer of the analyzed water:

A 4 and 250 **B** 2 and 500 **C** 500 and 2 **D** 250 and 2 **E** 250 and 4

12. While examining a patient, an otolaryngologist noticed hyperaemia and significantly edematous tonsils with a grayish film upon them. Microscopical examination of this film revealed some gram-positive bacilli placed at an angle with each other. What disease might be suspected?

A Diphtheria
B Meningococcal nasopharyngitis
C Epidemic parotitis
D Angina
E Scarlet fever

13. Patient with vomiting, dizziness, sensation of dubble vision, difficult swallowing was admitted to the hospital. Doctor suspects botulism. What diagnostic methods should be used for diagnosis approving?

A -
B Bacteriological, mycological
C Biological test, bacteriological
D Protozoological, microscopical
E Allergic test, serological

14. A patient has an open pulmonary form of disease. What sputum staining should be selected for finding out the tubercle (Koch's) bacillus?

A Method of Burry-Gins
B Method of Ziel-Neelsen
C Method of Gram
D Method of Romanowsky-Giemsa
E Method of Neisser

15. During surgical operation a blood transfusion was performed. The blood must be checked to find antigens of some disease. What disease is expected to be found?

A Virus of hepatitis A
B Virus of hepatitis E
C Adenovirus
D Virus of hepatitis B
E Enterovirus

16. What diagnostic method should be used in industry to test the raw leather for presence of B. anthracis?

A Serological test
B Microscopy with Burry-Gins stain
C Microscopy with Aujeszky stain
Bacteriological analysis
E Ascoli's thermo precipitation test

17. During influenza epidemic, morbidity in the schoolchildren, who did not participate in sports, was 40%, while in the schoolchildren, who engaged in regular physical activities, morbidity did not exceed 20%. What adaptation mechanism ensured low morbidity in the physically active schoolchildren?

A Cross-adaptation
B Specific adaptation

C Physiological adaptation
D Biochemical adaptation
E Genetic adaptation

18. A 5-year-old child is diagnosed with Bruton syndrome (X-linked agammaglobulinemia) that manifests itself as severe clinical course of bacterial infections and absence of B lymphocytes and plasma cells. What changes of immunoglobulin content can be observed in blood serum of the child with immunodeficiency?

A Decreased IgA, IgM
B Increased IgA, IgM
C Decreased IgD, IgE
D Increased IgD, IgE
E No changes

19. During the skill-building session in microbiology the students need to stain the prepared and fixed sputum smears obtained from a tuberculosis patient. What staining technique should be used in this case?

A Gram **B** Burry **C** Giemsa **D** Gins **E** Ziehl-Neelsen

20. First-year schoolchildren have received tuberculin skin test (Mantoux test) at the school nurse's office. The purpose of this test was:

A To determine the children that need to receive BCG vaccination
B To preventively vaccinate against tuberculosis
C To measure immunity stress toward diphtheria
D To measure allergization rate toward rickettsia
E To detect parotitis in the schoolchildren

21. Various biological preparations can be used for poliomyelitis prevention. What drug induces the type of local intestinal mucosal immunity that lasts the longest?

A Parenteral vaccination with inactivated vaccine
B Oral vaccination with live vaccine
C Oral introduction of poliovirus-specific immunoglobulin
D Parenteral vaccination with live vaccine
E Parenteral introduction of normal human immunoglobulin

22. Sanitary assessment of a pond, where the children from a recreation summer camp take their swims, detected there oval cysts 50-60 micron in diameter, with 2 nuclei visible in their cytoplasm (macronucleus and micronucleus). What protozoa do these cysts belong to?

A Amoeba **B** Lamblia **C** Toxoplasma **D** Balantidium **E** Euglena

23. A 40-year-old woman was diagnosed with glomerulonephritis based on her clinical symptoms and the results of urine analysis. Anamnesis states chronic tonsillitis. What microorganisms are the most likely cause for her kidney damage?

A Streptococci **B** Staphylococci **C** Escherichia **D** Mycoplasma **E** Meningococci

24. Preventive vaccination against poliomyelitis is made with inactivated vaccine introduced parenterally. What immunoglobulins create the postvaccinal immunity in this case?

A IgM, IgG
B IgG, secretory IgA
C IgM, secretory IgA
D Serum ^A, IgM
E IgJ, IgM

25. A 6-year-old child with suspected active tuberculous process has undergone diagnostic Mantoux test. What immunobiological preparation was injected?

A Tularinum **B** BCG vaccine **C** DTP vaccine **D** Tuberculin **E** Td vaccine

26. A bacteriological laboratory has been investigating a sample of homemade dried fish that was the cause of severe food poisoning. Microscopy of the culture inoculated in Kitt-Tarozzi medium revealed microorganisms resembling a tennis racket. What diagnosis can be made?

ABotulism **B** Salmonellosis **C** Cholera **D** Dysentery **E** Typhoid fever

27. Initial inoculation of water in 1% peptone water resulted in growth of a thin film on the medium surface in 6 hours. Such cultural properties are characteristic of causative agent of the following disease:

ACholera **B** Plague **C** Tuberculosis **D** Dysentery **E** Pseudotuberculosis

28. Stool culture test of a 6-month-old bottlefed baby revealed a strain of intestinal rod-shaped bacteria of antigen structure 0-111. What diagnosis can be made?

A Food poisoning
B Gastroenteritis
C Choleriform disease
D Colienteritis
E Dysentery-like disease

29. Immune-enzyme assay has detected HBs antigen in blood serum. What disease is it characteristic of?

A Viral hepatitis type A
B Viral hepatitis type B
C AID
D Tuberculosis
E Syphilis

30. A woman gave birth to a stillborn baby with numerous malformations. What protozoan disease could cause intrauterine death?

AToxoplasmosis **B** Leishmaniasis **C** Malaria **D** Amebiasis **E** Lambliasis

31. A patient has been hospitalised with provisional diagnosis of virus B hepatitis. Serological reaction based on complementation of antigen with antibody chemically bound to peroxidase or alkaline phosphatase was used for disease diagnostics. What is the name of the applied serological reaction?

A Bordet-Gengou test
B Radioimmunoassa
C Immunofluorescence test

D Immune-enzyme analysis
E Antigen-binding assay

32. A patient working at a pig farm complains of paroxysmal abdominal pain, liquid feces with mucus and blood, headache, weakness, fever. Examination of large intestine revealed ulcers from 1 mm up to several cm in diameter, feces contained oval unicellular organisms with cilia. What disease can be suspected?
A Amebiasis
B Balantidiasis
C Toxoplasmosis
D Lambliasis
E Trichomoniasis

33. In one of Polessia regions there was an outbreak of helminthiasis manifested by cramps and facial edemas. The developed preventive measures in particular included ban for eating infested pork even after heat processing. What helminthiasis was the case?
A Trichinosis
B Taeniarhynchosis
C Teniasis
D Echinococcosis
E Alveococcosis

34. A man is suffering from diarrhea. In summer he spent his vacation in the south at the sea coast. Bacteria with the following properties were detected in his feces: gram-negative curved mobile monotrichous bacilli that do not produce spores or capsules. Bacilli are undemanding to nutrient medium but require alkaline reaction (pH 8,59,5). Described are the agents of the following enteric infection:
A Cholera
B Shigellosis
C Typhoid fever
D Colienteritis
E Pseudotuberculosis

35. Impression smear of mucosa biopsy material has been obtained from a patient with peptic ulcer disease of the stomach. Gram-negative arcuate bent microorganisms were detected, urease activity test was positive. What microorganisms were detected in the patient?
A Spirilla **B** Spirochete **C** Helicobacter **D** Leptospira **E** Treponema

36. A patient with probable liver abscess was delivered to a surgical department. The patient for a long time had been on an assignment in an African country and had recurrent cases of acute gastrointestinal disturbance. What protozoan disease can it be?

A Malaria **B** Trypanosomiasis **C** Leishmaniasis **D** Amebiasis **E** Toxoplasmosis

37. Mass mortality of rodents was observed in one of the mountain villages. Simultaneously there occurred a disease outbreak in the local population. The disease manifested by rapidly progressive fever up to 40°C, marked intoxication, and enlargement of inguinal lymph nodes. Smear preparations made from autopsy specimens contained gram-negative ovoid bacilli with bipolar staining. What microorganism is the causative agent of this disease?

A Yersinia pestis
B Staphylococcus
C Francisella tularensis
D Bacillus anthracis
E Clostridia

38. Patients with similar complaints applied to the doctor: weakness, pain in the intestines, GIT disorder. Examination of the faeces revealed that one patient with four nucleus cysts should be hospitalized immediately. What protozoa are such cysts typical for?
A Intestinalamoeba
B Dysenteric amoeba
C Balantidium
D Trichomonas
E Lamblia

39. A female patient consulted a physician about digestive disorder, extended abdominal pain. Examination revealed drastic decrease in hemoglobin concentration. It is known from the anamnesis that while living in the Far East the patient used to eat freshly-salted caviar. Some relatives living with her had the similar condition. What is the most likely diagnosis?
A Diphyllobothriasis
B Echinococcosis
C Teniasis
D Trichiniasis
E Ascaridiasis

40. Serological diagnostics of infectious diseases is based upon specific interaction with antigenes. Specify the serological reaction that underlies adhesion of microorganisms when they are affected by specific antibodies in presence of an electrolyte:
A Agglutination reaction
B Precipitation reaction
C Complement-binding reaction
D Hemadsorption reaction
E Neutralization reaction

Exercise 3. Match the terms to their definitions.

1. Fermentation	**A)** is a taxonomic category ranking used in biological classification that is below family and above species
2. Bacillus	**B)** is a relatively rare bacterial infection that affects people and animals. It can pass from animals to humans when an unhealed break in the skin comes in contact with water or soil where animal urine is present.
3. Agar	**C)** is the process in which a substance breaks down into a simpler substance. Microorganisms like yeast and bacteria usually play a role in this process.
4. Leptospirosis	**D)** is a specialized defense protein synthesized by the vertebrate immune system.
5. Genus	**E)** is any of a genus of rod-shaped gram-positive usually aerobic bacteria producing endospores and including many saprophytes and some parasites.

6. Antibody	**F)** is a dried hydrophilic, colloidal substance extracted from various species of red algae. It is used in cultures for bacteria and other microorganisms, in making emulsions, and as a supporting medium in procedures such as immunodiffusion and electrophoresis.
7. Chancre	**G)** potentially life-threatening invasion of the bloodstream by pathogenic agents and especially bacteria along with their toxins from a localized infection (as of the lungs or skin) that is accompanied by acute systemic illness.
8. Septicemia	**H)** is the first sign of syphilis; it is a small, painless sore. It can appear on the sexual organs, rectum, or inside the mouth.

Exercise 4. Match the diseases to the causative agents (or the type of infectious agents).

anthrax	*Shigella or Entamoeba histolytica*
plague	*Streptococcus pyogenes*
cholera	*Bacillus*
typhoid fever	*Clostridium*
leprosy	*Yersinia pestis*
dysentery	*Salmonella enterica*
scarlet fever	*Plasmodium*
botulism	*Treponema pallidum*
malaria	*Virus*
syphilis	*Vibrio*
mumps	*Mycobacterium*

Exercise 5. Match the words with the similar meaning.

specimen	analysis
curved	swallowing
assay	bacilliform
impregnate	sample
motility	identify
rod-shaped	egg-shaped
filament	bent
specify	soak
ovoid	crease
fold	fiber
deglutition	mobility

Exercise 6. Complete each sentence with the correct ending from box B

A	**B**
1) Mycobacteria are slender rod bacteria that are stained …	1) … remain clinically silent.
2) Ninety percent of primary infection foci …	2) … on the skin, mucosa, and peripheral nerves
3) Humans show a considerable degree …	3) … atypical mycobacteria (old designation), nontuberculous mycobacteria (NTM) or MOTT (mycobacteria other than

	tubercle bacilli).
4) Diagnosis requires microscopic and cultural identification …	4) … with special differential stains (Ziehl-Neelsen).
5) Leprosy is manifested mainly …	5) … of genetically determined resistance to TB.
6) Mycobacteria that are neither tuberculosis nor leprosy bacteria are categorized as …	6) … a purulent conjunctivitis, seen mainly in newborn children.
7) Gonococci are Gram-negative, coffee-bean-shaped cocci …	7) of the pathogen or pathogen-specific DNA.
8) Gonococci reaching the conjunctival membrane may cause …	8) … by smear infection or indirect via food and drinking water.
9) Species with many flagella (e.g., Proteus species) show motility …	9) that are usually paired and have a diameter of approximately 1 lm.
10) Transmission is either direct …	10) … on the agar surface.

Exercise 7. Write the sentences in the Passive.

1) In 1890 the German physician and bacteriologist Robert Koch formulated four criteria for establishing a causative relationship between a microbe and a disease.
2) In active immunization, administration of vaccines stimulates the immune system to develop a disease-specific immunity.
3) The term *asepsis* covers all measures aiming to prevent contamination of objects or wounds.
4) The temperature coefficient describes the influence of temperature on the effectiveness of chemical agents.
5) When heat kills microorganisms, their proteins (enzymes) are irreversibly denatured.
6) Laboratory analysis detected oval eggs covered with lumpy capsules in the patient's feces.
7) Gaston Ramon first used this preparation for diphtheria prevention.
8) Manufactures should use Ascoli's thermo precipitation test to test the raw leather for presence of B. anthracis.
9) What protozoan disease could cause intrauterine death?
10) Microscopy of the culture inoculated in Kitt-Tarozzi medium revealed microorganisms resembling a tennis racket.
11) Immunological processes can also influence the course of viral infections.
12) A number of substances can induce the production of interferon in a cell, for example, double-stranded RNA, synthetic or natural polynucleotides, bacteria, various low-molecular compounds and, above all, viruses.

8.3. MICRIBIOLOGY
Part 3

Exercise 1. Active Vocabulary.

NOUNS	VERBS	ADJECTIVES	ADVERBS
bean-shaped	impregnate	caseous	irregularly
broth	moisten	clublike	radially
bug		elongated	
fly		fusiform	
inoculum		pyriform	
scabies		porrect	
scraping		strip-like	
sediment		undulating	
thickening		vermiform	
tick			
turbidity			

Exercise 2. TESTS

1. The immunoblot detected gp120 protein in the blood serum. This protein is typical for the following disease:

A Syphilis
B Virus B hepatitis
C Tuberculosis
D HIV-infection
E Poliomyelitis

2. In order to determine toxigenicity of diphtheria bacilli a strip of filter paper impregnated with antitoxic diphtherial serum was put on the dense nutrient medium. There were also inoculated a microbial culture under examination and a strain that is known to be toxigenic. If the microbial culture under examination produces exotoxin, this will result in formation of:

A Precipitin lines
B Haemolysis zones
C Zones of diffuse opacification
D Zones of lecithovitellinous activity
E Precipitin ring

3. Examination of patients with periodontitis revealed the interdependence between the rate of affection of periodontal tissues and the amount of lysozyme in saliva and gingival liquid. These results can be obtained during studying the following protection system of an organism:

A Non-specific resistance
B Humoral immunity
C Cellular immunity
D Autoresponsiveness
E Tolerance

4. A patient complains of skin itch, especially between fingers, in the inguinal creases, on the lower abdomen. Examination of these regions revealed there some small vesicles. Laboratory diagnostics allowed to establish that this condition had been caused by a representative of Arthropoda. Specify the disease caused by this arthropod:

A Myiasis
B Demodicosis
C Scabies
D Pediculosis
E Dermatotropic leishmaniasis

5. A 71 year old man had been presenting with diarrhea for 10 days. The feces had admixtures of blood and mucus. He was delivered to a hospital in grave condition and died 2 days later. Autopsy of the body revealed the following: diphtheritic colitis with multiple irregularly-shaped ulcers of different depth in both sigmoid colon and rectus. Bacteriological analysis revealed Shigella. What was the main disease?

A Yersiniosis
B Typhoid fever
C Salmonellosis
D Nonspecific ulcerous colitis
E Dysentery

6. There was a record of some anthrax cases among animals in a countryside. The spread of disease can be prevented by means of immunization. What kind of vaccine should be used?

A Salk vaccine
B BCG vaccine
C STI live vaccine
D Sabin’s vaccine
E Diphteria and tetanus toxoids and pertussis vaccine

7. Examination of duodenal contents revealed some pyriform protozoa with twin nuclei and four pairs of flagella. There were two supporting filaments between the nuclei and a suctorial disc on the ventral side. What representative of protozoa was revealed in this patient?

A Lamblia
B Toxoplasma
C Leishmania
D Intestinal trichomonad
E Trypanosome

8. Vomiting matters of a patient suspected of having cholera were delivered to the bacteriological laboratory. The material was used for preparing a "hanging drop"specimen. What type of microscopy will be applied for identification of the causative agent by its motility?

A Fluorescence microscopy
B Electron microscopy
C Immune and electron microscopy
D Phase-contrast microscopy
E Immersion microscopy

9. During examination of a patient a dentist revealed a lot of "white spots zones of enamel demineralization. What microorganisms take part in the development of this process?

A Streptococcus mutans
B Streptococcus salivarius
C Streptococcus pyogenes
D Veilonella parvula
E Staphylococcus epidermidis

10. A 4 year old child presents with general weakness, sore throat and deglutitive problem. After his examination a doctor suspected diphtheria and sent the material to the bacteriological laboratory. In order to determine the diphtheria causative agent the material should be inoculated into the following differential diagnostic medium:

A Endo's agar
B Blood telluriteagar
C Ploskyrev's agar
D Sabouraud's agar
E Levenshtein-Yessen agar

11. A 22 year old patient from the West Ukraine complains of laboured nasal breathing. Morphological examination of biopsy material of nasal mucous membrane revealed lymphoid, epithelioid, plasma cells as well as Mikulicz's cells. What is the most probable diagnosis?

A Syphilis **B** Glanders **C** Tuberculosis **D** Leprosy **E**Rhinoscleroma

12. Clinical diagnosis of a female patient was gonorrhoea. What examination method can be applied for confirmation of this diagnosis?

A Microscopy of pathological material
B Infection of laboratory animals
C Test with bacteriophage
D Hemagglutination reaction
E Immobilization reaction

13. During regular examination of schoolchildren it was revealed that a 10 year old girl had asymmetric oval eggs with a larva in the scrape from her perianal folds. What diagnosis should be made?

A Enterobiasis
B Ascariasis
C Amebiasis
D Trichocephalosis
E Ankylostomiasis

14. Researchers of a bacteriological laboratory examine tinned meat for botulinic toxin. For this purpose a group of mice was injected with an extract of the material under examination and antitoxic antibotulinic serum of A, B, E types. A control group of mice was injected with the same extract but without antibotulinic serum. What serological reaction was applied?

A Double immune diffusion
B Precipitation
C Complement binding
D Opsonocytophagic

E Neutralization

15. During the repeated Widal's agglutination test it was noticed that the ratio of antibody titers and O-antigens S.typhi in the patient's serum had increased from 1:100 to 1:400. How would you interpret these results?

A The patient previously had typhoid fever
B The patient is an acute carrier of typhoid microbes
C The patient is a chronic carrier of typhoid microbes
D The patient has typhoid fever
E The patient was previously vaccinated against typhoid fever

16. 48 hours after tuberculine test (Mantoux test) a child had a papule 10 mm in diameter on the spot of tuberculine injection. What hypersensitivity mechanism underlies these changes?
A Cellular cytotoxicity
B Anaphylaxis
C Antibody-dependent cytotoxicity
D Immunocomplex cytotoxicity
E Granulomatosis

17. A patient has been suffering from diarrhea for 5 day. On the fifth day colonoscopy revealed that membrane of rectum was inflamed, there were greyish-green films closely adhering to the subjacent tissue. What is the most probable diagnosis?
A Salmonellosis
B Typhoid fever
C Nonspecific ulcerative colitis
D Dysentery
E Crohn's disease

18. A patient has acne on his face. Microscopic examination of scrapings from the affected areas revealed living porrect vermiform arthropoda 0,2-0,5 mm large with four pairs of short extremities in the front part of their bodies. What is the laboratory diagnosis?
A Scabies **B**Demodicosis **C** Myiasis **D** Pediculosis **E** Phthiriasis

19. Among junior children of an orphanage an outbreak of intestinal infection with signs of colienteritis was registered. In order to identify isolated causative agent it is necessary to:
A To study virulence of the causative agent
B To determine sensitivity to antibiotics
C To study sensitivity to bacteriophages
D To study biochemical properties of the causative agent
E To study antigenic properties of the causative agent

20. A patient has been suffering from elevated temperature and attacks of typical cough for 10 days. Doctor administered inoculation of mucus from the patient's nasopharynx on the agar. What microorganism is presumed?
A Listeria
B Pfeiffer's bacillus
C Pertussis bacillus
D Klebsiella

E Staphylococcus

21. Microscopic examination of a microbial culture revealed fusiform sporeforming microorganisms that get violet-blue Gram's stain. What microorganisms were revealed?
AClostridia **B** Streptococci **C** Spirochaete **D** Actinomycete **E** Diplococci

22.A bacteriological laboratory received sputum sample of a patient suffering from tuberculosis. Bacterioscopic examination of smears and detection of tuberculosis bacillus can be realized by one of enrichment methods that involves processing of sputum only with solution of caustic soda. What is this method called?
A Flotation
B Inactivation
C Homogenization
D Filtration
E Neutralization

23. A patient had been suffering from profuse diarrhea and vomiting for 2 days. He died from acute dehydration. Autopsy revealed that the intestinal wall was edematous and hyperemic, with multiple haemorrhages in the mucous membrane. Intestinal lumen contains whitish fluid resembling of rice water. What disease caused death?
A Cholera
B Dysentery
C Salmonellosis
D Typhoid fever
E Enterocolitis

24. Material taken from a patient with provisional diagnosis "influenza"was referred to a laboratory. For virological examination the hemadsorption reaction was applied. This reaction can be applied for detection of the following viruses:
A Any viruses
B All the simple viruses
C All the complex viruses
D DNA-genomic viruses
E Viruses containing hemagglutinin

25. A 23 year old man has perforation of hard palate. In the area of this perforation there was a compact well-defined formation. Microscopic examination of the resected formation revealed a large focus of caseous necrosis surrounded by granulation tissue with endovasculitis, cellular infiltration composed of lymphocytes, epithelioid cells (mainly plasmocytes). What is the most probable diagnosis?

A Leprosy **B** Tuberculosis **C** Scleroma **D** Sarcoma **E** Syphilis

26.A doctor revealed tissues injury on patient's scalp with localized suppurations and diagnosed his disease as myiasis. This infestation is caused by larvae of the following insect:
A Malarial mosquito
B Kissing bug
C Stable fly (Stomoxys calcitrans)
D Wohlfahrt's fly
E Mosquito

27. After inoculation of investigated material (feces) on 1% alkaline peptone water and 8-hour-long incubation in the thermostat under 37°C there is growth of pale bluish film observed. Such cultural properties are characteristic of the agent of the following disease:

A Cholera
B Plague
C Typhoid fever
D Paratyphoid A fever
E Dysentery

28. A child with suspected colienteritis was delivered to the infectious diseases hospital. Colibacillus was obtained from the child's feces. How to determine whether this bacillus is of pathogenic variety?

A Agglutination reaction with serum 0
B Based on its biochemical properties
C By means of bacteriophage typing
D Microscopy of stained smears
E Based on the nature of its growth in Endo medium

29. Examination of a patient with pustular skin lesions allowed to isolate a causative agent that forms in the blood agar roundish yellow middle-sized colonies surrounded by haemolysis zone. Smears from the colonies contain irregular shaped clusters of gram-positive cocci. The culture is oxidase- and catalase-positive, ferments mannitol and synthesizes plasmocoagulase. What causative agent was isolated?

A Streptococcus pyogenes
B Streptococcus agalactiae
C Staphylococcus aureus
D Staphylococcus epidermidis
E Staphylococcus saprophyticus

30. Microscopic examination of a Gram-stained scrape from patient's tongue revealed oval, round, elongated chains of dark-violet gemmating cells. What disease can be caused by this causative agent?

A Actinomycosis
B Candidosis
C Streptococcal infection
D Staphylococcal infection
E Diphtheria

31. Blood of a patient with presumable sepsis was inoculated into sugar broth. There appeared bottom sediment. Repeated inoculation into blood agar caused growth of small transparent round colonies surrounded by hemolysis zone. Examination of a smear from the sediment revealed gram-positive cocci in form of long chains. What microorganisms are present in blood of this patient?

A Tetracocci **B** Micrococci **C** Staphylococci **D**Streptococci **E** Sarcina

32. Microscopy of stained (Ziehl-Neelsen staining) smears taken from the sputum of a patient with chronic pulmonary disease revealed red bacilli. What property of tuberculous bacillus was shown up?

A Acid resistance
B Alkali resistance
C Alcohol resistance
D Capsule formation

E Sporification

33. In order to estimate toxigenicity of diphtheria agents obtained from patients the cultures were inoculated on Petri dish with nutrient agar on either side of a filter paper strip that was put into the centre and moistened with antidiphtheric antitoxic serum. After incubation of inoculations in agar the strip-like areas of medium turbidity were found between separate cultures and the strip of filter paper. What immunological reaction was conducted?

A Coomb's test
B Precipitation gel reaction
C Agglutination reaction
D Rings precipitation reaction
E Opsonization reaction

34. A patient with clinical signs of encephalitis was delivered to the infectious diseases hospital. Anamnesis registers a tick bite. Hemagglutination-inhibition reaction helped to reveal antibodies to the causative agent of tick-borne encephalitis in the dilution 1:20 which is not diagnostic. What actions should the doctor take after he had got such result?

A To repeat the examination with serum taken 10 days later
B To examine the same serum
C To apply more sensitive reaction
D To repeat examination with another diagnosticum
E To deny diagnosis of tick-borne encephalitis3

35. A culture of monkey cells (Vero) and a group of mouse sucklings were infected with an inoculum taken from a child with provisional diagnosis "enterovirus infection". There was no cytopathic effect on the cell culture but mouse sucklings died. What enteric viruses might have caused disease of this child?

A Coxsackie B
B Coxsackie A
C ECHO virus
D Polioviruses
E Unclassified enteric viruses 68-71

36. A patient of surgical department complains of pain in the small of her back and in the lower part of her belly; painful and frequent urination. Bacteriological examination of urine revealed gram-negative oxidase-positive rod-shaped bacteria forming greenish mucoid colonies with specific smell. What causative agent can it be?

A E.coli
B Proteus mirabilis
C Pseudomonas aeruginosa
D Str.pyogenes
E Mycoplasma pneumonie

37.A gynaecologist was examining a patient and revealed symptoms of genital tract inflammation. A smear from vagina contains pyriform protozoa with a spine, flagella at their front; there is also an undulating membrane. What disease can be suspected?

A Balantidiasis
B Lambliasis

C Intestinal trichomoniasis
D Toxoplasmosis
E Urogenital trichomoniasis

38. Inoculum from pharynx of a patient ill with angina was inoculated into blood-tellurite agar. It resulted in growth of grey, radially striated (in form of rosettes) colonies 4-5 mm in diameter. Grampositive bacilli with clublike thickenings on their ends placed in form of spread wide apart fingers are visible by microscope. What microorganisms are these?
A Diphtheria corynebacteria
B Botulism clostridia
C Diphtheroids
D Streptococci
E Streptobacilli

39. Analysis of the cerebrospinal fluid of a child with signs of purulent lesion of brain tunics revealed gram-negative bean-shaped diplococci. What presumptive diagnosis can be made on the basis of the analysis results?

A Gonorrhea **B**Meningitis **C** Cholera **D** Plague **E** Anthrax

41. It is necessary to carry out preventive vaccination of a student group because of an occurrence of diphtheria. Which preparation should be used for the creation of the artificial active immunity?

A DTP vaccine
B Specific immunoglobulin
C Diphtheria toxoid
D Inactivated bacteria vaccine
E Anti-diphtheria serum

Exercise 3. Match the diseases to the vector of the causative agent, its common name, and morphology of the corresponding parasitic arthropods.

Disease	***Vector of the causative agent***	***Common name***	***Morphology***
Lyme borreliosis and "early summer meningoencephalitis"	Sarcoptes scabiei	Lice (*Sing. louse*)	About 0.2–0.5 mm long with ovoid bodies. The adults and nymphs have four pairs of legs, the larva has three pairs of legs. Following transmission to a human host a female penetrate into the epidermis and begin to tunnel
Scabies	Anoplura	Ticks	Dorsoventrally flattened insects, about 1.5–4 mm in length, wingless, with reduced eyes, short (five-segmented) antennae, piercing and sucking mouthparts, and strong claws designed to cling to hairs
Pediculosis and phthiriosis	Ixodes	Mites	Male: about 2–3 mm long with a highly chitinized scutum covering the entire dorsal surface. Female: 3–4

			mm, up to 12 mm when fully engorged after a blood meal; the scutum covers only the anterior portion of the body. Adults and nymphs (the latter about 1 mm long) have four pairs of legs, the smaller larvae (about 0.5 mm long) only three pairs. Possess characteristic piercing mouthparts.

Exercise 4. Fill in the table

NOUN	ADJECTIVE	VERB
curve	curved	
	inoculative	
cause		
infestation		
		deepen
		recur
	impregnated	
specification		
		immunize

Exercise 5. Fill in the gaps with the words given in the box.

photosynthetic pigments	species
defenses	parasitic
eukaryotes	transformation
arthropods	mitochondria

Fungi and Protozoa

- ***Fungi.*** Fungi (Mycophyta) are nonmotile … with rigid cell walls and a classic cell nucleus. They contain no … and are carbon heterotrophic, that is, they utilize various organic nutrient substrates (in contrast to carbon autotrophic plants). Of more than 50 000 fungal …, only about 300 are known to be human pathogens. Most fungal infections occur as a result of weakened host immune … .
- ***Protozoa.*** Protozoa are microorganisms in various sizes and forms that may be free-living or …. They possess a nucleus containing chromosomes and organelles such as … (lacking in some cases), an endoplasmic reticulum, pseudopods, flagella, cilia, kinetoplasts, etc. Many parasitic protozoa are transmitted by …, whereby multiplication and … into the infectious stage take place in the vector.

Exercise 6. Find misused words and replace them with correct ones (form a word that fits suitably). Explain your choice.

Covid-19 patients who recovery from the disease still have robust immune from the coronavirus eight months after infection, according to a new study. The result is an encouraging sign that the authors interpret to mean immunity to the viral probably lasts for many years, and it should alleviate fearful

that the covid-19 vaccine would require repeated booster shots to protective against the disease and final get the pandemic under control.

“There was a lot of concerned originally that this virus might not induce much memory,” says Shane Crotty, a research at the La Jolla Institute for Immunology in California and a coauthor of the new paper. “Instead, the immune memory looks quite good.”

The study, published January 6 in Science, contrasts with earlier findings that suggestion covid-19 immunity could be short-lived, putting millions who’ve already recovered at risk of reinfected. That predicament wouldn’t have been a totally surprise, since infection by other coronaviruses generates antibodies that fade fairly quick. But the new study suggests reinfection should only be a problem for a very small percentage of people who’ve development immunity—whether through an initial infection or by vaccination.

In fact, the new study does show that a small number of recovered people do not have long-lasting immunize. But vaccinate ought to offset that problem by ensuring herd immunity in the larger population.

Exercise 7. Use the verbs in brackets in the correct form.

1. Before the first prototype electron microscope (to develop) in 1931 the light microscope (to use) as the only option to investigate cells.
2. Over the past 30 years, numerous studies (to conduct) to explain processes such as membrane traffic and organelle biogenesis.
3. In 1632–1723, Antonie van Leeuwenhoek (to teach) himself to make lenses, (to construct) basic optical microscopes and (to isolate) protozoa from rain water, and bacteria from his own mouth.
4. Despite the patient (to receive) medications for 20 days, his condition didn’t improve.
5. Specific immune responses (to base) on antibodies and specific reactions of T lymphocytes.
6. It’s only the second time I (to conduct) microscopic evaluation of a gram-stain slide made from those bacterial colonies.
7. If chemotherapy (not to discontinue) last week liver damage would have become too severe.
8. His condition already considerably (to improve) and soon he (to return) to work.
9. The students (to discuss) the effectiveness of vaccine usage in preventing some types of influenza since eight o`clock.
10. The pain (to relieve) by sublingual nitroglycerine before the ambulance arrived.
11. The doctor will prescribe the proper antibiotic as soon as the complete evaluation (to perform).
12. When Koch, who previously (to identify) the tuberculosis bacillus, (to present) his findings to the Cholera Commission in Berlin in 1884, the commission (to congratulate) him, but also (to recognize) Filippo Pacini's previous discovery of the bacterium.

9.1. PHARMACOLOGY
Part 1

Exercise 1. Read the text:

Neurotransmitters. Each neuron is a distinct anatomic unit. Communication between nerve cells – and between nerve cells and effector organs – occurs through the release of specific chemical signals, called neurotransmitters, from the nerve terminals. This release depends on processes that are triggered by Ca^{++} uptake and regulated by phosphorylation of synaptic proteins. The neurotransmitters rapidly diffuse across the synaptic cleft or gap (synapse) between nerve endings and combine with specific receptor on the postsynaptic (target) cell.

Types of neurotransmitters. Although over 50 chemical signal molecules in the nervous system have tentatively been identified, 6 signal compounds–norepinephrine (and closely related epinephrine), acetylcholine, dopamine, serotonin, histamine, and γ-amino butyric acid–are most commonly involved in the actions of therapeutically useful drugs. Each of these chemical signals binds to a specific family of receptors. Cholinergic and adrenergic neurotransmitters are the primary chemical signals in the autonomic nervous system, whereas a wide variety of neurotransmitters function in the CNS.

Acetylcholine. The autonomic nerve fibers can be classified into two groups based on the chemical nature of the neurotransmitter released. If transmission is mediated by acetylcholine, the neuron is termed **cholinergic**. Acetylcholine mediates the transmission of nerve impulses across autonomic ganglia in both the sympathetic and parasympathetic nervous systems. It is the neurotransmitter at the adrenal medulla.

Transmission from the autonomic postganglionic nerves to the effector organs in the parasympathetic system also involves the release of acetylcholine.

Noradrenaline and Adrenaline.

Adrenaline is one of five catecholamines – *Adrenaline, Noradrenaline, Dopamine, Dobutamine,* and *Isoproterenol* – commonly used in therapy. The first three catecholamines occur naturally, the latter two are synthetic compounds. *Adrenaline* is synthesized in the adrenal medulla and released into the blood stream. *Adrenaline* interacts with both α and β receptors. At low doses, β effects (vasodilatation) on the vascular system predominate, whereas at high doses, α effects (vasoconstriction) are strongest.

Actions:

a. **Cardiovascular:** the major actions of *adrenaline* are on the cardiovascular system. *Adrenaline* strengthens the contractility of the myocardium (positive inotropic: β_1 action) and increases its rate of contraction (positive chronotropic: β_1 action). Cardiac output therefore increases. With these effects comes increased oxygen demands on the myocardium. *Adrenaline* constricts arterioles in the skin, mucous membranes, and viscera (α effects) and dilates vessels going to the liver and skeletal muscle (β_2 effects). Renal blood flow is decreased. The cumulative effect, therefore, is an increase in systolic blood pressure, coupled with a slight decrease in diastolic pressure.
b. **Respiratory:** *Adrenaline* causes powerful bronchodilation by acting directly on bronchial smooth muscle (β_2 action). This action relieves all known allergic- or histamine-induced bronchoconstriction. In the case of anaphylactic shock, this can be life-saving.
c. **Hyperglycemia:** *Adrenaline* has a significant hyperglycemic effect because of increased glycogenolysis in liver (β_2 effect), increased release of glucagon (β_2 effect), and a decreased release of insulin (α_2 effect).
d. **Lipolysis:** *Adrenaline* initiates lipolysis through its agonist activity on the β receptors of adipose tissue, which activate a hormone-sensitive lipase, which hydrolyzes triacylglycerols to free fatty acids and glycerol.

Therapeutic uses:

a. **Bronchospasm:** *Adrenaline* is the primary drug used in the emergency treatment or any condition of the respiratory tract where the presence of bronchoconstriction has resulted in diminished respiratory exchange. Thus, in the treatment of acute asthma and anaphylactic shock, A*drenaline* is the drug of choice; within a few minutes after subcutaneous administration, greatly improved respiratory exchange is observed. Administration may be repeated after a few hours. However, selective β_2 agonists, such as *Terbutaline*, are presently favored in the chronic treatment of asthma because of a longer duration of action and minimal cardiac stimulatory effect.
b. **Glaucoma:** In ophthalmology, a 2 % A*drenaline* solution may be used topically to reduce intraocular pressure in open-angle glaucoma. It is reduces the production of aqueous humor by vasoconstriction of the ciliary's body blood vessels.
c. **Anaphylactic shock:** *Adrenaline* is the drug of choice for the treatment of Type I hypersensitivity reactions in response to allergens.
d. **In anesthetics:** Local anesthetic solutions usually contain 1:100,000 parts *Adrenaline*. The effect of the drug is to greatly increase the duration of the local anesthesia. It does this by producing vasoconstriction at the site of injection, thereby allowing the local anesthetic to persist at the site before being absorbed into the circulation and metabolized. Very weak solutions of *Adrenaline* (1:100,000) can also be used topically to vasoconstriction mucous membranes to control oozing of capillary blood.

Pharmacokinetics. *Adrenaline* has a rapid onset but brief duration of action. In emergency situation *Adrenaline* is given intravenously for the most rapid onset of action; it may also be given subcutaneously, by endotracheal tube, by inhalation, or topically to the eye. Oral administration is ineffective.

Adverse effects. *Adrenaline* can produce adverse CNS effects that include anxiety, fear, tension, headache, and tremor. The drug may induce cerebral hemorrhage as a result of a marked elevation of blood pressure. *Adrenaline* can trigger cardiac arrhythmias, particularly if the patient is receiving *digitalis*. *Adrenaline* can induce pulmonary edema in predisposing patients with left ventricular failure.

Noradrenaline

Since *Noradrenaline* is the neuromediator of adrenergic nerves, it should theoretically stimulate all types of adrenergic receptors. In practice, when the drug is given in therapeutic doses, the α receptors are most affected.

Cardiovascular actions:

a. **Vasoconstriction:** *Noradrenaline* causes a rise in peripheral resistance due to intense vasoconstriction of most vascular beds, including the kidney (an α_1-receptor effect). Both systolic and diastolic blood pressure increase.
b. **Baroreceptor reflex:** In isolated cardiac tissue *Noradrenaline* stimulates cardiac contractility; however, in vivo, little if any cardiac stimulation is noted. This is due to the increased blood pressure that induces the reflex rise in vagal activity by stimulating the baroreceptors. This bradycardia is sufficient to counteract the local action of *Noradrenaline* on the heart.

If *atropine* (which block the transmission of vagal effects) is given before *Noradrenaline,* then *Noradrenaline* stimulation of the heart is evident as tachycardia.

Therapeutic uses. *Noradrenaline* is used to treat shock because it increases vascular resistance and, therefore, increases blood pressure; however, *Dopamine* is better, because it does not reduce blood flow to the kidney as does *Noradrenaline.* Other actions of *Noradrenaline* are not considered clinically significant. It is never used for asthma.

Exercise 2. Answer the questions to the text:

1. What is a neurotransmitter?
2. Which neurotransmitters are most commonly involved in the actions of therapeutically useful drugs?
3. What does acetylcholine mediate?
4. What kind of neurotransmission is called cholinergic?
5. What catecholamines are commonly used in therapy?
6. Which catecholamines occur naturally and which are synthetic compounds?
7. How does Adrenaline act on the cardiovascular system?
8. How does Adrenaline affect the respiratory system?
9. What are the main therapeutic actions of Adrenaline?
10. What kind of administration is ineffective for Adrenaline?
11. What adverse effects can Adrenaline produce?
12. What are the cardiovascular actions of Noradrenaline?
13. What happens if atropine is given before Noradrenaline?
14. What ae the therapeutic uses of Noradrenaline?
15. Why is Dopamine better to treat shock than Noradrenaline?

Exercise 3. Say whether the following statements are true or false according to the text:

1. Transmission from the autonomic postganglionic nerves to the effector organs in the parasympathetic system also involves the release of adrenaline.
2. Adrenaline has the strongest effect on the cardiovascular system.
3. The action of noradrenaline can be life-saving in case of anaphylactic shock.
4. Adrenaline significantly increases glycogenolysis in the liver.
5. Adrenaline is the drug of choice for managing anaphylactic shock.
6. The duration of local anesthetics effect is greatly increased due to adrenaline.
7. Oral administration of adrenaline is the most effective.
8. Noradrenaline is used to treat shock because it increases vascular resistance and, therefore, decreases blood pressure.

Exercise 4. Match the terms with their definitions:

1) neurotransmitter	**a)** the innermost part of the adrenal gland, consisting of cells that secrete epinephrine (adrenaline), norepinephrine (noradrenaline), and a small amount of dopamine in response to stimulation by sympathetic preganglionic neurons
2) synaptic cleft	b) an extreme, often life-threatening allergic reaction to an antigen to which the body has become hypersensitive.
3) adrenal medulla	**c)** breakdown of the molecule glycogen into glucose, a simple sugar that the body uses to produce energy
4) catecholamine	**d)** breakdown of fats and other lipids by hydrolysis to release fatty acids
5) glycogenolysis	**e)** a group of eye diseases which result in damage to the optic nerve and cause vision loss
6) lipolysis	**f)** the space that separates a neuron and its target

	cell at a chemical synapse.
7) glaucoma	**g)** a monoamine neurotransmitter, an organic compound that has a catechol (benzene with two hydroxyl side groups next to each other) and a side-chain amine
8) anaphylactic shock	**h)** a chemical substance which is released at the end of a nerve fibre by the arrival of a nerve impulse and, by diffusing across the synapse or junction, effects the transfer of the impulse to another nerve fibre, a muscle fibre, or some other structure

Exercise 5. Complete the table with the missing parts of speech:

VERB	NOUN	ADJECTIVE
	communication	
		specific
identify		
widen		
	mediator\medium	
		transmissive
reduce		
	synthesis	
interact		
	constriction	

Exercise 6. Fill the gaps in the text with the missing parts:

POISONING BY BELLADONNA ALKALOIDS

Deliberate or accidental ingestion of belladonna alkaloids or other classes of drugs 1_____ is a major cause of poisonings. Infants and young children are especially susceptible to the toxic effects of atropinic drugs. Indeed, many cases of intoxication in children have resulted from 2_____. Serious intoxication may occur in children who 3_____ containing belladonna alkaloids. The diagnosis of atropine poisoning is suggested by 4_____ – dry mouth, mydriasis, blurred vision, hot dry skin, and, in addition, hyperreexia, excitement, hallucinations, delirium and later, cerebral depression and coma. As it was described with characteristic American verbal felicity – “hot as a hare, blind as a bat, dry as a bone, red as a beet and mad as a hen”.

The treatment of atropine (and other anticholinergic drugs) poisoning is on general lines. Measures to limit intestinal absorption should be initiated without delay 5_____. For symptomatic treatment, anticholinesterase drug (physostigmine) is the rational therapy. This agent enters the central nervous system and 6_____. Physostigmine 1-4 mg i.v. or i.m. is effective, though it may need

repeating, 7_____. If marked excitement is present, diazepam is the most suitable agent 8___. Ice bags and alcohol sponges help to reduce fever, especially in children.

a. ingest berries or seeds
b. a wide-spread paralysis of parasympathetic innervation
c. if the poison has been taken orally
d. with atropinic properties
e. reverses both the central and peripheral effects
f. for sedation and for control of convulsion
g. as its action (1-2 hours) is shorter than that of atropine
h. conjunctival instillation of atropine eye-drops

Exercise 7. Write in words:

IV (i.v.)	
IM (i.m.)	
Las	
HDL	
GI	
CSF	
REM	
SC (s.c.)	
AC	
BBB	

Exercise 8. Match the beginnings and ends of the sentences:

1. A drug is called an **agonist**	a. the ability of a drug to bind to receptor, shown by the proximity of the curve to the *y* axis (if the curves are parallel); the nearer the *y* axis, the greater the affinity.
2. A drug is called an **antagonist**	b. relative doses of >2 agonists to produce the same magnitude of effect, again shown by the proximity of the respective curves to the *y* axis (if the curves do not cross).
Potency shows	c. when binding to the receptor results in a response
4. Affinity is	d. a measure of how well a drug produces a response (effectiveness), shown by the maximal height reached by the curve.
5. Efficacy is	e. when binding to the receptor is not associated with a response; the drug has an effect only by preventing an agonist from binding to the receptor.

Exercise 9. Change the form of the words in brackets to complete the sentences:

INTRACELLULAR RECEPTORS

Intracellular receptors include receptors for steroids. (**Bind)** of hormones or drugs to such receptors releases (**regulate)** proteins which permit (**active)** (and in some cases, dimerization) of the hormone-receptor complex.

- Such complexes translocate to the nucleus, where they interact with (**respond)** elements in spacer DNA. This (**interact)** leads to changes in gene (**express)**.
- For example, drugs interacting with glucocorticoid receptors lead to gene expression of proteins that inhibit the production of (**inflammation)** mediators.

Other examples of intracellular receptors include intracellular receptors for thyroid hormones, gonadal steroids, and vitamin D.

Pharmacologic responses elicited via (**modify)** of gene expression are usually slower in onset but longer in duration than many other drugs.

Exercise 10. **Choose the correct variant.**

1. The diagnosis of the..... should be made by measuring quantitative PBG before starting specific treatment for porphyria.

a) acute attack b) alopecia c) allergen d) afferent nerves

2……..are a diverse group of pharmacological agents used in the treatment of epileptic seizures.

a) amenorrhea b) anticonvulsants c) antiepileptic d) antivirals

3 are steroidal androgens that include natural androgens like testosterone and so on.

a) anxiolytics b) antitussives c) anti - ulcer effect d) anabolic steroids

4.....are substances that reduce fever.

a) antitussives b) atony c) antipyretics d) atopen

5..... are medecines that suppress coughing.

a) alopecia b) antitussives c) allergen d) agonist

6..... is the cessation of breathing.

a) apnoea b) asthenia c) antiviral d) allergy

7.....is the feeling of body fatigue, or tiredness.

a) acidosis b) alopecia c) asthenia d) afferent nerves

8..... are used as a short-term treatment for bipolar disorder to control psychotic symptoms such as hallucinations, delusions, or mania symptoms.

a) asphyxia b) antipsychotic medications c) atrioventricular node d) atony

9…….controls the heart rate.

a) agonist b) allergen c) antipyretic d) atrioventicular node

10…….is a proliferative physiological process in which the body facilitates the repair of a bone fracture.

a) bone healing b) cachexia c) catabolism d) carotid sinus

11.....is loss of weight, muscle atrophy, fatigue,weakness and significant loss of appetite in someone.

a) colitis b) endometriosis c) cachexia d) collapse

12.....is a dilated area at the base of the internal carotid artery just superior to the bifurcation of the internal carotid and external carotid at the level of the superior border of thyroid cartilage.

a) cognitive function b) carotid sinus c) diarrhea d) dyspnea

13..... is a condition of the digestive system characterized by hard feces that are difficult to pass.

a) hypotension b) hypertension c) hirsutism d) constipation

14..... is the condition of having at least three loose or liquid bowel movements each day.

a) diarrhea b) constipation c) rectum d) feces

15..... is the feeling that one cannot breathe well enough.

a) exstrasystole b) epilepsy attack c) glaucoma d) dyspnea

16..... is something that helps loosen mucus so you can cough it up.

a) heart attack b) expectorant c) erythropoietin d) fainting

17..... is a loss of consciousness and muscle strength characterized by a fast onset, short duration, and spontaneous recovery.

a) fainting b) consciousness c) loss d) termination

18..... is common name for myocardial infarction, when the blood supply to a part of the heart is interrupted.

a) epilepsy attack b) fainting c) heart attack d) hirsutism

19.....is excessive body hair in men and women on parts of the body where hair is normally absent or minimal.

a) infarction b) hirsutism c) hair d) diarrhea

20…….is a measurement of the pressure of brain tissue and the cerebrospinal fluid that cushions and surrounds the brain and spinal cord.

a) cachexia b) catabolism c) colitis d) intracranial pressure

21……is the fluid pressure inside the eye.

a) intraocular pressure b) hypotension c) hypertension d) hirsutism

22..... is any technique to induce the absence of sensation in a specific part of the body, generally for the aim of inducing local analgesia, that is, local insensitivity to pain, although other local senses may be affected as well.

a) meningitis b) metabolism c) local anesthesia d) migraine

23.....is a semi-solid tissue which may be found within the spongy or cancellous portions of bones in birds and mammals.

a) myofibril b) bone marrow c) myasthenia d) ovulation

24.....can cause severe throbbing pain or a pulsing sensation, usually on just one side of the head.

a) migraine b) headache c) brain d) bone marrow

25..... is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health.

a) proctitis b) sedative c) sepsis d) obesity

26..... is an abnormal condition of the mind that results in difficulties determining what is real and what is not.

a) probiotics b) prebiotics c) psychosis d) stomatitis

27.....is recovery from illness or injury.

a) symbiotics b) reconvalescence c) scorbutus d) surfactant

28..... is a chronic and severe mental disorder that affects how a person thinks, feels, and behaves.

a) schizophrenia b) nerve c) disorder d) mental

29.....is a disease resulting from a lack of vitamin C (ascorbic acid).

a) tetany b) toxic goiter c) stroke d) scorbutus

30..... is a medical condition in which poor blood flow to the brain results in cell death.

a) sulphonamides b) stroke c) sedative d) proctitis

31..... is a medical sign consisting of the involuntary contraction of muscles, which may be caused by disease or other conditions.

a) sepsis b) psychosis c) tetany d) probiotics

32..... is a thyroid gland that contains autonomously functioning thyroid nodules, with resulting hyperthyroidism.

a) toxic goiter b) goiter c) gland d) contamination

33.....is a result of untreated leg vein problems.

a) tuberculosis b) cancer c) ulcer d) trophic ulcer

34.....is a medicine taken or given to counteract a particular poison.

a) tumor b) antidote c) tranquilizer d) ventricular fibrillation

35..... is when the heart quivers instead of pumping due to disorganized electrical activity in the ventricles.

a) stomatitis b) sedative c) ventricular fibrillation d) tranquilizer

9.2. PHARMACOLOGY

Part 2

Exercise 1. Active Vocabulary

Verbs	Nouns	Adjectives	Adverbs	Conjunctions/ Prepositions
develop	admission	acute	preliminarily	despite
fail	case	antiinflammatory	several	due to
receive	drug	close		during
suppress	inhibition	evident		
use	introduction	general		
	mucosa	mucosal		
	output			
	spot			
	vision			

Exercise 2. Krok tests:

1. A woman with seasonal vasomotor rhinitis, who works as a train dispatcher and is an outpatient, should be prescribed an antihistaminic drug that does not suppress the central nervous system. Name this drug:

A. Loratadine
B. Dimedrol (Diphenhydramine)
C. Diprazine (Promethazine)
D. Suprastin (Chloropyramine)
E. Tavegyl (Clemastine)

2. During treatment with bismuth preparations a patient with syphilis developed gray spots on his oral mucosa and nephropathy symptoms. What drug is used as an antidote to bismuth preparations poisoning?

A. Unithiol
B. Nalorphine
C. Bemegride
D. Naloxone
E. Methylene blue

3. On the 2-3 day after the gastric resection the patient's intestinal peristalsis failed to restore. What should the patient be prescribed to stimulate the function of his gastrointestinal tract?

A. Proserin
B. Platyphyllin
C. Cyclodol (Trihexyphenidyl)
D. Atropine
E. Dithyline (Suxamethonium chloride)

4. A patient is diagnosed with diabetic coma. Blood sugar is 18,44 mmol/l. What glucose-regulating drug should be prescribed in the given case?

A. Rapid-acting insulin

B. Intermediate-acting insulin
C. Long-acting insulin
D. Biguanide
E. Sulfonylurea derivative

5. A man came into the admission room with complaints of edemas, rapid heart rate, dyspnea, and cyanotic mucosal tunics. He was diagnosed with chronic heart failure. What drug should be prescribed to improve the patient's general state?
A. Digoxin
B. Papaverine hydrochloride
C. Mesaton (Phenylephrine)
D. Cordiamin
E. Nitroglycerine

6. The patients with organic brain disorder can take the following drug to improve their memory:
A. Piracetam
B. Nitrazepam
C. Medazepam
D. Diazepam
E. Caffeine

7. In preparation for business trip abroad the doctor was prescribed a histoschizontocidal antimalarial drug as a personal means of disease prevention. What drug was given to the doctor?
A. Chingamin
B. Biseptol (Co-trimoxazole)
C. Doxycycline
D. Mefloquine
E. Quinine

8. A 50-year-old man is diagnosed with ischemic heart disease and cardiosclerosis with hypertensive syndrome. What drug should be prescribed in this case?
A. Metoprolol
B. Acetylsalicylic acid
C. Corglycon
D. Strophanthine
E. Potassium chloride

9. Preoperative examination revealed prothrombin deficiency in the blood of the patient. What drug should be preliminarily prescribed to mitigate blood loss in the patient during the surgery?
A. Vicasol (Menadione)
B. Thrombin
C. Aminocapronic acid
D. Phenylin (Phenindione)
E. Contrykal (Aprotinin)

10. During regular check-up a child is determined to have interrupted mineralization of the bones. What vitamin deficiency can be the cause?
A. Calciferol
B. Riboflavin

C. Tocopherol
D. Folic acid
E. Cobalamin

11. A patient with chronic bronchitis was prescribed a drug with mucolytic action. Name this drug:
A. Ambroxol
B. Anaprilin (Propranolol)
C. Atropine sulfate
D. Magnesium sulfate
E. Paracetamol

12. Therapeutics unit of a hospital received a man suffering from ulcer disease of the stomach with hyperacidity. Which of the listed group of drugs must be used as a part of the complex therapy of this patient?
A. Histamine H_2-receptor antagonists
B. Calcium channel blockers
C. Nonsteroidal antiinflammatory drugs
D. Steroidal antiinflammatory drugs
E. Histamine H_1-receptor antagonists

13. During gastric resection the patient received mixed anesthesia with tubocurarin chloride muscle relaxant; to restore spontaneous respiration the patient received proserin. What pharmacological group does this drug belong to?
A. Cholinesterase inhibitors
B. Angiotensin-converting-enzyme inhibitors
C. Calcium channel blockers
D. Muscarinic antagonists
E. Muscarinic agonists

14. To treat bronchitis the patient was prescribed a beta-lactam antibiotic. Its mechanism of action is based on inhibition of murein production, which results in death of the causative agent. Name this drug:
A. Penicillin G Sodium Salt
B. Bijochinol (Quinine bismuth iodide)
C. Ciprofloxacin
D. Azithromycin
E. Streptomycin

15. A 38-year-old woman developed a bronchial asthma attack. Which of the listed bronchial spasmolytics is effective for emergency aid and belongs to beta-2-adrenergic agonists?
A. Salbutamol
B. Adrenaline
C. Ipratropium bromide
D. Platyphyllin
E. Atropine

16. After an emotional upset a woman has been suffering from disturbed sleep for several days. What soporific drug would be preferable for this type of insomnia?
A. Nitrazepam
B. Phenobarbital

C. Ethaminal sodium (Pentobarbital)
D. Barbamylum (Amobarbital)
E. Chloral hydrate

17. To stop the bleeding the patient was prescribed a direct coagulant. During introduction of the solution the patient was complaining of pain along the vein, hot sensation, and palpitations. Name the drug that causes such symptoms:
A. Calcium chloride
B. Hirudine
C. Ergocalciferol
D. Pentoxyl
E. Streptokinase

18. A patient with pulmonary tuberculosis is prescribed the most effective anti-tuberculous antibiotic. Name this drug:
A. Rifampicin
B. Tetracycline
C. Streptocide
D. Furasolidone
E. Bactrim (Co-trimoxazole)

19. A 4-year-old child has been admitted to an orthopaedic department with displaced shin fracture. Bone fragments reposition requires analgesia. What drug should be chosen?
A. Promedol
B. Analgin
C. Morphine hydrochloride
D. Panadol
E. -

20. A patient has been diagnosed with gonorrhea. As fluoroquinolones are the drugs of choice for treatment of gonorrhea the patient should be prescribed:
A. Ciprofloxacin
B. Furazolidone
C. Fluorouracil
D. Sulfacarbamide (Urosulfanum)
E. Cefazolin

21. A 40-year-old patient suffers from bronchial asthma and prolonged tachycardia. Choose the optimal drug for rapid relief of bronchial spasm in the given case:
A. Salbutamol
B. Adrenalin hydrochloride
C. Ephedrine hydrochloride
D. Orciprenaline
E. Isoprenaline (Isadrinum)

22. A patient with acute myocardial infarction has been administered heparin as a part of complex therapy. Some time after heparin injection the patient developed hematuria. What heparin antagonist should be injected to remove the complication?
A. Protamine sulfate

B. Vicasol
C. Aminocaproic acid
D. Neodicumarin
E. Fibrinogen

23. An alcoholic suffers from alcoholic psychosis with evident psychomotor agitation. What neuroleptic drug should be administered for emergency aid?
A. Aminazine
B. Diazepam
C. Sodium bromide
D. Reserpine
E. Halothane

24. A 16-year-old young man suffering from seasonal allergic rhinitis has been prescribed a highly active second-generation H1 blocker, which can be characterized by absence of marked sedative action. Name this drug:
A. Loratadine
B. Pipolphen
C. Chloropyramine (Suprastin)
D. Indometacin
E. Erythromycin

25. A 36-year-old patient has been administered a depolarizing muscle relaxant during a surgery. Name this drug:
A. Dithylinum
B. Proserin
C. Pipecuronium bromide (Arduan)
D. Diazepam
E. Aminazine

26. Prescription of penicillin G sodium salt has caused development of neurotoxic effects (hallucinations, convulsions). Such reaction is the result of antagonism with the following neurotransmitter:
A. GABA
B. Dopamine
C. Serotonin
D. Adenosine
E. Acetylcholine

27. A patient has arterial hypertension. What long-acting calcium channel blocker should be prescribed?
A. Amlodipine
B. Octadine
C. Pyrroxanum
D. Atenolol
E. Reserpine

28. Name the halogen-containing antiseptic with fungicidal properties, which is used to treat dermatomycosis:
A. Iodine solution

B. Formalin solution
C. Methylene blue
D. Brilliant green
E. Boric acid solution

29. Due to severe pain syndrome a patient was prescribed a narcotic analgesic. Name this drug:
A. Morphine
B. Metamizole (Analgin)
C. Nimesulide
D. Dimethyl sulfoxide
E. Indometacin

30. A patient with arthritis has been prescribed an anti-inflammatory selective COX-2 inhibitor. Select this drug among those given below:
A. Celecoxib
B. Phenylbutazone (Butadion)
C. Dimethylsulfoxide (Dimexid)
D. Indometacin
E. Metamizole (Analgin)

31. A patient after disrupted cerebral circulation has developed paralysis. Choose the anticholinesterase drug to be prescribed in this case:
A. Proserin
B. Cordiamin
C. Aceclidine
D. Methacin
E. Hexamethonium (Benzohexonium)

32. A 5-year-old child has been diagnosed with acute right distal pneumonia. Sputum inoculation revealed that the causative agent is resistant to penicillin and senstive to macrolides. What drug should be prescribed?
A. Azithromycin
B. Tetracycline
C. Gentamycin
D. Streptomycin
E. Ampicillin

33. Despite the administration of cardiotonics and thiazide diuretic a patient with chronic heart failure has persistent edemas and the risk of ascites arose. What medication should be administered to enhance the diuretic effect of the administered drugs?
A. Spironolactone
B. Furosemide
C. Amiloride
D. Clopamide
E. Manithol

34. An alcoholic has alcoholic psychosis with evident psychomotor agitation. What neuroleptic drug should be administered for emergency aid?
A. Aminazine

B. Diazepam
C. Sodium bromide
D. Reserpine
E. Halothane

35. When treating a patient with chronic cardiac failure a doctor detected bradycardia and deterioration of the patient's general state. Such condition is caused by cumulative effect of a drug. Which drug of those listed below has cumulative action?
A. Digoxin
B. Diphenhydramine (Dimedrol)
C. Hydrochlorothiazide
D. Isosorbide
E. Retinol acetate

36. A patient has been given atropine sulfate for rapid relief of spastic colon symptoms. The use of this drug is contraindicated in the following disease:
A. Glaucoma
B. Bronchial asthma
C. Bradycardia
D. Hypotension
E. Gastric ulcer

37. A patient has developed paroxysmal ventricular tachycardia against the background of cardiac infarction. What antiarrhythmic drug should be chosen to avoid lowering cardiac output?
A. Lidocaine hydrochloride
B. Procainamide
C. Verapamil
D. Propranolol
E. Potassium chloride

38. Prolonged treatment of hypothyroidism has caused general dystrophy, dental caries, tachycardia, tremor of extremities. What drug is the cause of these side effects?
A. L-thyroxin
B. Humulin (Human insulin)
C. Parathyreoidinum
D. Thyrocalcitonin
E. Prednisolone

39. To treat rheumatoid arthritis a 65-year-old woman was prescribed an immunosuppressive hormonal drug as a part of her complex therapy. Name this drug:
A. Prednisolone
B. Thymus cytomedins (Thymalin)
C. Chloropyramine (Suprastin)
D. Riboflavin
E. Fercovenum

40. An 18-year-old patient has developed candidiasis after the case of pneumonia treated with β-lactam antibiotic. What antimycotic agent should be prescribed?
A. Fluconazole

B. Streptomycin
C. Ampicillin
D. Phthalylsulfathiazole
E. Trimethoprim/sulfamethoxazole (Bi-septol)

Exercise 3. Give synonyms of the following words:

prescribe		fast	
lower		worsening	
treatment		detect	
adverse effects		medication	
stop		excitation	

Exercise 4. Fill the table with the missing parts of speech:

Verb	Noun	Adjective	Adverb
prescribe			
		active	
necessitate			
	agitation		
		prolonged	
	prevention		
improve			
	admission		
	risk		
	coagulant		

Exercise 5. Read the tests below with answers and explanations:

1. Lorazepam can be safely used as a pre-anaesthetic medication in a patient undergoing liver transplantation without fear of excessive CNS depression because the drug is

(A) excreted in unchanged form
(B) actively secreted into the GI tract
(C) conjugated extrahepatically
(D) a selective anxiolytic devoid of CNS depressant actions
(E) reversible by naloxone

Answer: C.

Most benzodiazepines are metabolized by liver cytochrome P450. In a patient lacking liver function, benzodiazepines that are metabolized via extrahepatic conjugation (e.g., lorazepam, oxazepam) are safer in terms of the possibility of excessive CNS depression. Lorazepam is metabolized, probably in the lungs, via glucuronidation. Although benzodiazepine actions can be reversed, the drug that acts as an antagonist is flumazenil, not naloxone.

2. A patient comes to the ER with a painful stab wound. The ER resident administers pentazocine for the pain. Soon after administration the patient experiences sweating, restlessness, and an increase in pain sensations. What is the most likely explanation for his symptoms?

(A) The patient is probably tolerant to pentazocine.
(B) The patient is a heroin addict.
(C) Pentazocine is an ineffective analgesic.
(D) Pentazocine was used at the wrong dose.
(E) Pentazocine doesn't cross the blood-brain barrier.

Answer:B.

Pentazocine is an agonist at κ (kappa) opioid receptors and an ant agonist at p opioid receptors. Mixed agonist-antagonists can displace p receptor agonists such as heroin from receptors, resulting in the rapid development of symptoms of withdrawal in patients who are physically dependent on such drugs—"precipitated withdrawal." Symptoms include yawning, lacrimation, salivation, restlessness, anxiety, sweating, goosebumps, muscle cramps, and pain.

3. A 29-year-old man is being treated with an antidepressant drug, and his mood is improving. However, he complains of feeling "jittery" and agitated at times, and if he takes his medication in the afternoon he finds it difficult to get to sleep at night. He seems to have lost weight during the 6 months that he has been taking the drug. He has been warned not to take other drugs without consultation because severe reactions have occurred with opioid analgesics including meperidine. This patient is probably taking

(A) alprazolam
(B) chlorpromazine
(C) paroxetine
(D) amitriptyline
(E) trazodone

Answer: C.

The patient is probably taking an SSRI such as paroxetine. SSRIs rarely cause sedation and commonly cause agitation and the "jitters," which sometimes necessitates concomitant use of drugs that are strongly sedating, such as trazodone. SSRIs are best taken in the morning to avoid problems of insomnia, and they appear to cause weight loss, at least during the first 12 months of treatment. Severe drug interactions leading to the "serotonin syndrome" have been reported when SSRIs have been used together with MAO inhibitors, tricyclics, and the opioid meperidine.

Exercise 5.1 Answer the questions to the tests above:

1. What is glucuronidation?

2. What is a specific form of penetrating trauma to the skin that results from a knife or a similar pointed object called?

3. What is the inability to rest or relax called?
4. What are the symptoms of precipitated withdrawal?

5. What does feeling “jittery” mean?

6. What is SSRI?

7. What is MAO inhibitors?

8. What kind of drugs are tricyclics?

Exercise 5.2 Find the words in the tests above meaning the following:

1. a wound resulting from any sharp object penetrating into the skin, soft tissues, and organs with the injury deeper than it is wide on the surface of the skin

2. the inability to rest or relax as a result of anxiety or boredom

3. a rapid and intense onset of withdrawal symptoms initiated by medication as part of addiction treatment

4. a state of the skin caused by cold, fear, or excitement, in which small bumps appear on the surface as the hairs become erect; goose pimples

5. nervous or unable to relax

6. a state of calm or sleep produced by a sedative drug

Exercise 6. Insert the word combinations from the box into the text below:

cancer	**withdrawal symptoms**	**signs of pain**	**cause addiction**	**pain relievers**	**muscle aches**

Pain medications work best if they are used when the first … occur. If you wait until the pain has worsened, the medication may not work as well.

If patients have ongoing pain (such as due to **…**), they may be prescribed to take long-acting opioid medications. In this case, morphine might be used for sudden (breakthrough) pain only as needed. Other **…** (such as acetaminophen, ibuprofen) may also be prescribed with morphine.

Suddenly stopping this medication may cause withdrawal, especially if the patient has used it for a long time or in high doses. To prevent withdrawal, the dose might be lowered slowly.

… may include restlessness, mental/mood changes (including anxiety, trouble sleeping, thoughts of suicide), watering eyes, runny nose, nausea, diarrhea, sweating, **….**, or sudden changes in behavior.

When morphine is used for a long time, it may not work as well. Though it helps many people, this medication may sometimes **….** This risk may be higher if patients have a substance use disorder (such as overuse of or addiction to drugs/alcohol).

9.3. PHARMACOLOGY

Part 3

Exercise 1. Active Vocabulary

Verbs	Nouns	Adjectives	Adverbs	Conjunctions/ Prepositions
affect	constipation	biliary	however	against
complain	department	efficient		along with
deliver	derivative	incompatible		in order to
eliminate	edemata	intermittent		within
enable	heartburn	numerous		

face	level	subcutaneous		
remedy	manifestation	unbearable		

Exercise 2. Krok tests:

1. Ascarid eggs have been detected during stool analysis. What drug should be prescribed?
A. Mebendazole
B. Nystatin
C. Chloramphenicol
D. Tetracycline
E. Furazolidone

2. A patient with chronic heart failure with edema has increased level of blood aldosterone. What diuretic would be most effective in this case?
A. Spironolactone
B. Triamterene
C. Acetazolamide
D. Hydrochlorothiazide
E. Furosemide

3. What drug will be most appropriate for the patient who has chronic gastritis with increased secretion?
A. Pirenzepine
B. Pancreatine
C. Pepsin
D. Aprotinin
E. Chlorphentermine

4. A child was born asphyxiated. What drug must be administered to the newborn to stimulate breathing?
A. Aethimizolum
B. Lobeline
C. Prazosin
D. Atropine
E. Proserine

5. A patient who had been taking diclofenac sodium for arthritis of mandibular joint developed an acute condition of gastric ulcer. Such side effect of this medicine is caused by inhibition of the following enzyme:
A. Cyclooxygenase-1 (COX-1)
B. Cyclooxygenase-2 (COX-2)
C. Lipoxygenase
D. Phosphodiesterase
E. Monoamine oxidase

6. A 26-year-old female patient with bronchitis has been administered a broad spectrum antibiotic as a causal treatment drug. Specify this drug:
A. Doxycycline
B. Interferon

C. BCG vaccine
D. Ambroxol
E. Dexamethasone

7. A 68-year-old patient consults a cardiologist, complaining of high arterial blood pressure, pain in the heart region, intermittent pulse. Prescribe the β_1-adrenoreceptor blocker for the treatment of the described pathology:
A. Metoprolol
B. Morphine hydrochloride
C. Nootropil
D. Fenoterol
E. Benzylpenicillin

8. A 60-year-old male patient has type II diabetes. A doctor has prescribed him synthetic hypoglycemic long-acting drug that is sulfonylurea derivative. What drug is it?
A. Glibenclamide
B. Butamide
C. Metformin
D. Actrapid (soluble insulin)
E. Acarbose

9. A patient complains of photoreception disorder and frequent acute viral diseases. He has been prescribed a vitamin that affects photoreception processes by producing rhodopsin, the photosensitive pigment. What vitamin is it?
A. Retinol acetate
B. Tocopherol acetate
C. Pyridoxine hydrochloride
D. Cyanocobalamin
E. Thiamine

10. A 30-year-old patient with a past history of virus B hepatitis complains of prolonged nosebleeds. What drug will be most efficient in remedying this condition?
A. Vicasolum
B. Fraxiparine
C. Folic acid
D. Dipiridamol
E. Asparcam

11. A girl receives antibiotics of the penicillin group for acute bronchitis. On the third day of treatment she developed allergic dermatitis. Which drug should be administered?
A. Loratadine
B. Cromolyn sodium
C. Beclomethasone
D. Ephedrine hydrochloride
E. Levamisole

12. A patient with biliary dyskinesia and constipations has been prescribed a cholagogue having also a laxative effect. What drug has been administered?
A. Magnesium sulfate

B. Allochol
C. Cholosas
D. Cholenzyme
E. Nicodinum

13. A patient with urolithiasis has unbearable spasmodic pain. To prevent pain shock, he has been given an injection of atropine along with a narcotic analgesic having antispasmodic effect. What drug was it?
A. Promedol
B. Nalorphine
C. Tramadol
D. Ethylmorphine hydrochloride
E. Morphine hydrochloride

14. A 66-year-old patient with Parkinson's disease shows an improvement in locomotor activity after prolonged use of a certain drug which is converted to dopamine by the decarboxylation. What drug has the patient taken?
A. Levodopa
B. Naloxone
C. Celecoxib
D. Droperidol
E. Chlorpromazine

15. A patient has been administered an antiinflammatory drug that blocks the action of cyclooxygenase. Specify this antiinflammatory agent:
A. Aspirin
B. Analgene
C. Allopurinol
D. Thiamin
E. Creatine

16. A 12-year-old child has a viral infection complicated by obstructive bronchitis. Bronchospasm can be eliminated by inhalations of a drug from the following pharmacological group:
A. β_2-agonists
B. *M* -anticholinergics
C. *N* -cholinomimetics
D. β_2-adrenergic blockers
E. Analeptics

17. A patient has recurrent attacks of epileptic seizures and stays unconscious between them. In order to stop convulsions the drugs of the following group should be used in the first place:
A. Tranquilizers
B. Neuroleptics
C. Muscle relaxants
D. Sedatives
E. Analeptics

18. A patient with arthritis and varicose veins has been taking a non-steroidal antiinflammatory drug for a long time, which caused thrombosis of skin veins. Which of the following drugs might have

caused this complication?
A. Celecoxib
B. Indomethacin
C. Aspirin
D. Phenylbutazone
E. Ibuprofen

19. Examination of a child who hasn't got fresh fruit and vegetables during winter revealed numerous subcutaneous hemorrhages, gingivitis, carious cavities in teeth. What vitamin combination should be prescribed in this case?
A. Ascorbic acid and rutin
B. Thiamine and pyridoxine
C. Folic acid and cobalamin
D. Riboflavin and nicotinamide
E. Calciferol and ascorbic acid

20. A patient suffering from chronic hyperacidic gastritis takes an antacid drug for heartburn elimination. After its ingestion the patient feels better but at the same time he has a sensation of stomach swelling. Which of the following drugs might be the cause of such side effect?
A. Sodium hydrocarbonate
B. Magnesium oxide
C. Magnesium trisilicate
D. Aluminium hydrooxide
E.Pepsin

21. A 63-year-old patient with collapse presentations was delivered to the emergency hospital. A physician has chosen noradrenalin against hypotension. What is its mechanism of action?
A. Activation of α_1-adrenoreceptors
B. Activation of serotonin receptors
C. Activation of β-adrenoreceptors
D. Activation of dopamine receptors
E. Block of *M* –cholinoreceptors

22. A patient suffering from syphilis has been treated with bismuth preparations. As a result of it some grey spots turned up on the mucous membrane of the oral cavity; nephropathy symptoms were also present. What drug should be used for treatment of bismuth intoxication?
A. Unithiol
B. Methylene blue
C. Naloxone
D. Bemegride
E. Nalorphine

23. A 20-year-old patient complains of morbid thirst and hyperdiuresis (up to 10 l daily). Glucose concentration in blood is normal but it is absent in urine. The patient has been diagnosed with diabetes insipidus. What hormonal drug is the most appropriate for management of this disorder?
A. Vasopressin
B. Cortisol
C. Thyroxin
D. Oxytocin

E. Insulin

24. A nurse accidentally injected a nearly double dose of insulin to a patient with diabetes mellitus. The patient lapsed into a hypoglycemic coma. What drug should be injected in order to help him out of coma?
A. Glucose
B. Lidase
C. Insulin
D. Somatotropin
E. Noradrenaline

25. A patient has a slowly healing fracture. What medicine can be used to accelerate formation of connective tissue matrix?
A. Methyluracil
B. Prednisolone
C. Cyclophosphan
D. Methotrexate
E. Cyclosporine

26. After the second abortion a 23-year-old woman has been diagnosed with toxoplasmosis. Which drug should be used for toxoplasmosis treatment?
A. Co-trimoxazole
B. Itraconazole
C. Mebendazole
D. Azidothimidine
E. Acyclovir

27. After 4 months of treatment for tuberculosis the patient began complaining of toes and fingers numbness, sensation of creeps. He was diagnosed with polyneuritis. What antituberculous drug might have caused these complications?
A. Isoniazid
B. Rifampicin
C. Ciprofloxacin
D. Sodium salt of benzylpenicillin
E. Alcohol iodine solution

28. A patient with epilepsy and depressive reaction has been administered a drug that reduced epilepsy manifestations and improved the patient's psychic condition.
A. Sodium valproate
B. Ethosuxemide
C. Amitriptyline
D. Phenytoin
E. Phenobarbital

29. A patient diagnosed with morphinism has been admitted to the narcological department. A doctor noted a decrease in pharmacological activity of morphine. Repetitive use of a drug may result in tolerance to its effect, and this phenomenon is called:
A. Addiction
B. Cumulation

C. Tachyphylaxis
D. Antagonism
E. Allergy

30. A patient suffers from stenocardia and takes isosorbide mononitrate. He was prescribed a complementary drug with disaggregating effect. What drug is it?
A. Acetylsalicinic acid
B. Nitroglycerine
C. Propranolol
D. Nifedipine
E. Validol

31. In spite of treatment with cardiotonics and thiazide diuretic a patient suffering from chronic cardiac failure still presents with edemata and faces a risk of ascites. What medication should be administered in order to increase the diuretic effect of the above mentioned drugs?
A. Spironolactone
B. Furosemide
C. Amiloride
D. Clopamide
E. Manithol

32. A patient underwent appendectomy. In the postoperative period he has been taking an antibiotic. The patient complains about hearing impairment and vestibular disorders. What group of antibiotics has such by-effects?
A. Aminoglycosides
B. Penicillins
C. Tetracyclines
D. Macrolides
E. Cephalosporins

33.A patient consulted a dentist about itching and burning in the oral cavity; high temperature. The patient was diagnosed with trichomonal gingivostomatitis. What drug should be chosen for his treatment?
A. Metronidazole
B. Ampicillin
C. Doxycycline hydrochloride
D. Gentamicin sulfate
E. Nystatin

34. A patient suffers from pulmonary tuberculosis. During treatment neuritis of visual nerve arose. What drug has caused this by-effect?
A. Isoniazid
B. Ethambutol
C. Kanamycin
D. Rifampicin
E. Streptomycin

35. A patient with ischemic heart disease has been administered an antianginal drug that reduces the myocardial oxygen consumption and improves blood supply of myocardium. What drug is it?

A. Nitroglycerine
B. Validol
C. Propranolol
D. Promedol
E. Retabolil

36. A patient with diabetes mellitus complicated by angiopathy has been recommended a drug which is a sulphonyl urease derivate of the second generation. It improves microcirculation and is known for its relatively good tolerance. What drug is it?
A. Glibenclamide
B. Glibutidum
C. Insulin
D. Acarbose
E. Adrenalin

37. A 30-year-old patient complains about having abdominal pain and diarrhea for five days; body temperature rise up to 37*,* 5^{o}C along with chills. The day before a patient had been in a forest and drunk from an open water reservoir. Laboratory analyses enabled to make the following diagnosis: amebic dysentery. What is the drug of choice for its treatment?
A. Metronidazole
B. Furazolidonum
C. Levomycetin
D. Phthalazol
E. Emetine hydrochloride

38. A patient suffering from stomach ulcer has been treated with an antacid drug almagel. For acute bronchitis treatment he was prescribed the antibiotic methacycline. However within next 5 days the fever didn't fall, cough and sputum nature remained unchanged. The physician came to the conclusion that the drugs were incompatible. What type of drug incompatibility is the case?
A. Pharmacokinetic, absorption stage
B. Pharmacokinetic, biotransformation stage
C. Pharmaceutic
D. Pharmacodynamic
E. Direct antagonism

39. A patient with essential hypertension has a high rate of blood renin. Which of antihypertensive drugs should be preferred?
A. Lisinopril
B. Propranolol
C. Prazosinum
D. Nifedipine
E. Dichlothiazide

40. A patient with cardiogenic shock, hypotension, asphyxia and edemata was given an injection of non-glycosidic cardiotonic. What drug was injected?
A. Dobutamine
B. Caffeine sodium benzoate
C. Cordiamin
D. Aethimizolum

E. Bemegride

Exercise 3. Find synonyms of the following words in the tests:

urinative		bring	
primary hypertension		wide	
efficient		epistaxis	
suitable		treat	
respiration		obstipation	

Exercise 4. Fill the table with the missing parts of speech:

Verb	Noun	Adjective	Adverb
		destructive	
list			
	conclusion		
supply			
		visual	
face			
	response		
enable			
	choice		
change			

Exercise 5. Match the terms with their definitions:

1) broad spectrum antibiotic	a) occasional beats are skipped, caused by conditions such as premature atrial contractions, premature ventricular contractions, and atrial fibrillation. Synonym: irregular pulse.
2) intermittent pulse	b) an escape of blood from a ruptured blood vessel.
3) biliary dyskinesia	c) sometimes called a flaccid.
4) hemorrhages	d) acts on the two major bacterial groups, gram-positive and gram-negative, or any antibiotic that acts against a wide range of disease-causing bacteria.
5) elimination	e) is a substance which neutralizes stomach acidity and is used to relieve heartburn, indigestion or an upset stomach.
6) antacids	f) an abnormal or excessive thirst, or a craving for unusual forms of drink.
7) atonic bladder	g) is a disorder of some component of biliary part of the digestive system in which bile physically can not move normally in the proper direction through the tubular biliary tract.
8) morbid thirst	h) the complete removal or destruction of something.

Exercise 6. Read the questions and explanations:

1. Which one of the following is an established clinical use of morphine?

(A) Management of generalized anxiety disorders
(B) Relief of pain associated with biliary colic
(C) Pulmonary congestion
(D) Treatment of cough associated with use of ACE inhibitors
(E) Suppression of the ethanol withdrawal syndrome

Answer: C.

Morphine continues to be used in pulmonary congestion, in part because of its sedative (calming) and analgesic effects and also because of its vasodilating actions, which result in favorable hemodynamics in terms of cardiac and pulmonary function. Similarly, morphine is of value in an acute MI, especially its ability to relieve pain. However, morphine is not suitable for pain of biliary origin because it causes contraction of the sphincters of Oddi, leading to spasms. None of the other proposed indications are appropriate

2. A 40-year-old man was given a drug that binds to a subunit of the $GABA_A$ receptor. When used at a high dose, the drug can open Cl^-channels independent of GABA. What drug was the man given?

(A) Diazepam
(B) Ethanol
(C) Phenobarbital
(D) Baclofen
(E) Dronabinol

Answer: C.

Benzodiazepines, barbiturates, and ethanol all modulate the actions of the $GABA_A$ receptor, while baclofen works at the $GABA_B$ receptor, and dronabinol works on cannabinoid receptors. Of the $GABA_A$ drugs, only barbiturates have GABA-mimicking activity and this occurs at high doses. This is one of the reasons why barbiturates are a more dangerous group of drugs than benzodiazepines since benzos lack GABA-mimicking activity.

3. A hospital nurse is taking imipramine for a phobic anxiety disorder, and her patient is being treated with chlorpromazine for a psychotic disorder. Which of the following adverse effects is likely to occur in both of these individuals?

(A) Excessive salivation
(B) Pupillary constriction
(C) Orthostatic hypotension
(D) Seizure threshold
(E) Weight loss

Answer: C.

Orthostatic hypotension occurs with both tricyclic antidepressants and phenothiazines because both types of drug can block alpha-adrenergic receptors in venous beds. Their ability to block M receptors leads to xerostomia (not salivation) and mydriasis (not miosis). Tricyclics and phenothiazines also share a common tendency to decrease seizure threshold and cause weight gain (not loss).

Exercise 6.1 Answer the questions to the tests above:

1. Why is morphine used in pulmonary congestion?
2. Why is morphine not suitable for pain of biliary origin?
3. Which $GABA_A$ drugs have GABA-mimicking activity at high doses?
4. Why are barbiturates a more dangerous group of drugs than benzodiazepines?
5. Why does orthostatic hypotension occur with both tricyclic antidepressants and phenothiazines?

6. Do tricyclics and phenothiazines cause weight gain or weight loss?

Exercise 7. Read the text below and say if the statements under the text are true or false.

Barbiturates are medications that cause you to relax or feel drowsy. They can also stop or prevent convulsions and seizures. The most common uses are for anesthesia reasons, treating epilepsy and nonepileptic seizures, insomnia and other conditions.

Barbiturates belong to the sedative-hypnotic class of medications. Sedatives are medications that help you calm down and relax. Hypnotics make you drowsy (their name comes from the word "hypnos," which means "sleep" in Greek).

Barbiturates affect your brain by increasing a brain chemical called gamma-aminobutyric acid (GABA), which slows down the activity of your brain cells.

In years past, barbiturates were a common part of general anesthesia in surgeries. That's because these medications help ease a person into a deep sleep. Today, other medications do this job better.

However, barbiturates are still proven medications for treating many conditions. They also combine well with other medications like acetaminophen (Tylenol® or Paracetamol®) to treat certain conditions. The most common uses are:

- Preventing seizures.
- Treating insomnia.
- Pre-anesthesia sedation (they help a person fall asleep quickly and pleasantly) and anxiety reduction.
- Treating high cerebrospinal fluid pressure inside the skull (intracranial hypertension).

While barbiturates are useful for the above listed, some of these uses are less common in certain countries. For example, barbiturates are less common for pre-anesthesia in the United States because many newer drugs are more effective and have fewer side effects.

1. Barbitirates belong to CNS depressants.
2. They can never be used as anti-convulsants.
3. Barbiturates can help in insomnia.
4. Barbiturates are used only for anesthesia.
5. Sedatives relieve pain.
6. Hypnotics make you fall asleep.
7. Barbiturates slows down the activity of your brain cells.
8. Barbiturates are never combined with any other medications.
9. Barbiturates treat high blood pressure.
10. Barbiturates are not used as often as before because they are too expensive.

10. SYSTEMATIZATION OF THE COURSE: THE MAIN GROUPS OF TERMS USED IN PHARMACY

EXERCISE 1. READ THE TEXT

DIABETES

Diabetes mellitus, often simply diabetes, is a group of metabolic diseases in which a person has high blood sugar, either because the body does not produce enough insulin, or because cells do not respond to the insulin that is produced. At least 171 million people worldwide suffer from diabetes, or 2.8% of the population.

There are three main types of diabetes:

Type 1 diabetes results from the body's failure to produce insulin, and presently requires the person to inject insulin (insulin-dependent diabetes mellitus, IDDM for short, and juvenile diabetes). Type 1 diabetes is partly inherited and then triggered by certain infections.

Type 2 diabetes results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency (non-insulin-dependent diabetes mellitus and adult-onset diabetes). Type 2 diabetes is due primarily to lifestyle factors and genetics, particularly excessive body weight and not enough exercise.

Gestational diabetes is when pregnant women who have never had diabetes before, have a high blood glucose level during pregnancy. It may precede development of type 2 DM.

The classical symptoms of diabetes are polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger). The other symptoms are:

- unexplained weight loss;
- presence of ketones in the urine (ketones are a byproduct of the breakdown of muscle and fat that happens when there is not enough available insulin);
- fatigue;
- irritability;
- blurred vision is a common complaint leading to a diabetes diagnosis; Type 1 should always be suspected in cases of rapid vision change, whereas with Type 2 change is generally more gradual;
- slow-healing sores;
- frequent infections, such as gums or skin infections and vaginal infections.

Symptoms may develop rapidly (weeks or months) in type 1 diabetes while type 2 diabetes they usually develop much more slowly and may be subtle or absent. The elevated plasma glucose levels cause marked glycosuria and diuresis resulting in dehydration.

Risk factors for Type 1 diabetes include: a family history (parent or sibling) of Type 1 diabetes; injury to the pancreas (such as by infection, tumor, surgery or accident); presence of autoantibodies (antibodies that mistakenly attack your own body's tissues or organs); physical stress (such as surgery or illness); illnesses caused by viruses.

Risk factors for Type 2 diabetes include: family history (parent or sibling) of Type 2 diabetes; overweight; high blood pressure; low HDL cholesterol (the "good" cholesterol); physically inactive; age 45 or older; gestational diabetes; a history of heart disease or stroke; being a smoker.

All forms of diabetes have been treatable since insulin became available in 1921, and type 2 diabetes may be controlled with medications. Both type 1 and 2 are chronic conditions that usually cannot be cured. Prevention and treatment involve a healthy diet, physical exercise and maintaining a normal body weight. Treatment regimens differ according to the diabetes type. All patients should be instructed in glucose self-monitoring.

The main complications of diabetes mellitus are diabetic retinopathy, diabetic neuropathy, diabetic nephropathy, foot ulcers. Serious long-term complications include cardiovascular disease, stroke, chronic kidney failure and damage to the eyes.

Exercise 2. Answer the questions to the text:

1. What is diabetes mellitus?
2. How many types of diabetes you know?
3. What is Type 1 diabetes?
4. What is Type 2 diabetes?
5. What is gestational diabetes?
6. When did insulin become available?
7. What are the symptoms of diabetes?
8. What are the risk factors for Type 1 and Type 2 diabetes?
9. How is diabetes controlled?
10. What are the main complications of diabetes?

Exercise 3. Say if the statements are true or false according to the text:

1. Diabetes mellitus is characterized by high blood sugar level.
2. It's a very common disease in the world.
3. There are 2 types of diabetes.
4. Gestational diabetes is diabetes in young children
5. Polydipsia is a classical symptom of diabetes.
6. In type 1 diabetes symptoms develop slowly.
7. Diabetes is an infectious disease
8. Diabetes type 1 is controlled with insulin
9. All diabetic patients must control their level of blood sugar.
10. Diabetic retinopathy, diabetic neuropathy, diabetic nephropathy, foot ulcers are common complications of the disease.

Exercise 4. Read the text and answer the questions below:

AIDS

Acquired Immune Deficiency Syndrome

Human immunodeficiency virus (HIV) causes acquired immunodeficiency syndrome (AIDS), a condition in which progressive failure of the immune system contributes to life-threatening opportunistic infections which affect any organ system such as respiratory tract, digestive tract, endocrine system, etc.

HIV infection is considered pandemic by the World Health Organization (WHO) infecting about 0,6 % of the world's population.

Two main strains of HIV-1 and HIV-2 cause AIDS. HIV-1 is more common in the Western Hemisphere. Untreated HIV-1 cases eventually lead to AIDS. The patients die from opportunistic infections or malignant tumours associated with the progressive failure of the immune system. HIV-2 is more prevalent in West Africa and it is transmitted less easily and progresses less quickly to AIDS than HIV-1. In both strains, the virus may persist at low levels for years in a host without causing disease. The only sign of infection is the presence of antibodies against the virus. Once immunodeficiency occurs, if left untreated, death usually follows within 2 to 3 years of the first onset of symptoms.

The AIDS virus is transmitted through bodily fluids such as blood, breast milk, etc. Casual contact with the infected person doesn't result in the transmission of the virus. The most efficient methods of HIV transmission include sexual, sharing needles for IV drugs, and receiving transfusions of contaminated blood. An infected mother may pass the virus to her unborn child. Susceptibility to HIV infection increases if there is a break in the skin or mucous membrane, which allows the virus to enter the blood stream.

The stages of HIV infection are acute infection (also known as primary infection), latency (window period) and AIDS. During 2-4 weeks post-exposure a person may develop an influenza-like illness, the symptoms of which may include fever, swollen lymph nodes, and pharyngitis, rash and last for several weeks. The latency stage involves few or no symptoms at all and can last from 2 weeks to 20 years. AIDS, the final stage of HIV infection, is defined by various opportunistic infections and cancers that finally lead to deaths.

Untreated, HIV can progress to AIDS within a decade and, without treatment, life expectancy after diagnosis is about 3 years.

This may be shorter if the person develops a severe opportunistic illness. However, treatment with antiretroviral drugs can prevent AIDS from developing.

If AIDS does develop, it means that the immune system is severely compromised, that is, weakened to the point where it can no longer successfully respond against most diseases and infections.

People living with AIDS are vulnerable to a wide range of illnesses, including:

- pneumonia
- tuberculosis

- oral thrush, a fungal condition in the mouth or throat
- cytomegalovirus (CMV), a type of herpes virus
- cryptococcal meningitis, a fungal condition in the brain
- toxoplasmosis, a brain condition caused by a parasite
- cryptosporidiosis, a condition caused by an intestinal parasite
- cancer.

The shortened life expectancy linked with untreated AIDS is not a direct result of the syndrome itself. Rather, it is a result of the diseases and complications that arise from having an immune system weakened by AIDS.

There is currently no available vaccine for HIV or cure for HIV or AIDS. The only known methods of prevention are based on avoiding exposure to the virus or an antiretroviral treatment which can just slow the course of the disease. Antiretroviral treatment reduces both the mortality and the morbidity of HIV infection. But, these drugs have some side-effects such as diarrhea, malaise, nausea and fatigue. They don't completely eradicate the virus, but can greatly prolong the lives of patients infected with HIV.

1. What is AIDS?
2. What systems does HIV damage?
3. What is the difference between two HIV strains?
4. How is HIV transmitted?
5. What are the stages of HIV infection?
6. What symptoms is each HIV stage characterized by?
7. What illnesses are AIDS patients vulnerable to?
8. What treatment for HIV or AIDS exists nowadays?
9. What is the action of antiretroviral drugs?
10. What are the adverse reactions of HIV drugs?

Exercise 5. Find the correct answers:

1. HIV destroys the … system first.
a) immune b) respiratory c) nervous d) circulatory

2. … strains of HIV cause AIDS.
a) 3 b)4 c)2 d) 6

3. Once immunodeficiency occurs and is not treated, death usually follows …years of the first onset of symptoms.
a) 1-2 b) 2-3 c) 4-5 d) 10-11

4. The AIDS virus is transmitted …
a) by casual contact b) by talking c) through bodily fluids d) by sharing clothes

5. HIV infection stages are acute infection (also known as primary infection), latency (window period) and …
a) the second stage b) AIDS c) HIV 2 d) death

6. During 2-4 weeks post-exposure a person may develop …
a) tumours b) ulcers c)influenza-like symptoms d) diarrhea

7. Treatment with … can prevent AIDS from developing.

a) antiretroviral drugs b)antibiotics c)barbiturates d) vitamins

8. People living with AIDS are NOT more vulnerable to … than others:
a) cancer b) tuberculosis c) caries d) toxoplasmosis

9. AIDS is a … disease.
a) bacterial b) infectious c) hereditary d)genetic

10) …is NOT a characteristic side-effect of AIDS.
a) diarrhea b)headache c)nausea d) fatigue

Exercise 6. Read the KROK tests:

1. An.....is a method of quantitative analysis for determining the concentration of an acid or base.
a) back titration b) acid - base titration c) direct titration d) displacement titration
2. An.....is a class of balance designed to measure small mass in the sub-milligram range.
a) analytical chemistry b) analytical analysis c) analytical determination d) analytical balance
3..... is an electrode of the device connected to the positive pole of battery.
a) anode b) cathode c) electrode d) wire
4..... is a nontoxic or minimally toxic gas which reduces or displaces the normal oxygen concentration in breathing air.
a) asphyxiating gas b) propan gas c) methane gas d) carbon monoxide
5..... occurs when two reagents are used - one that reacts with the original sample, and second that reacts with the first reagent.
a) acid - base titration b) back titration c) direct titration d) displacement titration
6..... is a generally cylindrical container with a flat bottom.
a) bottle b) test - tube c) beaker d) burette
7 .....is a squeeze bottle with a nozzle. It is used to rinse various pieces of laboratory glasswares.
a) flask b) syringe c) pipette d) bottle
8..... is a graduated glass tube with a tap at one end for delivering known volumes of a liquid, especially in titrations.
a) burette b) beaker c) test - tube d) bottle
9. Lead Nitrate and Sodium Potassium Iodine are..... that form a yellow precipitate for Lead Iodine.
a) gaseous solutions b) solid solutions c) colourless solutions d) liquid solutions
10..... is a piece of furniture where pharmaceutical glasswares are dried.
a) table b) dissicator c) scales d) items
11.....is a pharmaceutical item for storage of distilled water, solutions.
a) bottle b) flask c) pipette d) beaker
12..... is a form of volumetric analysis in which the formation of a coloured complex is used to indicate the end point of a titration.
a) complex formation titration b) direct titration c) back titration d) displacement titration
13.....is a strong, red colour, inclining to purple.
a) green colour b) black colour c) yellow colour d) crimson colour
14..... is a way to determine the contents of a substance quantitatively.

a) direct titration b) back titration c) complex formation titration d) displacement titration
15..... is a second titration for metal ions that do not have a good indicator.
a) direct titration b) complex formation titration c) displacement titration d) back titration
16.....is a colourless liquid organic compound with the chemical formula CH3COOH.
a) sulphuric acid b) acetic acid c) oxalic acid d) uric acid
17.....is the organic compound with the formula(CH3)2CO.
a) acetone b) acetyl c) acetylene d) alcohol
18.....are non-aromatic compounds.
a) aldehyde b) acrylonitrile c) acidic d) aliphatic hydrocarbon
19..... is the amino acid that has a single hydrogen atom as its side chain.
a) anion b) aniline c) glycerol d) aromatic
20..... substance doesn't contain water.
a) anhydride b) anhydrous c) asymmetric d) butyl
21.....is a organic compounds bearing the functional group R-N=N-R'.
a) benzene b) camphor c) carbohydrate d) azo dye
22.....is a molecule that features two joined rings.
a) bicyclic molecule b) monatomic molecule c) macromolecular molecule d) neutral molecule
23.....is the association of a pair of homologous chromosomes physically held together by at least one DNA crossover.
a) bonding b) carbonic c) bivalent d) cation
24.....is a lasting attraction between atoms, ions or molecules that enables the formation of chemical compounds.
a) bond b) chlorination c) coal d) configuration
25.....is a colourless liquid with a "sweet" smell that can be detected at low levels.
a) amine b) carbon tetrachloride c) benzoic acid d) azo dye
26..... is an organic compound that contains a carboxyl group (C(=O)OH).
a) uric acid b) sulphuric acid c) acetic acid d) carboxylic acid
27.....is the lightweight black carbon and ash residue hydrocarbon produced by removing water and other volatile constituents from animal and vegetation substances.
a) coal b) dust c) charcoal d) sawdust
28.....is an acid compound found in citrus fruits.
a) citric acid b) sulphuric acid c) acetic acid d) oxalic acid
29..... is the change of the physical state of matter from gas phase into liquid phase.
a) cellulose b) carbonic c) anthracene d) condensation
30.....is a system of connected p orbitals with delocalized electrons in a molecule, which in general lowers the overall energy of the molecule and increases stability.
a) contraction b) conjugation c) cycle d) cyanide
31..... has to do with the uses of aggravated conditions of heat, humidity, oxygen, sunlight, vibration which speed up the normal aging processes of items.
a) accelerated ageing b) activation energy c) boiling temperature d) conjugation
32.....is a general process in which molecules separate or split into smaller particles such as atoms, ions or radicals, usually in a reversible manner.
a) association b) dissociation c) splitting d) combination
33 ……replicates the work of the real kidney.
a) artificial stomach b) artificial liver c) artificial rectum d) artificial kidney

34.....of an object is the total displacement during some extended period of time, divided by that period of time.
a) average placement b) average movement c) average displacement d) average constituent
35..... is a four carbon acid, CH3CH2CH2COOH, with an unpleasant odor.
a) butiric acid b) oxalic acid c) sulphuric acid d) acetic acid
36.....is defined as the concentration of surfactants above which micelles form and all additional surfactants added to the system.
a) charge b) chain c) critical concentration of micelle - forming d) coalescence
37..... is distributed in the form of small particles (crystals, threads, films or platelets, droplets, or bubbles) in the other, continuous phase, the dispersion medium. a) colloidal dispersion b) coarse - disperse system c) condition d) equation
38.....is the process by which organic substances are broken down into simpler organic matter.
a) composition b) structure c) combination d) decomposition
39.....water can make a liquid thinner or weaker.
a) mixed b) diluted c) transferred d) drop
40.....is a structure that appears on the surface of an object when it is exposed to a fluid.
a) single electrical layer b) third electrical layer c) double electrical layer d) fourth electrical layer
41..... is the electrical intensity or "pressure" developed by a source of electrical energy such as a battery or generator.
a) electrical current b) electromotive force c) electrical cable d) electrical power
42.....is soluble in both of fat and water and enables fat to be uniformly dispersed in water as an emulsion.
a) emulsifying agent b) equilibrium c) endothermal d) exchange
43.....is a type of vaporization that occurs on the surface of a liquid as it changes into the gas phase when it reaches its boiling point.
a) dimension b) emulsion c) evaporation d) decomposition
44.....is the ease at which the material can be fused together or to the temperature or amount of heat required to melt a material.
a) fusibility b) mobility c) stationary d) movement
45.....is a method of rapid elimination of cholesterol from the plasma.
a) absorption b) adsorption c) hemosorption d) option
46..... is a collection of health effects that are present within 24 hours of exposure to high doses of ionizing radiation.
a) radiation b) acute radiation sickness c) X - ray d) sickness
47..... are endocrine glands that produce a variety of hormones including adrenaline and the steroids - aldosterone and cortisol.
a) adrenal glands b) thyroid glands c) genes d) membrances
48..... is a mass of cells that lack the ability to invade neighboring tissue or metastasize.
a) cancer b) decomposition c) benign tumor d) swelling
49..... is the process by which blood changes from a liquid to a gel, forming a blood clot.
a) blood contamination b) blood poisoning c) blood change d) blood coagulation
51.....is the maximum quantity of oxygen that will combine chemically with the hemoglobin in a unit volume of blood.

a) blood oxygen capacity b) hydrogen c) oxygen d) hemoglobin

52..... is a resilient and smooth elastic tissue, a rubber-like padding that covers and protects the ends of long bones at the joints.

a) catarrhal b) burn c) bleeding d) cartilage

53..... occurs when the blood supply to part of your brain is interrupted or reduced.

a) arterial hyperemia b) atrophy c) cerebral stroke d) cyanosis

54.....is the process by which blood changes from a liquid to a gel, forming a blood clot.

a) clotting b) cortex layer c) brain d) forehead

55..... is a therapy technique used in physical therapy, where blockage of blood in an area of the body is deliberately made.

a) cerebral stroke b) compression ischemia c) consciousness d) decompression

56.....is an anatomical term for loose connective tissue composed of adipocytes.

a) adipose tissue b) absorption c) adsorption d) evaporation

57..... is a homodimeric protein enzyme of 86 kilodaltons.

a) alkaline battery b) alkaline c) biliary obstruction d) alkaline phosphatese

58.....are steroid acids found predominantly in the bile of mammals and other vertebrates.

a) sulphuric acids b) bile acids c) uric acids d) acetic acids

59. …….blocks the bile ducts, which carry bile to the small intestine for digestion and waste removal.

a) chylomicron b) citric acid c) biliary obstruction d) tricarboxylic acid cycle

60..... is interruption of a chemical pathway owing to one chemical substance inhibiting the effect of another by competing with it for binding or bonding. a) competitive inhibition b) exudation c) decomposition d) composition

61..... is a cell that displays antigen complexes with major histocompatibility complexes (MHCs) on their surfaces.

a) accessory cell b) dead cell c) alive cell d) cell

62.....is a fruit in which some of the flesh is derived not from the ovary but from some adjacent tissue exterior to the carpel.

a) vegetable b) food c) aggregate -accessory fruit d) dairy product

63.....are the most diverse group of land plants.

a) anisocytic b) annual plants c) apical meristem d) angiosperms

64..... is a plant collected from the phloem or bast surrounding the stem of certain dicotyledonous plants.

a) fiber b) bast fiber c) cartilage d) flower

65.....is a flowering plant that takes two years to complete its biological lifecycle.

a) annual plant b) flowering plant c) addition root d) biennial plant

66.....is a zygomorphic, sympetalous corolla with the limb divided into two lips.

a) bilabiate corolla b) collateral bundle c) collenchyma d) companion cell

67..... is a fruit with a large "stone" inside.

a) bundle b) root c) stone - fruit d) stem

68..... are a division of vascular land plants containing a single extant class.

a) cutinization b) cystoliths c) buds d) conifers

69..... is a rounded underground storage organ consisting of a swollen stem base

covered with scale leaves.
a) corymb b) corm c) conifer d) branch
70.....is a botanical term for an inflorescence with the flowers growing in such a fashion that the outermost are born on longer pedicels.
a) corymb b) corm c) bulb d) root
71..... include many types of cancer, particularly those of the bone marrow and blood cells (leukemia, lymphoma, multiple myeloma), and certain chronic infections.
a) acquired immunodeficiencies b) illnesses c) diseases d) disorder
72..... is a serious infectious disease caused by gram-positive, rod-shaped bacteria known as Bacillus anthracis.
a) hives b) ulcer c) anthrax d) pollution
73.....is a medication made up of antibodies against the tetanus.
a) artificial active immunity b) antitetanus immunoglobulin c) anti - viral drug d) autoclaving
74..... causes gastroenteritis, an inflammation of the gastrointestinal tract involving both of the stomach and the small intestine.
a) allergen b) antibiotic c) acute intestinal infection d) amoebic dysentery
75..... is a laboratory method to check for certain antibodies or antigens in a variety of body fluids including saliva, urine, cerebrospinal fluid, or blood. a) blood tellurium agar b) bactericidal c) anaerobic wound infection d) agglutination test
76.....is a disorder of sight due to the eye and brain not working well together.
a) ambiopia b) coli – index c) capsular bacteria d) bismuth sulfite agar
77.....inhibits the synthesis of mycolic acid, resulting in disruption of the bacterial cell walls.
a) penicillin b) antitetanus immunoglobulin c) anti - TB action d) blue - green pigment
78..... are germs. They are different in size and shape.
a) illnesses b) bacteria and fungi c) disorders d) contamination
79..... is a type of asexual reproduction in which a new organism develops from an outgrowth or bud due to cell division at one particular site.
a) budding reproduction b) colienteritis c) capsular bacteria d) amoebic dysentery
80..... is an infection caused by the bacterium Corynebacterium diphtheriae.
a) autoclaving b) allergens c) immunity d) causative agent of diphtheria