

MINISTRY OF HEALTH OF UKRAINE  
ODESA NATIONAL MEDICAL UNIVERSITY  
Department of Medical Biology and Chemistry

**CONFIRMED** by  
Vice-rector for scientific and  
pedagogical work  
Eduard BUBIACHKIVSKYI



**METHODOLOGICAL DEVELOPMENT  
TO THE PRACTICAL CLASSES ON THE EDUCATIONAL  
DISCIPLINE**

Faculty, course  
Specialty  
Academic discipline

**International faculty, 4 year**  
**226 «Pharmacy, industrial pharmacy»**  
**Biochemistry Of Essential Nutrients**

The program was approved:  
at a meeting of the Department of Medical biology and chemistry  
Odesa National Medical University

Minute № 1 dated 26 august 2024

Head of Department \_\_\_\_\_

(signature)

Hennadii STEPANOV

***Developers:***

Head of the department, associate professor of the department, Ph.D., Stepanov H.F.  
associate professor of the department, Ph.D., Storchylo O.V.  
senior teacher, PhD Vasylieva A.G.  
senior teacher, Kostina A.A.

## *Practical lesson No. 1*

**Topic:** Nutritional biochemistry. Food components.

**Goal:** Learning the basic anatomical and physiological foundations of nutrition.

**Basic concepts:** nutrients, phytonutrients, antinutrients, Micronutrients

**Equipment:** demonstration materials of the department

### **Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

1. Anatomical and physiological basis of nutrition.

2. The body's need for nutrients.

3. Definition of "Nutritionology" concepts. Purpose, object, tasks of nutrition science.

4. Definition of the terms "Nutrients", "Macronutrients", "Micronutrients".

The acquirer must be able to:

- conduct search for potential and new sources of essential nutrients

- substantiation of rational nutrition, reducing the level of diseases, associated with violation of nutritional status

- indications for the use of dietary fibers

Questions to check basic knowledge on the topic of the lesson:

- The concept of replaceable and irreplaceable food substances.

- food fibers, ballast substances.

- the effect of refined foods.

- the importance of vitamins, amino acids, and minerals in a balanced diet.

- the history of the creation of the first transgenic plants.

- criteria and methodological principles for assessing the safety of food products from genetically modified sources.

- formation of professional skills.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

- anatomical and physiological basis of nutrition.

- the body's need for nutrients.

- definition of the term "Nutritionology".

- the goal, object, tasks of nutrition science.

- definition of the terms "Nutrients", "Macronutrients", "Micronutrients".

- nutritional value of trace elements

- optimal amount of the main energy nutrients

Test tasks (Appendix 1).

3. Formation of professional skills and abilities.

Formation of biochemical bases of healthy nutrition; understanding of processes of intake and digestion of nutrients in the body to provide it with energy and structural components and the biochemical basis of the regulation of human eating behavior and biochemical aspects of dietetics.

4. Summing up.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
2. Lunyova H.G. Clinical biochemistry. – Magnolia, 2021. – 400 p.
3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonsky – Ternopil: TDMU, 2019. – 732 p.
4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

Auxiliary

1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.
2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.
3. Functional biochemistry/ edited by N. O. Sibirnoi. - LNU, 2018. - 644 p.

Electronic information resources:

1. <https://info.odmu.edu.ua/chair/biology/>
2. <http://libblog.odmu.edu.ua/>
3. <https://moodle.odmu.edu.ua/login/index.php>

## *Practical lesson No. 2*

**Topic:** Biochemical aspects of the regulation of eating behavior and processes digestion

**Goal:** Study biochemical bases of digestion and absorption of nutrients

**Basic concepts:** biocatalysis, digestive enzymes, nutritional genomics

**Equipment:** demonstration materials of the department

**Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).
2. Control of the reference level of knowledge.

The acquirer must know:

- the organization and interrelationship of the action of enzymes of the gastrointestinal tract;
- peculiarities of the action of individual forms of enzymes and their importance in the digestion of nutrients;
- basics of enzyme diagnostics and enzyme therapy;
- enzyme systems that are damaged in the most common enzyme diseases.
- concepts of nutritional genomics;

The acquirer must be able to:

- make an assumption about a possible pathology based on the analysis of enzyme activity.
- to determine the criteria and methodological principles for assessing the safety of food

Questions to check basic knowledge on the topic of the lesson:

- compartmentalization of enzymes;
- mechanisms of absorption of digestion products;
- Enzymodiagnosics and its role in medical practice;
- Enzyme therapy and its significance in medicine;
- Isoenzymes, their importance in biocatalysis;

3. Formation of professional skills and abilities.

To teach to determine the criteria and methodological principles for assessing the safety of food products from genetically modified sources.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

- Mechanisms of carbohydrate digestion and absorption
- Mechanisms of digestion and absorption of lipids. The role of bile acids.
- Mechanisms of protein digestion and absorption. The role of NSI in protein digestion.
- The concept of nutritional genomics
- Enzyme therapy for hereditary pathology

Test tasks (Appendix 1).

4. Summary:

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.

2. Lunyova H.G. Clinical biochemistry. – Magnolia, 2021. – 400 p.

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### *Practical lesson No. 3*

**Topic:** Carbohydrates as components of food and their role in the formation of health.

**Goal:** to study biological role of carbohydrates in human nutrition

**Basic concepts:** metabolism, catabolism, anabolism, galactosemia, glycogenesis

**Equipment:** demonstration materials of the department

#### **Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- biological role of carbohydrates in human nutrition;
- main carbohydrate components of food;
- the main metabolic ways of using carbohydrates as the main source of energy;
- recommended average rates of carbohydrates in the daily diet
- features of carbohydrate metabolism in normal and pathological conditions.

The acquirer must be able to:

- calculate the energy balance of glucose oxidation;
- explain, what leads to insufficient consumption of sweet carbohydrates;
- explain, what leads to an excess of carbohydrates in the diet.

Questions to check basic knowledge on the topic of the lesson:

- ways of carbohydrate metabolism in the human body.
- glycolysis, glycogenolysis, glycogenesis, gluconeogenesis.
- oxidative decarboxylation of pyruvate.
- glycogenesis.

3. Formation of professional skills and abilities.

One of the main tasks of training medical students is the formation of clinical thinking, which allows them to work independently with patients both during their studies at senior courses and during internships. Control over the assimilation of knowledge should be a mandatory part of each lesson, which serves to unify the training of doctors, to improve the quality of medical education, the relevance of which cannot be doubted at present. Undoubtedly, test control is indispensable for assessing knowledge in classes, as it takes a minimum amount of time and concerns various issues. Test control also serves as an objectification of the assessment of the knowledge of each student. Test control within the framework of each topic allows the teacher to form a complete picture of the level of preparation of each student and to plan an individual approach to the acquisition of knowledge and skills in the process of further education.

Therefore, the combination of directly examining the topic of the lesson, monitoring the assimilation of knowledge and conducting test control are the main components for the formation of clinical thinking in future doctors.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Biological role of carbohydrates in human nutrition.
2. The main carbohydrate components of food.
3. The main metabolic ways of using carbohydrates as the main source of energy.
4. Peculiarities of carbohydrate metabolism in normal and pathological conditions.

Test tasks (Appendix 1).

4. Summary:

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
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#### *Practical lesson No. 4*

**Topic:** Lipids as components of food and their role in the formation of health

**Goal:** Formation of systemic knowledge about the role lipids in human nutrition.

**Basic concepts:** lipids, biomembranes, lipolysis, fatty acid profile of nutrition.

**Equipment:** demonstration materials of the department.

**Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).
2. Control of the reference level of knowledge.

The acquirer must know:

- biological role of lipids in human nutrition;
- main lipid components of food;
- peculiarities of lipid metabolism in normal and pathological conditions;
- recommended average rates of lipids in the daily diet
- integrative mechanisms of functioning of  $\omega$ -3 fatty acids and mitochondria

- peculiarities of lipid metabolism in normal and pathological conditions.
- fatty acid profile of nutrition
- unsaturated fatty acids: vital or toxic

The acquirer must be able to:

- calculate the energy balance of glycogen oxidation and VLDL;
- explain the fatty acid profile of nutrition;
- explain, what leads to lack of fats in food
- explain, what leads to PUFA deficiency in food products
- explain, what leads to excessive use of fats with food products

Questions to check basic knowledge on the topic of the lesson:

- ways of lipid exchange in the human body.
- tissue lipolysis, oxidation of glycerol and VHL.
- metabolism and biotransformation of cholesterol.
- transport forms of lipids in the blood. Their structure.
- sphingolipidosis.

### 3. Formation of professional skills and abilities.

One of the important components of the training of future doctors is the development of clinical thinking - the ability to transform the acquired knowledge into the ability to apply it in practical activities. In contrast to test tasks, consideration of the topic of the lesson directly carries not only the function of knowledge control, but also a significant element of training and development of the thinking of future specialists

Undoubtedly, test control is indispensable for assessing knowledge in classes, as it takes a minimum amount of time and concerns various issues. Test control also serves as an objectification of the assessment of the knowledge of each student. Test control within the framework of each topic allows the teacher to form a complete picture of the level of preparation of each student and to plan an individual approach to the acquisition of knowledge and skills in the process of further education.

Therefore, the combination of directly examining the topic of the lesson, monitoring the assimilation of knowledge and conducting test control are the main components for the formation of clinical thinking in future doctors.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. biological role of lipids in human nutrition.
2. the main lipid components of food.
3. peculiarities of lipid metabolism in normal and pathological conditions;
4. recommended average rates of lipids in the daily diet
5. integrative mechanisms of functioning of  $\omega$ -3 fatty acids and mitochondria
6. peculiarities of lipid metabolism in normal and pathological conditions.
7. fatty acid profile of nutrition
8. unsaturated fatty acids: vital or toxic

Test tasks (Appendix 1).

4. Summary of the lesson. Assessment.
5. List of recommended literature

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook

for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.

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4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

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### ***Practical lesson No. 5***

**Topic:**Proteins as components of food and their role in the formation of health.

**Goal:**Formation of systematic knowledge about the role of proteins in human nutrition.

**Basic concepts:**"Complete protein". Positive and negative nitrogen balance. Integrated index of essential amino acids.

**Equipment:**demonstration materials of the department

#### **Plan:**

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- replaceable and essential amino acids
- biological role of proteins in human nutrition
- the concept of "complete protein"
- nitrogen balance in normal and pathological conditions.
- metabolism of essential amino acids.
- integrated index of essential amino acids.
- biological value of proteins

The acquirer must be able to:

- explain the role of glutathione in the transport of amino acids
- which are central nervous system mediators
- indicate the reactions of the metabolism of essential amino acids
- explain the role of biogenic amines
- explain the role of PALF in the metabolism of amino acids
- to predict the biological value of proteins

Questions to check basic knowledge on the topic of the lesson:



- ways of formation and maintenance of the pool of amino acids in the body.
- transport of amino acids into cells.
- deamination of amino acids. Mechanism of indirect deamination of L-amino acids.
- decarboxylation of amino acids: enzymes, physiological significance.
- Enzymopathies of protein metabolism

### 3. Formation of professional skills:

The modern training of doctors forms a predominantly therapeutic type of thinking in future specialists, while the trends in the development of medicine require the education of doctors who possess a preventive, prophylactic type of clinical thinking. Therefore, the material presented in the topic of the practical lesson will contribute to the formation of the preventive type of thinking of the future doctor.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Biological role of proteins in human nutrition.
2. The main protein components of food.
3. The main metabolic ways of using carbohydrates as the main source of energy.
4. Peculiarities of protein metabolism in normal and pathological conditions.
5. Positive and negative nitrogen balance.
6. Integrated index of essential amino acids
7. Prediction of the biological value of proteins

Test tasks (appendix 1):

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
2. Lunyova H.G. Clinical biochemistry. – Magnolia, 2021. – 400 p.
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4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

Auxiliary

1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.
2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.
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## Practical lesson No. 6

### **Topic:** Water-soluble vitamins as components of human nutrition. Bioflavonoids. Nutritional supplements

**Goal:** Study of the mechanism of action and biological role of this group of vitamins. Show the possibility of using them in practical medicine. Study biochemical bases of vitamin interventions in correcting the functioning of the methionine cycle

To train collectors on the quantitative determination of vitamin C in plant objects

Teach applicants how to qualitatively determine vitamins B1, B2, B6, PP.

Study of coenzyme forms of vitamins and their role in the catalytic activity of enzymes.

**Basic concepts:** vitamins, coenzymes, prosthetic group

**Equipment:** Laboratory of the department

#### **Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- what vitamins are, their biological role for the body
- distribution and daily requirement of water-soluble vitamins.
- peculiarities of absorption, transportation and chemical modifications of water-soluble vitamins in the human body.
- chemical composition and structure of vitamins;
- Symptoms and consequences of hypovitaminosis due to water-soluble vitamins.

The acquirer must be able to:

- to determine the amount of vitamin C in a plant object.
- to interpret the biochemical bases of vitamin interventions in correcting the functioning of the methionine cycle.
- to explain the experimental contradictions of the use of vitamin preparations.

Questions to check basic knowledge on the topic of the lesson:

- Coenzyme function of vitamins
- What are the groups of coenzymes?
- Differences of coenzymes from prosthetic groups
- The role of coenzymes in catalysis
- The structure of the most common coenzymes
- Causes of hypovitaminosis B1, B2, B6, PP.
- Symptoms of hypovitaminosis B1, B2, B6, PP and their consequences for the body.
- Which water-soluble vitamins are coenzymes?
- Sources of vitamin C, daily requirement. What does vitamin C cause?
- Nucleotide coenzymes.
- Coenzymes-phosphorus esters of vitamins.

3. Formation of professional skills and abilities.

3.1 Demonstration and practical work «*Qualitative reactions to vitamins B1, B2, B6, PP*».  
*Recommendations for performing tasks.*

### **A. Qualitative determination of thiamine**

The principle of the method: during oxidation, thiamine turns into thiochrome, which has the ability to fluoresce blue in ultraviolet light.

Work progress: 1. Oxidation of thiamine to thiochrome:

Pour 0.5 ml of 5% thiamine solution into the test tube, then 1.0 ml of 5% ferric cyanide and 2.0 ml of 10% NaOH solution. Mix thoroughly and leave for 10 minutes.

2. *Extraction of thiochrome:*

After 10 minutes, 1.0 ml of isobutyl alcohol is added to the test tube, shaken and allowed to settle for 5 minutes.

3. *Registration of indicators and conclusion:*

The test tube is brought to the source of ultraviolet light. A solution of thiochrome in isobutyl alcohol fluoresces blue.

### **B. Qualitative determination of riboflavin**

Principle of the method:

In ultraviolet light, riboflavin is able to fluoresce in a yellow-green color. When it is reduced with sodium hyposulfite, it loses this property.

The main stages of work performance.

1. *Preparation of material for research:*

Take 2 test tubes and label them "experiment" and "control". Pour 1.0 ml of 0.02% riboflavin solution into both test tubes.

2. *Restoration of riboflavin:*

A few crystals of sodium hyposulfite are added to the test tube marked "experiment". The solution turns from bright yellow to pale yellow.

3. *Comparative fluorometry:*

Both test tubes are raised to the source of ultraviolet light. Reconstituted riboflavin in a test tube does not fluoresce under ultraviolet light.

### **B. Qualitative determination of pyridoxine**

Principle of the method:

If iron chloride is added to the pyridoxine solution, a red color of the complex salt appears, similar to red iron phenolate.

The main stages of work performance.

1. *Preparation of material for research:*

Pour 0.5 ml of 5% pyridoxine solution into the test tube.

2. *Carrying out the reaction:*

Pour 0.5 ml of 5% ferric chloride solution into the test tube and shake it. The mixture turns red.

### **G. Qualitative determination of vitamin RR**

Principle of the method:

Nicotinic acid, when heated with a solution of copper acetic acid, forms a blue soluble precipitate of the copper salt of nicotinic acid.

The main stages of work performance.

1. *Preparation of material for research:*

Pour 1.0 ml of 1% nicotinic acid solution into the test tube.

2. *Formation of the copper salt of nicotinic acid:*

Add 1.0 ml of 5% copper acetic acid solution to the nicotinic acid solution. They stir. They heat up. A poorly soluble blue precipitate of the copper salt of nicotinic acid is formed.

*Requirements for work results.*

Enter the obtained data and calculations into the workbook.

Make medical and biological conclusions.

3.2. Demonstration and practical work "Quantitative determination of vitamin C in products according to the Tillmans method."

*Recommendations for performing tasks.*

Principle of the method: Determination of the content of vitamin C (ascorbic acid) is based on its reaction with 2,6-dichlorophenolindophenol. Using the change in color, based on the amount of the reagent spent on the oxidation of vitamin C, it is possible to determine its amount in the object under study.

Progress:

1. Preparation of material for research.

Take 1.0 g of rose hips or needles, grind it in a porcelain mortar, then add 10.0 ml of 2% hydrochloric acid. Quickly filter the hood to a dry flask.

2. Determination of content by titration.

Measure 3.0 ml of the filtrate into a conical flask and titrate with a 0.001 N solution of the sodium salt of 2,6-dichlorophenolindophenol to a pale pink color that does not disappear within 30 seconds.

The calculation is carried out according to the following formula:

$$C = , \text{ where } \frac{M \cdot 0,088 \cdot 10}{A \cdot B}$$

C is the concentration of vitamin C in the solution;

M is the amount of 2,6-dichlorophenolindophenol used for titration;

0.088 – the amount of vitamin C that binds 1 ml of 2,6-dichlorophenolindophenol;

10 – the number of hoods;

A is the amount of extract taken for titration;

B is the amount of researched material in

Conclusion: with the help of the described method, it is possible to determine the content of vitamin C in plant objects.

*Requirements for work results.*

Enter the obtained data into the workbook.

Make medical and biological conclusions.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Distribution and daily requirement of water-soluble vitamins.
2. Features of absorption, transportation and chemical modifications of water-soluble vitamins in the human body.
3. Biochemical bases of vitamin interventions in correcting the functioning of the methionine cycle.
4. Experimental contradictions in the use of vitamin preparations.
5. Pathology of vitamin metabolism

Test tasks (Appendix 1).

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
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Auxiliary

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## *Practical lesson No. 7*

### **Topic: Fat-soluble vitamins as components of human nutrition**

**Goal:** \_\_To study the mechanism of action and biological role of this group of vitamins. Show the possibility of using them in practical medicine.

Teach applicants how to qualitatively determine vitamins A, D, E, K.

**Basic concepts:** \_\_\_\_\_ fat-soluble vitamins, hypo- and hypervitaminosis, causes, consequences, symptoms

**Equipment:** \_\_\_\_\_ Laboratory of the department

#### **Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- know the role of each of the vitamins listed above in metabolism
- distribution and daily need of fat-soluble vitamins.
- peculiarities of absorption, transportation and chemical modifications of fat-soluble vitamins in the human body.
- violation of the balance of vitamins in the body

The acquirer must be able to:

- to qualitatively determine the vitamins in the studied sample.
- explain the violation of the balance of vitamins in the body.

Questions to check basic knowledge on the topic of the lesson:

- Characteristics of fat-soluble vitamins.
- What are carotenoids.
- The role of bile acids in the absorption of fat-soluble vitamins.
- Participation of fat-soluble vitamins in metabolism.

3. Formation of professional skills and abilities.

3.1 Demonstration and practical work «*Qualitative reactions to fat-soluble vitamins A, D, E, K (Vikasol)*».

*Recommendations for performing tasks.*

#### **A. Qualitative determination of vitamin A**

Principle of the method: If chloroform and concentrated sulfuric acid are added to fish oil containing vitamin A, a purple ring forms at the interface between the two liquids.

The main stages of work performance.

1. *Preparation of the hood:*

2 drops of fish oil are dripped into the test tube, and then 5 drops of chloroform. They shake

2. *Formation of a colored complex:*

Add 0.5 ml of concentrated sulfuric acid to the obtained extract. Mix carefully. A purple ring appears at the interface between the two liquids, which then turns brown. The appearance of such a ring indicates that the solution contains vitamin A.

## **B. Qualitative determination of vitamin D**

Principle of the method: When vitamin D interacts with hydrochloric acid aniline, a red color is observed.

The main stages of work performance.

*1. Preparation of the reaction mixture:*

Pour 0.5 ml of fish oil into a dry test tube, then add 1.0 ml of aniline hydrochloric acid solution.

*2. Boiling:*

The contents of the test tube are heated to boiling with constant stirring and boiled for 30 seconds. The yellow emulsion first acquires a dirty-green, and then a brown-red color. This indicates that the solution contains vitamin D.

## **B. Qualitative determination of vitamin E**

Principle of the method: When an alcoholic solution of tocopherol reacts with concentrated nitric acid, the reaction mixture turns red.

The main stages of work performance.

Pour 0.5 ml of an alcoholic tocopherol solution into a dry test tube and add 1.0 ml of concentrated nitric acid. As a result of the reaction, a product of quinoid nature is formed, which gives a red color. This color indicates the presence of vitamin E in the solution.

## **D. Qualitative determination of vitamin K**

Principle of the method: If cysteine and NaOH are added to a solution containing vitamin K, the solution will acquire a lemon-yellow color.

The main stages of work performance.

Pour 0.5 ml of Vikasol into the test tube, then add 0.5 ml of cysteine and one drop of 10% NaOH solution.

In the presence of cysteine, the Vikasol solution in an alkaline environment acquires a lemon-yellow color.

*Requirements for work results.*

Enter the obtained data and calculations into the workbook.

Make medical and biological conclusions.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Distribution and daily need of fat-soluble vitamins.
2. Features of absorption, transportation and chemical modifications of fat-soluble vitamins in the human body.
3. Violation of the balance of vitamins in the body

Test tasks (Appendix 1).

4. Summary:

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook

for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.

2. Lunyova H.G. Clinical biochemistry. – Magnolia, 2021. – 400 p.

3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonsky – Ternopil: TDMU, 2019. – 732 p.

4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

#### Auxiliary

1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.

2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.

3. Functional biochemistry/ edited by N. O. Sibirnoi. - LNU, 2018. - 644 p.

#### Electronic information resources:

1. <https://info.odmu.edu.ua/chair/biology/>

2. <http://libblog.odmu.edu.ua/>

3. <https://moodle.odmu.edu.ua/login/index.php>

### *Practical lesson No. 8*

#### **Topic:Micro- and macroelementsas componentshuman nutrition.**

**Goal:Formation of system knowledge aboutbiological activity of micro- and macroelements, theirrole in human nutrition.**

**Basic concepts:micro- and macroelements. Daily need,Microelementosis.**

**Equipment:demonstration materials of the department**

#### **Plan:**

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- biological activity and daily need for macronutrients
- biological activity and daily need for trace elements
- endogenous trace elements
- exogenous trace elements.
- causes of mineral metabolism disorders

The acquirer must be able to:

- to explaincauses of mineral metabolism disorders

Questions to check basic knowledge on the topic of the lesson:

- the role of trace elements in metabolic processes.
- the role of trace elements in metabolic processes.
- macronutrients as cofactors.

3. Formation of professional skills:

One of the important components of the training of future doctors is the development of clinical thinking - the ability to transform the acquired knowledge into the ability to apply it in practical activities. In contrast to test tasks, consideration of the topic of the lesson directly carries not only the



function of knowledge control, but also a significant element of training and development of the thinking of future specialists

Undoubtedly, test control is indispensable for assessing knowledge in classes, as it takes a minimum amount of time and concerns various issues. Test control also serves as an objectification of the assessment of the knowledge of each student. Test control within the framework of each topic allows the teacher to form a complete picture of the level of preparation of each student and to plan an individual approach to the acquisition of knowledge and skills in the process of further education.

Therefore, the combination of directly examining the topic of the lesson, monitoring the assimilation of knowledge and conducting test control are the main components for the formation of clinical thinking in future doctors.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Biological activity and daily need for macronutrients.
2. Biological activity and daily need for trace elements.
3. Prerequisite violation of the metabolism of mineral substances.
4. Endogenous trace element diseases.
5. Exogenous trace elements.

Test tasks (appendix 1):

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
2. Lunyova H.G. Clinical biochemistry. — Magnolia, 2021. — 400 p.
3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonsky — Ternopil: TDMU, 2019. — 732 p.
4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

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1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.
2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.
3. Functional biochemistry/ edited by N. O. Sibirnoi. - LNU, 2018. - 644 p.

Electronic information resources:

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3. <https://moodle.odmu.edu.ua/login/index.php>

***Practical lesson No. 9***

**Topic: Biochemical aspects of dietetics depending on age.**

**Goal:** To inform applicants that nutrition is a necessary prerequisite for human life, which ensures normal metabolism, the dynamic state of all biomolecules, cellular and extracellular structures.

**Basic concepts:**–digestion of food nutrients, nutrients, components of normal nutrition; biological value of individual nutrients.

**Equipment:** Laboratory of the department

**Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).
2. Control of the reference level of knowledge.

The acquirer must know:

- organization of the digestive tract,
- the enzyme spectrum and optimal pH values in certain departments of the digestive tract,
- end products of digestion of carbohydrates, lipids, nucleoproteins and proteins in the small intestine.
- the role of balanced rational nutrition in the formation and strengthening of health'I (rational nutrition, diet, composition and calculation of the daily ration).
- features of rational nutrition depending on age (children, teenagers, elderly).
- deficiencies in the nutrition of modern man.

The acquirer must be able to:

- determine all forms of acidity of gastric juice, make a medical-biological conclusion and predict the type of pathology under which the acidity of gastric juice will increase or decrease.
- determine the diet.
- explain the principles of calculating the daily ration.
- explain the features of rational nutrition depending on age
- to explain the deficiencies in the nutrition of modern man

Questions to check basic knowledge on the topic of the lesson:

1. Components of normal human nutrition. Macrocomponents, microcomponents.
2. The needs of the human body in nutritional compounds.
3. Digestion of nutrients.

3. Formation of professional skills and abilities.

3.1 Demonstration and practical work «*Determination of all forms of acidity of gastric juice*".  
*Recommendations for performing tasks.*

Principle of the method: Quantitative determination of the acidity of gastric juice is performed by titrating a portion of the filtered juice with 0.1 n NaOH with indicators, taking into account the amount of alkali used for titration (alkali neutralization). Distinguish between total acidity, total HCl, free and bound HCl.

Procedure: Measure 5 ml of filtered gastric juice into a flask, add 2 drops of dimethylaminoazobenzene and 2 drops of phenolphthalein. Titrate with 0.1 N NaOH until an orange color appears. Note the amount of alkali used for titration (V1). Continue the titration to a lemon-yellow color, note the amount of alkali (V2) that went into the titration, count from zero. Continue the titration until a pink color, note the amount of alkali (V3), count from zero.

Calculation:

V1 – corresponds to free HCl;

V2 is auxiliary, used for calculation. Corresponds to total HCl:

$$\frac{V_2 + V_3}{2}$$

V3 – corresponds to total acidity.

Acidity values are determined by the formula:

$$X = \frac{V (\text{мл}) \cdot 1000 \cdot 0,1}{5}, \text{ ммоль/л}$$

Bound HCl is found by the difference between total and free HCl.

Normally in adults:    free HCl – 20-40 mmol/l;  
                              total HCl – 30-50 mmol/l;  
                              bound HCl – 10-20 mmol/l;  
                              total acidity - 40-60 mmol/l.

Conclusion: The obtained result should be evaluated from the point of view of belonging to normal parameters of acidity of gastric juice or differences from them. Based on the received data, propose a diagnosis.

*Requirements for work results.*

Enter the obtained data and calculations into the workbook.

Make medical and biological conclusions.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Biochemistry of human nutrition: components and nutrients of normal nutrition.
2. Digestion and biological value of carbohydrates. Enzymes of the stomach and intestines.
3. Digestion and biological value of lipids. Enzymes of the stomach and intestines.
4. Digestion and biological value of proteins. Enzymes of the stomach and intestines.
5. Digestion of nucleoproteins.
6. Disruption of digestion of certain nutrients in the stomach and intestines. Hereditary enzymopathies of digestive processes.
7. The role of balanced rational nutrition in the formation and strengthening of health (rational nutrition, diet, composition and calculation of the daily ration).
8. Peculiarities of rational nutrition depending on age (children, teenagers, the elderly).
9. Deficiencies in the nutrition of modern man.

Test tasks (Appendix 1).

4. Summing up.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
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3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonsky – Ternopil: TDMU, 2019. – 732 p.
4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V.

Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

Auxiliary

1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.
2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.
3. Functional biochemistry/ edited by N. O. Sibirnoi. - LNU, 2018. - 644 p.

Electronic information resources:

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2. <http://libblog.odmu.edu.ua/>
3. <https://moodle.odmu.edu.ua/login/index.php>

### ***Practical lesson No. 10***

**Topic:**Biochemical aspects nutrition of athletes

**Goal:**Formation of system knowledge about features of rational nutrition depending on the type of activity.

**Basic concepts:**rational nutrition, energy consumption, muscle activity, diet.

**Equipment:**demonstration materials of the department

**Plan:**

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- Peculiarities of rational nutrition depending on the type of activity (people with mental work, physical work, athletes).
- Principles of rational nutrition.
- Dependence of the body's energy needs on work performed.
- The role of individual chemical components of food in ensuring muscle activity.
- Types of diets.

The acquirer must be able to:

- explain the role of individual chemical components of food depending on the type of activity (persons of mental work, physical work, athletes).
- explain the types of diets.

Questions to check basic knowledge on the topic of the lesson:

- the role of trace elements in metabolic processes.
- the role of trace elements in metabolic processes.
- energy value of proteins, lipids, carbohydrates.

3. Formation of professional skills:

One of the main tasks of training medical students is the formation of clinical thinking, which allows them to work independently with patients both during their studies at senior courses and during internships. control over the assimilation of knowledge should be a mandatory part of each lesson, which serves to unify the training of doctors, to improve the quality of medical education, the

relevance of which cannot be doubted at present. Undoubtedly, test control is indispensable for assessing knowledge in classes, as it takes a minimum amount of time and concerns various issues. Test control also serves as an objectification of the assessment of the knowledge of each student. Test control within the framework of each topic allows the teacher to form a complete picture of the level of preparation of each student and to plan an individual approach to the acquisition of knowledge and skills in the process of further education.

Therefore, the combination of directly examining the topic of the lesson, monitoring the assimilation of knowledge and conducting test control are the main components for the formation of clinical thinking in future doctors.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Peculiarities of rational nutrition depending on the type of activity (people with mental work, physical work, athletes).
2. Principles of rational nutrition.
3. Dependence of the body's energy needs on work performed.
4. The role of individual chemical components of food in ensuring muscle activity.
5. Types of diets.

Test tasks (appendix 1):

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
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4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

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1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.
2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.
3. Functional biochemistry/ edited by N. O. Sibirnoi. - LNU, 2018. - 644 p.

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2. <http://libblog.odmu.edu.ua/>
3. <https://moodle.odmu.edu.ua/login/index.php>

### ***Practical lesson No. 11***

**Topic: General characteristics of dietetics and dietetics**

**Goal:**Formation of system knowledge about features cooking while dieting.

**Basic concepts:**diet, overweight, diet therapy.

**Equipment:**demonstration materials of the department

**Plan:**

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- Peculiarities of food preparation when dieting.
- Basic food products that are not used in diet therapy.
- Calculation of body weight, value in the conditions of diet therapy.
- Excess weight, causes of development, features of choosing a diet for weight loss.
- Types of diet therapy for overweight, meaning.

The acquirer must be able to:

- calculate body weight.
- explain the features of choosing a diet for weight loss.

Questions to check basic knowledge on the topic of the lesson:

- the role of trace elements in metabolic processes.
- the role of trace elements in metabolic processes.
- energy value of proteins, lipids, carbohydrates.

3. Formation of professional skills:

The modern training of doctors forms a predominantly therapeutic type of thinking in future specialists, while the trends in the development of medicine require the education of doctors who possess a preventive, prophylactic type of clinical thinking. Therefore, the material presented in the topic of the practical lesson will contribute to the formation of the preventive type of thinking of the future doctor.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Peculiarities of food preparation when dieting.
2. Basic food products that are not used in diet therapy.
3. Calculation of body weight, value in the conditions of diet therapy.
4. Excess weight, causes of development, features of choosing a diet for weight loss.
5. Types of diet therapy for overweight, meaning.

Test tasks (appendix 1):

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook

for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.

2. Lunyova H.G. Clinical biochemistry. — Magnolia, 2021. — 400 p.

3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonskyi — Ternopil: TDMU, 2019. — 732 p.

4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

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2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.

3. Functional biochemistry/ edited by N. O. Sibirnoi. - LNU, 2018. - 644 p.

#### Electronic information resources:

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2. <http://libblog.odmu.edu.ua/>

3. <https://moodle.odmu.edu.ua/login/index.php>

### *Practical lesson No. 12*

#### **Topic: Peculiarities of medical and dietary nutrition in restoring health**

**Goal:** Formation of system knowledge about features of medical and dietary nutrition in restoring health.

**Basic concepts:** food additives, food toxic infections, dysentery, botulism, brucellosis, viral hepatitis A, trichinellosis and other helminths, raw food, vegetarianism, unloading diets, separate meals.

**Equipment:** demonstration materials of the department

#### **Plan:**

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- Food supplements and their impact on health.
- Diseases transmitted through food (food poisoning, dysentery, botulism, brucellosis, viral hepatitis A, trichinellosis and other helminths).
- Non-traditional types of nutrition (raw food, vegetarianism, nutrition depending on blood group) and their impact on health formation.
- Unloading diets.
- Peculiarities of separate nutrition, its role in shaping human health.

The acquirer must be able to:

- explain the causes of diseases transmitted through food (food poisoning, dysentery, botulism, brucellosis, viral hepatitis A, trichinellosis and other helminths).
- to explain the features of separate nutrition, its role in the formation of human health.

Questions to check basic knowledge on the topic of the lesson:

- digestion and absorption of carbohydrates in the gastrointestinal tract.
- digestion and absorption of lipids in the gastrointestinal tract
- digestion and absorption of proteins in the gastrointestinal tract
- energy value of proteins, lipids, carbohydrates.

3. Formation of professional skills:

One of the main tasks of training medical students is the formation of clinical thinking, which allows them to work independently with patients both during their studies at senior courses and during internships. Control over the assimilation of knowledge should be a mandatory part of each lesson, which serves to unify the training of doctors, to improve the quality of medical education, the relevance of which cannot be doubted at present. Undoubtedly, test control is indispensable for assessing knowledge in classes, as it takes a minimum amount of time and concerns various issues. Test control also serves as an objectification of the assessment of the knowledge of each student. Test control within the framework of each topic allows the teacher to form a complete picture of the level of preparation of each student and to plan an individual approach to the acquisition of knowledge and skills in the process of further education.

Therefore, the combination of directly examining the topic of the lesson, monitoring the assimilation of knowledge and conducting test control are the main components for the formation of clinical thinking in future doctors.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Food supplements and their impact on health/I.
2. Diseases transmitted through food (food poisoning, dysentery, botulism, brucellosis, viral hepatitis A, trichinellosis and other helminths).
3. Non-traditional types of nutrition (raw food, vegetarianism, nutrition depending on blood group) and their impact on health formation.
4. Unloading diets.
5. Peculiarities of separate nutrition, its role in shaping human health.

Test tasks (appendix 1):

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
2. Lunyova H.G. Clinical biochemistry. — Magnolia, 2021. — 400 p.
3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonsky – Ternopil: TDMU, 2019. — 732 p.
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### *Practical lesson No. 13*

#### **Topic: Diet for various diseases**

**Goal: Formation of system knowledge about features of dietary nutrition at chronic diseases of the stomach with normal and increased acidity, peptic ulcer disease of the stomach and duodenum, with secretory insufficiency, chronic inflammation of the intestines, chronic diseases of the liver and gall bladder, gout and uric acid diathesis**

**Basic concepts: colitis, enterocolitis, nephritis, pyelonephritis, pyelocystitis, diabetes**

**Equipment: demonstration materials of the department**

#### **Plan:**

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- Nutrition for chronic diseases of the stomach with normal and increased acidity, for peptic ulcer disease of the stomach and duodenum, with secretory insufficiency, for chronic inflammation of the intestines (colitis, enterocolitis).

- Constipation of food origin in order to strengthen the motor function of the intestines.

- Diet for chronic diseases of the liver and gall bladder, gout and uric acid diathesis.

- Principles of dietary nutrition in cardiovascular pathology.

- Principles of nutrition in kidney diseases (nephritis, pyelonephritis, pyelocystitis, etc.).

- Principles of diet for diabetes.

The acquirer must be able to:

- to explain the principles of dietary nutrition in chronic diseases of the stomach with normal and increased acidity, in peptic ulcer disease of the stomach and duodenum, with secretory insufficiency, in chronic inflammation of the intestines (colitis, enterocolitis)

- to explain the principles of dietary nutrition in chronic diseases of the liver and gall bladder, gout and uric acid diathesis.

- explain the principles of dietary nutrition in cardiovascular pathology).

- explain the principles of diet for diabetes.

Questions to check basic knowledge on the topic of the lesson:

- digestion and absorption of carbohydrates in the gastrointestinal tract.

- digestion and absorption of lipids in the gastrointestinal tract

- digestion and absorption of proteins in the gastrointestinal tract

- energy value of proteins, lipids, carbohydrates.

### 3. Formation of professional skills:

One of the important components of the training of future doctors is the development of clinical thinking - the ability to transform the acquired knowledge into the ability to apply it in practical activities. In contrast to test tasks, consideration of the topic of the lesson directly carries not only the function of knowledge control, but also a significant element of training and development of the thinking of future specialists

Undoubtedly, test control is indispensable for assessing knowledge in classes, as it takes a minimum amount of time and concerns various issues. Test control also serves as an objectification of the assessment of the knowledge of each student. Test control within the framework of each topic allows the teacher to form a complete picture of the level of preparation of each student and to plan an individual approach to the acquisition of knowledge and skills in the process of further education.

Therefore, the combination of directly examining the topic of the lesson, monitoring the assimilation of knowledge and conducting test control are the main components for the formation of clinical thinking in future doctors.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Nutrition for chronic diseases of the stomach with normal and increased acidity, for peptic ulcer disease of the stomach and duodenum, with secretory insufficiency, for chronic inflammation of the intestines (colitis, enterocolitis).
2. Constipation of food origin in order to strengthen the motor function of the intestines.
3. Diet for chronic diseases of the liver and gall bladder, gout and uric acid diathesis.
4. Principles of dietary nutrition in cardiovascular pathology.
5. Principles of nutrition in kidney diseases (nephritis, pyelonephritis, pyelocystitis, etc.).
6. Principles of diet for diabetes.

Test tasks (appendix 1):

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
2. Lunyova H.G. Clinical biochemistry. – Magnolia, 2021. – 400 p.
3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonsky – Ternopil: TDMU, 2019. – 732 p.
4. Basics of nutrition: / M.I. Kruchanytsia, I.S. Mironyuk, N.V. Rozumikova, V.V. Kruchanytsia, V.P. To others Uzhhorod: Publishing House of UzhNU "Hoverla", 2019. 252 p.

Auxiliary

1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.
2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.
3. Functional biochemistry/ edited by N. O. Sibirnoi. - LNU, 2018. - 644 p.

Electronic information resources:

1. <https://info.odmu.edu.ua/chair/biology/>
2. <http://libblog.odmu.edu.ua/>
3. <https://moodle.odmu.edu.ua/login/index.php>

### *Practical lesson No. 14*

**Topic:**Nutrition as an element of public health

**Goal:**Formation of system knowledge about impact of nutrition on population health.

**Basic concepts:**national food pyramid, individual nutrition, genetically modified foods and organisms

**Equipment:**demonstration materials of the department

**Plan:**

1. Organizational measures (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).

2. Control of the reference level of knowledge.

The acquirer must know:

- Public health and the importance of nutrition.
- The influence of nutrition on the state of population health.
- Individual nutrition as a component of social.
- National food pyramid.
- Food safety.
- Genetically modified products and organisms.

The acquirer must be able to:

- explain the influence of nutrition on the state of population health.
- form a graph-logic diagram classification of GMP by origin.
- form a graph-logic diagram classification of GMP of plant origin by the nature of changes.
- explain possibilities and consequences of using genetically modified products.

Questions to check basic knowledge on the topic of the lesson:

- digestion and absorption of carbohydrates in the gastrointestinal tract.
- digestion and absorption of lipids in the gastrointestinal tract
- digestion and absorption of proteins in the gastrointestinal tract
- energy value of proteins, lipids, carbohydrates.

3. Formation of professional skills:

Modern training of doctors mainly shapes future specialists therapeutic type of thinking, while the trends in the development of medicine require the education of doctors who possess a preventive, prophylactic type of clinical thinking. Therefore, the material presented in the topic of the practical lesson will contribute to the formation of the preventive type of thinking of the future doctor.

Control materials for the final stage of the lesson.

Questions to check the final level of knowledge:

1. Public health and the importance of nutrition.
2. The influence of nutrition on the state of population health.
3. Individual nutrition as a component of social.
4. National food pyramid.

5. Food safety.
6. Genetically modified products and organisms.
7. Classification of GMP by origin.
8. Classification of GMP of plant origin by the nature of changes.
9. Possibilities and consequences of using genetically modified products.

Test tasks (appendix 1):

4. Summary.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Biological and bioorganic chemistry: In 2 books. — Kn. 2: Biological chemistry: Textbook for med. University of the IV R.A. — 2nd ed., ed. Approved by the Ministry of Education and Culture / Ed. Yu.I. Gubskiy, I.V. Nizhenkovskaya. — K., 2017. — 544 p.
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3. Human biochemistry: a textbook / Ya.I. Gonskyi, T.P. Maksymchuk; under the editorship Ya.I. Gonskyi — Ternopil: TDMU, 2019. — 732 p.
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Auxiliary

1. Zubar N. M. Basics of physiology and nutrition hygiene: Textbook. K.: Center of educational literature, 2010. 336 p.
2. Zubar N.M., Rul Yu.V., Bulgakova M.K. Physiology of nutrition: workshop. K.: Educational Center of literature, 2013. 208 p.
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Electronic information resources:

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### *Practical lesson No. 15*

**Topic:** Final control of knowledge: credit

**Goal:** Determine the level of assimilation acquirers of the basic principles of rational nutrition and general laws of the use of essential nutrients.

**Equipment:** laboratory of the department

**Plan:**

1. Organizational activities (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of higher education seekers to study the topic).
2. List of questions for preparation for control:
  1. Anatomical and physiological basis of nutrition.
  2. Nutritional biochemistry as a science.
  3. Components of human nutrition.
  4. Need human body in nutritional compounds.

5. Essential nutrients, phytonutrients, antinutrients
6. Micronutrients.
7. Nutritional value of trace elements.
8. Nutrition of the population as a component of public health.
9. Biochemical basis of digestion and absorption of nutrients.
10. Biochemical bases of regulation of human eating behavior.
11. Concept of nutritional genomics
12. Biological role of carbohydrates in human nutrition.
13. The main carbohydrate components of food.
14. The main metabolic ways of using carbohydrates as the main source of energy.
15. Peculiarities of carbohydrate metabolism in normal and pathological conditions.
16. Biological role of lipids in human nutrition.
17. The main lipid components of food.
18. Peculiarities of lipid metabolism in normal and pathological conditions.
19. Integrative mechanisms of functioning of  $\omega$ -3 fatty acids and mitochondria.
20. Fatty acid profile of nutrition.
21. Unsaturated fatty acids: vital or toxic.
22. Biological role of proteins in human nutrition.
23. The concept of "complete protein".
24. Nitrogen balance in normal and pathological conditions.
25. Metabolism of essential amino acids.
26. Integrated index of essential amino acids.
27. Prediction of the biological value of proteins.
28. Water-soluble vitamins.
29. Distribution and daily requirement of water-soluble vitamins.
30. Features of absorption, transportation and chemical modifications of water-soluble vitamins in the human body.
31. Biochemical bases of vitamin interventions in correcting the functioning of the methionine cycle.
32. Experimental contradictions in the use of vitamin preparations.
33. Fat-soluble vitamins.
34. Distribution and daily need of fat-soluble vitamins.
35. Features of absorption, transportation and chemical modifications of fat-soluble vitamins in the human body.
36. Violation of the balance of vitamins in the body.
37. The concept of micro- and macroelements, their biological activity.
38. The role of the main macronutrients in human nutrition. Daily need.
39. The role of basic trace elements in human nutrition. Daily need.
40. Pathological conditions associated with a lack of macro- and microelements in the body.
41. Water and drinking mode.
42. The role of balanced nutrition in the formation and strengthening of health (rational nutrition, diet, composition and calculation of the daily ration).
43. Peculiarities of rational nutrition depending on age (children, teenagers, the elderly).
44. Deficiencies in the nutrition of modern man.
45. The rule of "5 fingers".
46. Peculiarities of rational nutrition depending on the type of activity (people with mental work, physical work, athletes).
47. Principles of rational nutrition.
48. Dependence of the body's energy needs on work performed.
49. The role of individual chemical components of food in ensuring muscle activity.
50. Types of diets.

51. Peculiarities of food preparation when dieting.
52. Basic food products that are not used in diet therapy.
53. Calculation of body weight, value in the conditions of diet therapy.
54. Excess weight, causes of development, features of choosing a diet for weight loss.
55. Types of diet therapy for overweight, meaning.
56. Food supplements and their impact on health'I.
57. Diseases transmitted through food (food poisoning, dysentery, botulism, brucellosis, viral hepatitis A, trichinellosis and other helminths).
58. Non-traditional types of nutrition (raw food, vegetarianism, nutrition depending on blood group) and their impact on health formation.
59. Unloading diets.
60. Peculiarities of separate nutrition, its role in shaping human health.
61. Nutrition for chronic diseases of the stomach with normal and increased acidity, for peptic ulcer disease of the stomach and duodenum, with secretory insufficiency, for chronic inflammation of the intestines (colitis, enterocolitis).
62. Constipation of food origin in order to strengthen the motor function of the intestines.
63. Diet for chronic diseases of the liver and gall bladder, gout and uric acid diathesis.
64. Principles of diet for cardiovascular pathology, kidney diseases (nephritis, pyelonephritis, pyelocystitis, etc.), diabetes.
65. Public health and the importance of nutrition.
66. The influence of nutrition on the state of population health.
67. Individual nutrition as a component of social.
68. National food pyramid.
69. Food safety.
70. Genetically modified products and organisms.
71. Classification of GMP by origin.
72. Classification of GMP of plant origin by the nature of changes.
73. Possibilities and consequences of using genetically modified products.

#### 4. Summary.

#### 5. List of recommended literature (main, additional, electronic information resources):

##### Main:

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## Test tasks

- 1. At the early stages of human development, food was:**
  - a) a variety of products that nature gave them;
  - б) meat;
  - в) fish;
  - г) vegetables;
  - д) fruits.
  
- 2. The first humanoid creatures (appeared on our planet about 3 million years ago) used:**
  - a) remains of prey of wild animals;
  - б) wild plants, larvae, worms;
  - в) vegetables;
  - г) fruits;
  - д) fish
  
- 3. What did primitive human-like creatures eat with the remains of animals?**
  - a) to various infectious diseases;
  - б) changes in the digestive tract depending on the nature of food;
  - в) to changes in the immune system;
  - г) to changes in the cardiovascular system;
  - д) to changes in the endocrine system.
  
- 4. What food did the Cro-Magnons eat (about 40,000 years ago)?**
  - a) mostly meat;
  - б) vegetables;
  - в) fruits;
  - г) fish;
  - д) mixed food
  
- 5. In the process of evolution, the Cro-Magnons began to use:**
  - a) raw meat of small animals;
  - б) plant roots;
  - в) herbs;
  - г) fruits, berries;
  - д) all of the above.
  
- 6. In the next period of life, during excavations, archaeologists found in the remains of food:**
  - a) fish;
  - б) crayfish;



- B) shellfish;
- Г) meat of animals and wild plants;
- Д) all of the above.

**7. The discovery of fire (about 100,000 years ago) made it possible to:**

- а) to expand the range of products of vegetable and animal origin due to heat treatment;
- б) increase the nutritional value of products;
- В) improve the taste of products;
- Г) reduce the number of infectious diseases;
- Д) all of the above.

**8. What changes occurred in human nutrition about 10,000 years ago (the era of agriculture)?**

- а) use of cultivated plants;
- б) use of cereals, flax;
- В) consumption of vegetables, fruits;
- Г) consumption of meat from domesticated animals;
- Д) all of the above is true.

**9. In the Bronze Age (about 4,000 years ago), with the beginning of the era of arable land use, the following foods were consumed in the process of nutrition:**

- а) horticulture products (onions, garlic, etc.);
- б) horticultural products (plum, cherry, etc.);
- В) wheat cultivation, bread production;
- Г) eating berries;
- Д) all of the above.

**10. At the end of the 16th century in Europe began to consume:**

- а) potatoes;
- б) beet sugar;
- В) sunflower oil;
- Г) tomatoes;
- Д) all of the above.

**11. Differences in the nutrition of modern man and man in the cave period:**

- а) cavemen did not know breakfast, lunch, dinner;
- б) cave people consumed food when it was available;
- В) in the cave period, people ate once a day;
- Г) in the cave period, people ate every other day;
- Д) all of the above is true.

**12. What changes occur with food in the oral cavity?**

- а) food is delayed;

- б) food is crushed;
- в) food is moistened with saliva and partially broken down;
- г) food is prepared for entering the stomach and further breakdown;
- д) all of the above.

**13. Composition of saliva:**

- а) enzymes (proteases, peptidase, lysozyme);
- б) hydrochloric acid;
- в) hormones;
- г) carbonic anhydrase;
- д) all of the above.

**14. The mucous membrane of the stomach produces:**

- а) water;
- б) hydrochloric acid;
- в) gastric juice;
- г) hormones;
- д) enzymes

**15. Composition of gastric juice:**

- а) inorganic components (water, hydrochloric acid, chlorides, sulfates, phosphates, potassium, sodium, calcium, magnesium);
- б) organic components (protein, non-protein nitrogen-containing substances - urea, ammonia, uric acid, lactic acid, amino acids);
- в) enzymes (pepsin, rennin and gastrin, hormones);
- г) mucoproteins, Castle factor;
- д) all of the above.

**16. What are the components of the duodenum involved in digestion?**

- а) gastric contents (juice) entering the duodenum;
- б) pancreatic juice;
- в) bile;
- г) intestinal juice;
- д) all of the above.

**17. What digestive enzymes break down fats?**

- а) trypsin;
- б) hydrochloric acid;
- в) lipase;
- г) bile;
- д) all of the above.

**18. Bile in the human body is formed in:**

- a) liver;
- б) gall bladder;
- в) duodenum;
- г) spleen;
- д) pancreas.

**19. The small intestine in the human body performs the following functions:**

- a) digesting only carbohydrates;
- б) digestion of proteins and partially carbohydrates;
- в) fat digestion;
- г) digestion of fats and carbohydrates;
- д) absorption of cleavage products.

**20. Proteins are digested by enzymes that secrete:**

- a) stomach;
- б) salivary glands;
- в) pancreas;
- г) liver;
- д) small intestine

**21. Saliva has bactericidal properties:**

- a) hydrochloric acid;
- б) lysozyme;
- в) maltose;
- г) pepsin;
- д) amylase.

**22. Microorganisms of the large intestine play a role:**

- a) synthesize substances necessary for the human body;
- б) enhance water absorption;
- в) cause fermentation;
- г) neutralize harmful substances;
- д) cause decay of proteins and chyme components.

**23. An excess of animal proteins in the diet (meat, fish, legumes) leads to the accumulation of purine metabolism (uric acid) and the development of diseases:**

- a) kidney stone disease;
- б) gallstone disease;
- в) angina pectoris;
- г) hypertensive disease;
- д) all of the above.

**24. An excess of carbohydrates in the diet leads to the development of:**

- a) dental caries, obesity;
- б) hypertensive disease;
- в) hepatitis;
- г) gastritis;
- д) colitis

**25. What is the energy requirement per day, kcal/kg, for people with a hypotrophic body structure:**

- a) 35-40;
- б) 25-35;
- в) 20-40;
- г) 30-45;
- д) 32-42.

**26. Such basic functions as: plastic or construction, energetic, catalytic, transport, protective, hormonal, resistance, receptor are characteristic of:**

- a) carbohydrates;
- б) proteins;
- в) fats;
- г) vitamins;
- д) all of the above.

**27. Such functions as: energetic, plastic, protective, spare, regulatory are carriers of taste and aromatic substances, perform the role of emulsifiers, are carriers and solvents of fat-soluble vitamins: characteristic for**

- a) carbohydrates;
- б) fats;
- в) proteins;
- г) vitamin-like substances;
- д) all of the above.

**28. Which components are characterized by such functions as energetic, plastic, supporting, regulatory, spare, specific:**

- a) proteins;
- б) fats;
- в) carbohydrates;
- г) vitamin C;
- д) fat solution of vitamins.

**29. What is the energy requirement per day (kcal/kg) for people with a normotrophic body structure:**

- a) 30-45;

- б) 30-35;
- в) 25-35;
- г) 20-40;
- д) 32-42.

**30. What is the energy requirement per day (kcal/kg) for people with a hypertrophic body structure:**

- а) 30-45;
- б) 30-35;
- в) 25-30;
- г) 20-40;
- д) 32-42.

**31. What is the energy value (calorie) of 1 g. squirrel?**

- а) 4.3 kcal;
- б) 4 kcal;
- в) 5 kcal;
- г) 6 kcal;
- д) 10 kcal

**32. What is the need for proteins, including animal proteins, per day in a city with a hypotrophic body structure?**

- а) 100(55);
- б) 55(20);
- с) 150(100);
- д) 120(20);
- е) 200(100).

**33. What is the need for proteins, including animal proteins, per day in a city with a normotrophic body structure?**

- а) 100(55);
- б) 90(45);
- с) 150(100);
- д) 120(20);
- е) 200(100).

**34. What is the need for proteins, including animal proteins, per day in the case of a hypertrophic body structure?**

- а) 100(55);
- б) 90(45);
- в) 80(40);
- г) 120(20);
- е) 200(100).

**35. What is the need for proteins, including animal proteins, per day in g/kg with a hypotrophic body structure:**

- a) up to 1.5 (tv. up to 0.8);
- б) 2.5 (tv. to 1.8);
- в) 1.0 (tv. to 0.5);
- г) 1.4 (tv. to 0.1);
- д) 1.3 (tv. to 0.09).

**36. What is the need for proteins, including animal proteins, per day in g/kg with a normotrophic body structure:**

- a) up to 2.5 (tv. up to 1.8);
- б) up to 1.0 (tw. up to 0.5);
- в) up to 1.0 (tv. up to 0.5);
- г) up to 1.4 (tv. up to 0.1);
- д) up to 1.3 (tw. up to 0.09).

**37. What is the need for proteins, including animal proteins, per day in g/kg with a hypertrophic body structure:**

- a) up to 2.5 (tv. up to 1.8);
- б) up to 1.0 (tw. up to 0.5);
- в) up to 0.75 (tv. up to 0.4);
- г) up to 1.4 (tv. up to 0.1);
- д) up to 1.3 (tw. up to 0.09).

**38. The daily protein requirement of a healthy adult (in grams) is:**

- a) 80-100;
- б) 100-150;
- в) 300-400;
- г) 50-100;
- д) 150-200.

**39. What is the need for fats, including vegetable fats, per day g/kg with a hypotrophic body structure:**

- a) up to 1.5 (tv. up to 0.8);
- б) up to 2.5 (tv. up to 1.8);
- в) up to 1.0 (tv. up to 0.5);
- г) up to 1.4 (tv. up to 0.1);
- д) up to 1.3 (tw. up to 0.09).

**40. What is the need for fats, including vegetable, g/kg per day with a normotrophic body structure:**

- a) to 2.5 (tv. to 1.8);
- б) to 1.0 (tw. to 0.5);
- в) to 1.0 (tv. to 0.5);

- Г) to 1.4 (tv. to 0.1);  
Д) to 1.3 (tv. to 0.09).

**41. What is the need for fats, including vegetable, g/kg per day with a hypertrophic body structure:**

- а) up to 2.5 (tv. up to 1.8);  
б) 1) up to 1.0 (tw. up to 0.5);  
в) up to 0.75 (tv. up to 0.4);  
Г) up to 1.4 (tv. up to 0.1);  
Д) up to 1.3 (tw. up to 0.09).

**42. What is the energy value (calorie) of 1g of fat?**

- а) 4.5 kcal;  
б) 6 kcal;  
в) 7 kcal;  
Г) 4 kcal;  
Д) 9.3 kcal.

**43. What is the need for fats, including vegetable fats, per day in a city with a hypotrophic body structure?**

- а) 100(55);  
б) 70(40);  
в) 150(100);  
г) 120(20);  
д) 200(100).

**44. What is the need for fats, including vegetable fats, per day in the city of normotrophic structure of the body?**

- а) 100(55);  
б) 90(45);  
в) 150(100);  
г) 70(40);  
д) 200(100).

**45. What is the need for fats, including vegetable fats, per day in a city with a hypertrophic body structure?**

- а) 100(55);  
б) 90(45);  
в) 60(30);  
Г) 120(20);  
д) 200(100).

**46. What is the energy value (calorie) of 1 g. carbohydrates?**

- а) 4 kcal;  
б) 5 kcal;

- B) 5.5 kcal;
- Г) 9 kcal;
- Д) 3 kcal

**47. What is the need for carbohydrates, including simple ones, per day in the case of a hypotrophic body structure?**

- and) 400(150);
- b) 170(140);
- in) 150(100);
- d) 120(20);
- d) 200(100).

**48. What is the need for carbohydrates, including simple, per day in with a normotrophic body structure?**

- a) 100(55);
- б) 90(45);
- in) 150(100);
- d) 350(100);
- d) 200(100).

**49. What is the need for carbohydrates, including simple, per day in with a hypertrophic body structure?**

- a) 100(55);
- б) 90(45);
- B) 350(50);
- Г) 120(20);
- d) 200(100).

**50. What is the need for carbohydrates, including simple, per day in g/kg with a hypotrophic body structure:**

- a) to 6.5 (tv. to 1.0);
- б) up to 2.5 (tv. to 1.8);
- B) to 4.0 (tv. to 1.5);
- Г) to 3.4 (tv. to 1,1);
- Д) up to 1.3 (tv. to 1.09).

**51. What is the need for carbohydrates, including simple, g/kg per day for a normotrophic body structure:**

- a) up to 2.5 (tv. up to 1.8);
- б) up to 5.5 (tv. up to 0.8);
- B) up to 1.0 (tv. up to 0.5);
- Г) up to 1.4 (tv. up to 0.1);
- Д) up to 1.3 (tw. up to 0.09).

**52. What is the need for carbohydrates, including simple, g/kg per day with a**



**hypertrophic body structure:**

- a) up to 2.5 (tv. up to 1.8);
- б) up to 1.0 (tw. up to 0.5);
- в) up to 3.0 (tv. up to 0.4);
- г) up to 1.4 (tv. up to 0.1);
- д) to 2.3 (tv. to 1.09).

**53. What is the energy value per day, kcal with a hypotrophic body structure?**

- a) 2200-2800;
- б) 2400-2700;
- в) 2500-2600;
- г) 2300-2600;
- д) 2000-2500.

**54. What is the energy value per day, kcal at normotrophic body structure?**

- a) 2200-2400;
- б) 2400-2700;
- в) 2500-2600;
- г) 2300-2600;
- д) 2000-2500.

**55. What is the energy value per day, kcal in hypertrophic body structure?**

- a) 2200-2400;
- б) 2400-2700;
- в) 2500-2600;
- г) 2300-2600;
- д) 1900-2000.

**56. Which of the following vitamins are water-soluble:**

- a) group B (B1, B2, B6, B12);
- б) ascorbic acid;
- в) PP or B3 (niacin);
- г) folic acid;
- д) all of the above.

**57. Which of the following vitamins are fat-soluble?**

- a) A (retinol);
- б) E (tocopherol);
- в) D (calciferol);
- г) D2, B3 (ergocalciferol and cholecalciferol);
- д) all of the above.

**58. The listed substances: bioflavonoids, vitamin P, B15, choline, carnitine, vitamin U, lipoic acid are:**

- a) water-soluble vitamins;
- б) fat-soluble vitamins;
- в) trace elements;
- г) macronutrients;
- д) vitamin-like substances.

**59. Which vitamin is a source of: grain, oatmeal, yeast, pork, kidneys, peas:**

- a) vitamin B1;
- б) vitamin B2;
- в) vitamin WITH;
- г) vitamin AND;
- д) vitamin D.

**60. Vitamins A, D, K refer to:**

- a) water soluble;
- б) fat-soluble;
- в) mineral substances;
- г) vitamin-like substances;
- д) macroelements.

**61. Vitamins of group B, C, folic acid, biotin, pantothenic acid belong to:**

- a) water soluble;
- б) fat-soluble;
- в) vitamin-like substances;
- г) macroelements;
- д) trace elements.

**62. Name the foods that contain iron:**

- a) Fig;
- б) pasta;
- в) legumes;
- г) meat, liver;
- д) plums, grapes.

**63. Which foods contain the most vitamin B6:**

- a) soy;
- б) bean;
- в) meat products;
- г) bread and bakery products from coarse flour;
- д) all of the above.

**64. Which foods contain the most folic acid:**

- a) green vegetables, parsley, spinach;
- б) onion;

- В) meat products, liver;
- Г) lactic acid cheeses;
- Д) all of the above.

**65. Which foods contain the most vitamin B12:**

- а) beef, liver;
- б) mackerel;
- В) sardines;
- Г) lactic acid cheeses;
- Д) all of the above.

**66. Which foods contain the most vitamin A (carotene):**

- а) carrot;
- б) tomatoes;
- В) spinach;
- Г) red sweet pepper;
- Д) all of the above.

**67. Which foods contain the most vitamin D:**

- а) cow's milk, butter;
- б) chicken eggs;
- В) liver of animals and poultry;
- Г) fish, fish oil;
- Д) all of the above.

**68. The main source of carnitine (a vitamin-like substance):**

- а) vegetables;
- б) fruits;
- В) Mineral Water;
- Г) meat and meat products;
- Д) grape.

**69. The main source of lipoic acid (a vitamin-like substance):**

- а) green parts of plants;
- б) cabbage;
- В) meat;
- Г) milk;
- Д) all of the above.

**70. The main source of bioflavonoids (vitamin P):**

- а) quince;
- б) green tea;
- В) citrus fruits;

- Г) currant, rose hip;
- Д) all of the above.

**71. The following symptoms are characteristic of a deficiency of which vitamin:**

Kidney and bladder infections. Eye inflammation and discharge; inability to see in a darkened room; poor vision at night ("chicken blindness"); "goosebumps" on the back of the hands; brittle hair; eyelid redness, peeling, or dryness; dry eyes; burning, itching during urination; swelling or suppuration of the eyelids; sensitivity of the eyes to glare or fire; quick freezing; pimples and blackheads; dry, rough or cracked skin; warts; ulcers or sores in the mouth; bright red painful tongue; numbness of the hands or feet. a) Vitamin A b) Vitamin B2 c) Vitamin C

- Г) Vitamin B12
- Д) Vitamin D

**72. The following symptoms are characteristic of a deficiency of which vitamin:**

Slow or accelerated pulse; diastolic blood pressure above 90; poor memory; irritability; loss of appetite or weight; loss of reflexes; ankle swelling; feet; weakness in calf muscles; strong heartbeat; heart enlargement; muscle weakness or exhaustion; feeling depressed; tingling in hands or feet; poor coordination; leg cramps or pain; constipation a) Vitamin B1 (thiamine);

- Б) Vitamin B2;
- В) Vitamin C;
- Г) Vitamin B12;
- Д) Vitamin E.

**73. The following symptoms are characteristic of a deficiency of which vitamin:**

Sores in the corners of the mouth; shiny sick or swollen tongue; wrinkling of the upper lip; feeling of "sand" in the eyes; redness, itching, burning in the eyes; oily or peeling skin around the nose; abnormal hair loss; swelling or cracking of the lips; purple tongue; cataract; increased sensitivity of the eyes to light; spots before the eyes; conjunctivitis; oily hair.

- а) Vitamin B1;
- Б) Vitamin B2 (riboflavin);
- В) Vitamin C;
- Г) Vitamin B5 (pantothenic acid);
- Д) Vitamin E.

**74. The following symptoms are characteristic of a deficiency of which vitamin:**

Itchy, inflamed skin; dermatitis; anxiety or depression; diarrhea; swollen tongue with a red tip and sides; whitish, coated tongue; burning in hands or feet; cracks on the back of the hands; irritability; upset stomach; ulcers or sores in the mouth; bright red painful tongue; insomnia; numbness of the hands or feet.

- а) Vitamin B1;
- Б) Vitamin B3 (niacin);
- В) Vitamin E;
- Г) Vitamin B5 (pantothenic acid);

Д) Vitamin C.

**75. The following symptoms are characteristic of a deficiency of which vitamin:**

The pupils are unusually dilated; soreness, burning in hands or feet; weakening of resistance to diseases; numbness of hands or feet; hypoglycemia; irritability; insomnia; deep depression; poor coordination; constipation; joint pains and muscle spasms; irregular heart rhythm; headaches; fatigue, lack of energy.

- а) Vitamin D;
- б) Vitamin B3 (niacin);
- в) Vitamin E;
- г) Vitamin B5 (pantothenic acid);
- д) Vitamin C.

**76. The following symptoms are characteristic of a deficiency of which vitamin:**

Irritability or nervousness; inability to remember dreams; swelling of the extremities (edema); oily, scaly skin around the nose, eyes; muscle twitching; weakness of the muscles of the thumbs; nausea during pregnancy; perplexity; dizziness; it is impossible to clench, straighten the fists; greenish-yellow color of urine; hyperactivity; poor coordination when walking.

- а) Vitamin C;
- б) Vitamin B3 (niacin);
- в) Vitamin E;
- г) Vitamin B6 (pyridoxine);
- д) Vitamin D.

**77. The following symptoms are characteristic of a deficiency of which vitamin:**

The patient has a reddish tongue; spastic, convulsive twitching of limbs; memory loss; depression or irritability; stuttering; pale face; dizziness; back pain; loss of appetite; numbness of hands or feet; confusion or disorientation; apathy; paranoia or hallucinations; lemon-yellow skin tone; anemia; blurred vision; irregular menstruation.

- а) Vitamin C;
- б) Vitamin B3;
- в) Vitamin E;
- г) Vitamin B6;
- д) Vitamin B12.

**78. The following symptoms are characteristic of a deficiency of which vitamin:**

Easy formation of bruises; bleeding gums; cuts, sores and wounds heal slowly; low resistance to colds and flu; restlessness or irritability; facial swelling; fragile blood vessels of the eyes; loosening of teeth, loss of sensation in teeth; weakness or joint pain; severe hair loss; bleeding from the nose; anemia.

- а) Vitamin C;
- б) Vitamin B3;
- в) Vitamin E;

- Г) Vitamin D;
- Д) Holin.

**79. The following symptoms are characteristic of a deficiency of which vitamin:**

Burning in the mouth and throat; loss of energy; rickets; joint pains; myopia, myopia; insomnia; weak bone development; osteoporosis; destruction of teeth; muscle spasms; nervousness; constipation

- а) Vitamin B1;
- б) Vitamin B3;
- В) Vitamin IS;
- Г) Vitamin D;
- Д) Folic acid.

**80. The following symptoms are characteristic of a deficiency of which vitamin:**

Swelling or muscle strain; inability to concentrate; hemolytic anemia; anemia; discomfort during menstruation; muscular dystrophy; brittleness and hair loss; fatigue; drowsiness; men have a low sex drive.

- а) Vitamin B1;
- б) Vitamin B3;
- В) Vitamin E;
- Г) Vitamin D;
- Д) Biotin.

**81. The following symptoms are characteristic of a deficiency of which vitamin:**

The skin is shiny, dry and flaky; nausea; poor appetite; insomnia; hair loss; swollen, painful tongue; muscle pains; pale color of nails; irregular heart rhythm; extreme fatigue, exhaustion.

- а) Vitamin C;
- б) Choline;
- В) Vitamin A;
- Г) Vitamin D;
- Д) Biotin.

**82. The following symptoms are characteristic of a deficiency of which vitamin:**

Eczema; high cholesterol; it is difficult to lose weight; high blood pressure; bleeding ulcer; susceptibility to diseases.

- а) Vitamin C;
- б) Choline;
- В) Vitamin A;
- Г) Vitamin E;
- Д) Folic acid.

**83. The following symptoms are characteristic of a deficiency of which vitamin:**

The tongue is red, smooth and painful; swelling or bleeding from the gums; loss of appetite, weight; apathy or depression; strong heartbeat; Gray hair; awareness of irritability; mouth ulcers;

poor digestion; diarrhea; pallor; forgetfulness; vomit; increased skin pigmentation; anemia.

- a) Vitamin B2;
- б) Choline;
- в) Vitamin A;
- г) Vitamin E;
- д) Folic acid.

**84. With a deficiency of which mineral, the following symptoms are characteristic:**

Weak bone growth; osteoporosis; teeth are crumbling; joint pains; painful leg cramps; nervous tic or twitching; tingling in hands or feet; strong heartbeat; brittle fingernails; destruction of teeth, toothache; cramps during sleep or exercise; pain in the forearms or biceps; numbness or tingling of the limbs; insomnia; heavy menstruation.

- a) Calcium;
- б) Potassium;
- в) Zinc;
- г) Strontium;
- д) Copper.

**85. With a deficiency of which mineral, the following symptoms are characteristic:**

High cholesterol in the blood; hypoglycemia; intolerance to alcohol; diabetes-like symptoms.

- a) Chrome;
- б) Iodine;
- в) Zinc;
- г) Strontium;
- д) Manganese.

**86. With a deficiency of which mineral, the following symptoms are characteristic:**

Chronic fatigue; poor mental performance; enlargement of the thyroid gland, goiter; irritability; increase in body weight; strong heartbeat; high level of cholesterol in the blood; brittle nails; dry hair; constipation:

- a) Potassium;
- б) Iodine;
- в) Zinc;
- г) Strontium;
- д) Manganese.

**87. With a deficiency of which mineral, the following symptoms are characteristic:**

Anemia; flat or spoon-shaped nails; accelerated pulse; craving for ice; hair loss; paleness of the inner side of the lower eyelids; general apathy; lack of endurance and vitality; inability to concentrate; severe menstrual pain.

- a) Potassium;
- б) Iron;
- в) Zinc;

- Г) Magnesium;
- Д) Iodine.

**88. With a deficiency of which mineral, the following symptoms are characteristic:**

Loss of appetite; painful and cold hands and feet; irregular heart rhythm; anxiety, irritability; poor coordination; processes on the bones; muscle spasms and seizures; high blood pressure; loose or sensitive teeth; nausea or dizziness; increased sensitivity to noise; insomnia; hyperactivity; strong body odor.

- а) Calcium;
- б) Strontium;
- в) Zinc;
- Г) Magnesium;
- Д) Iodine.

**89. With a deficiency of which mineral, the following symptoms are characteristic:**

Glucose intolerance; loss of tone or strength of ligaments; heart rhythm disturbance; susceptibility to sports injuries; decrease in strength; weight loss

- а) Manganese;
- б) Iron;
- в) Zinc;
- Г) Magnesium;
- Д) Chrome.

**90. With a deficiency of which mineral, the following symptoms are characteristic:**

High blood pressure; high blood sugar; unusual thirst; swelling of ankles or hands; irregular heart rhythm, palpitations; constipation; muscle pain after exercise; dry skin

- а) Potassium;
- б) Iodine;
- в) Zinc;
- Г) Sodium;
- Д) Chrome.

**91. With a deficiency of which mineral, the following symptoms are characteristic:**

Muscle regeneration; eczema; cataract; psoriasis; cardiomyopathy; increased risk of cancer; cystic fibrosis; arthritis.

- а) Selenium;
- б) Iodine;
- в) Magnesium;
- Г) Sodium;
- Д) Strontium.

**92. With a deficiency of which mineral, the following symptoms are characteristic:**

Slow healing of cuts and wounds; loss of smell and taste; brittle nails; pimples; sterility or



impotence; sleep disturbance; malignant anemia; hair loss; susceptibility to infections; white spots on nails; stretch marks; loss of appetite; diarrhea; diseases of the prostate gland.

- a) Zinc;
- б) Selenium;
- в) Magnesium;
- г) Manganese;
- д) Strontium.

**93. Rational nutrition takes into account the following factors:**

- a) age;
- б) sex;
- в) seasonality;
- г) nature of work;
- д) all of the above.

**94. In order to ensure optimal conditions for a rational balanced diet, it is necessary to comply with the following requirements:**

- a) regular provision of the physiological needs of a person in energy and plastic substances;
- б) selection of products with a balanced composition of main components (proteins, fats, carbohydrates, minerals, vitamins);
- в) individualization of nutrition taking into account gender, age, indicators of physical and mental health, nature of labor activity;
- г) the influence of food products on the central nervous system, internal organs and culinary processing of food;
- д) all of the above.

**95. Names of unloading diets:**

- a) apple
- б) dairy;
- в) carrot;
- г) cucumber;
- д) all of the above.

**96. The classification of separate meals was proposed by:**

- a) R. Koch;
- б) L. Pasteur;
- в) M. Amosov;
- г) G. Shelton;
- д) M. Pevzner.

**97. What non-traditional types of food do you know?**

- a) vegetarian food;
- б) raw food;

- B) separate meals;
- Г) nutrition according to blood groups, and in the system of yogis;
- Д) all of the above.

**98. Which organs are most sensitive to coffee?**

- a) Central nervous system (especially departments responsible for mental functions);
- б) reaction to external stimuli increases;
- B) perception of reality sharpens;
- Г) inhibition processes in the cells of the cortex of the cerebral hemispheres are enhanced;
- Д) all of the above.

**99. With excessive coffee consumption, the following is noted:**

- a) exacerbation of almost all chronic diseases;
- б) assimilation of proteins slows down;
- B) "Theft" from the body of vitamins of group B, C, iron, calcium;
- Г) "Extracts" energy from the so-called "strategic reserve" of the body, necessary under the influence of various adverse factors;
- Д) all of the above.

**100. Excessive use of table salt contributes to:**

- a) pepsin stimulation;
- б) blood pressure increase;
- B) lowering blood pressure;
- Г) increase in body temperature;
- Д) all of the above.

**101. Excessive consumption of sugar causes:**

- a) the risk of developing cardiovascular diseases;
- б) increase in the content of uric acid in the blood;
- B) destruction of teeth (caries);
- Г) metabolic disorders (obesity);
- Д) all of the above.

**102. Spicy spices, acetic acid, inorganic acids in excessive consumption cause:**

- a) Stomach mucosa burn;
- б) cessation of action of ptyalin of saliva;
- B) Delay in the secretion of gastric juice;
- Г) Violation of assimilation of proteins;
- Д) All of the above.

**103. What is the need for nutrients and energy (per 1 kg of body weight) in children compared to adults:**

- а) higher;
- б) poverty;
- в) the same;
- г) not significantly changed;
- д) slightly changed.

**104. How does the daily need for energy change in children with age?**

- а) decreases;
- б) increases;
- в) does not change;
- г) changes slightly;
- д) increases slightly.

**105. What components of nutrition are most necessary for children of preschool and primary school age?**

- а) Squirrels;
- б) Carbohydrates;
- в) Fats;
- г) Vitamins;
- д) Vitamin-like substances.

**106. Insufficient amount of protein in food affects:**

- а) growth of the child;
- б) decrease in immunity;
- в) reduction of wound healing;
- г) recovery slows down;
- д) decrease in working capacity.

**107. The amount of fat in baby food is used for:**

- а) plastic purposes;
- б) is a source of fat-soluble vitamins necessary for children and adolescents;
- в) to improve immunity;
- г) to improve the function of the gastrointestinal tract;
- д) to improve kidney function.

**108. The excessive content of fats in children's food affects:**

- а) metabolic disorders;
- б) deterioration of protein utilization;
- в) deterioration of digestion;
- г) deterioration of carbohydrate metabolism;
- д) all of the above.

**109. What causes schoolchildren's increased need for carbohydrates:**

- a) higher basic metabolism in 1.5 - 2 times than in adults;
- б) higher basic metabolism than in adults;
- в) high motor activity, compared to adults;
- г) low motor activity, compared to adults;
- д) hypodynamia in children.

**110. What vitamins are most needed in childhood?**

- a) Vitamin D;
- б) Vitamin A, E;
- в) Vitamin C;
- г) Vitamin B group;
- д) All of the above.

**111. What minerals are most needed in childhood?**

- a) calcium;
- б) magnesium, phosphorus;
- в) fluorine;
- г) iodine;
- д) iron.

**112. Children's diet must include:**

- a) eggs (chicken, quail);
- б) chicken meat;
- в) sea fish (seafood);
- г) fermented milk products;
- д) fried potatoes.

**113. What are the characteristic features of the labor activity of persons with intellectual labor?**

- a) High nervous tension;
- б) High emotional stress;
- в) Hypokinesia;
- г) Violated mode of work and rest;
- д) Irrational nutrition.

**114. Peculiarities of the nature of the nutrition of persons with intellectual labor:**

- a) Excess nutrition by energy intensity;
- б) Unbalanced diet;
- в) Violation of the diet;
- г) Excessive eating in the evening, before going to bed;
- д) Going to work later.

**115. Rational nutrition should be balanced in terms of the content of the main components of food:**

- a) Proteins;
- б) Fat;
- в) Carbohydrates;
- г) Minerals;
- д) Vitamins.

**116. The diet should be antisclerotic, which contains:**

- a) Sulfur-containing amino acids (methionine, etc.);
- б) Unsaturated fatty acids;
- в) Water-soluble vitamins (in particular, group B);
- г) Fat-soluble vitamins;
- д) All of the above is given.

**117. Deficiencies in the diet of modern man:**

- a) excessive consumption of proteins, sweets, high-grade flour products and excessive consumption of canned products;
- б) frequent consumption of alcohol, coffee, tea, cocoa, chocolate and the habit of eating a lot and snacking between breakfast and lunch, lunch and dinner;
- в) insufficient chewing of food;
- г) the calorie content of food consumed in the afternoon exceeds 35-40%;
- д) all of the above.

**118. What energy value of the daily diet is recommended for men aged 60-74 years:**

- a) IN within 2000 Kcal;
- б) IN within 2500 Kcal;
- в) IN within 3000 Kcal;
- г) IN within 1500 Kcal;
- д) IN within 1800 Kcal

**119. What energy value of the daily ration is recommended for women aged 60-74 years:**

- a) IN boundaries 2500 Kcal;
- б) IN boundaries 1800 Kcal;
- в) IN boundaries 2000 Kcal;
- г) IN boundaries 2700 Kcal;
- д) IN boundaries 1500 Kcal

**120. What energy value of the daily diet is recommended for men over 75 years old:**

- a) IN boundaries 1800 Kcal;
- б) IN boundaries 2000 Kcal;
- в) IN boundaries 1500 Kcal;

- Г) IN boundaries 2500 Kcal;
- Д) IN boundaries 2800 Kcal

**121. What energy value of the daily diet is recommended for women over 75 years old:**

- а) IN boundaries 1600 Kcal;
- б) IN boundaries 2000 Kcal;
- В) IN boundaries 1500 Kcal;
- Г) IN boundaries 2500 Kcal;
- Д) IN boundaries 2800 Kcal

**122. What components of the diet are limited for the elderly:**

- а) Fats;
- б) Carbohydrates;
- В) Squirrels;
- Г) Vitamins;
- Д) Cellulose.

**123. In elderly people, the diet should be dominated by:**

- а) Lactic acid products;
- б) Meat;
- В) Vegetables;
- Г) Liver of animals;
- Д) Broths.

**124. Which trace elements are most needed by the elderly:**

- а) Chrome;
- б) Zinc;
- В) Silicon, selenium;
- Г) Cobalt;
- Д) All of the above.

**125. What principle of nutrition contributes to longevity?**

- а) balanced nutrition;
- б) sufficient amount of vitamins, minerals;
- В) high-quality nutrition;
- Г) preventive focus;
- Д) individualization of nutrition.

**126. What principle of nutrition does not contribute to longevity?**

- а) Balanced nutrition;
- б) Lack of vitamins and minerals;
- В) High-quality nutrition;

- Г) Preventive orientation;
- Д) Individualization of nutrition.

**127. What are the main principles of nutrition for athletes:**

- а) providing the body with the amount of energy that corresponds to its consumption during exercise;
- б) maintaining a balanced diet in relation to certain types of sports and intensity of physical exertion;
- в) the choice of adequate forms of nutrition (products, their combinations) during the periods of direct preparation for the competition, the competition itself and subsequent recovery;
- г) individualization of nutrition depending on the athlete's anthropometric and physiological systems, depending on the state of the digestive system, personal tastes and habits;
- д) all of the above.

**128. For what purpose do athletes use fats:**

- а) the most energetic diet;
- б) it is convenient to top up energy costs;
- в) vitamins A, E, D come with fats;
- г) PUFAs and phospholipids come with fats;
- д) all of the above.

**129. For what purpose do athletes use proteins:**

- а) intensive protein exchange;
- б) development of skeletal muscles;
- в) participation of a number of amino acids in energy metabolism;
- г) proteins are involved in the regulation of concentration, coordination and increase of general labor productivity;
- д) all of the above.

**130. What foods should be consumed to replenish carbohydrate metabolism:**

- а) oat flakes;
- б) muesli;
- в) pasta;
- г) potatoes, legumes;
- д) all of the above.

**131. What vitamins are necessary for athletes during physical and emotional stress:**

- а) Vitamin C;
- б) Vitamins of group B;
- в) Niacin;
- г) Vitamins A, E;
- д) All of the above.

**132. Drinking alcoholic beverages during sports:**

- a) sharply impair sports performance;
- б) violate the accuracy of coordination of movements;
- в) impair visual acuity;
- г) reduce muscle strength and physical endurance;
- д) all of the above.

**133. What should be the nutrition of athletes on competition days:**

- a) do not go to the start on an empty stomach; the last meal should be 3-4 hours before the competition;
- б) do not drink a lot of liquid immediately before the start;
- в) limit the consumption of coffee or other drinks containing caffeine; after the finish, replenish the loss of carbohydrates (special products, high-fat juices, compotes, etc.);
- г) do not consume hard-to-digest food (fatty, fried) or foods that cause flatulence;
- д) all of the above.

**134. What depends on the features (composition) of nutrition when participating in various sports:**

- a) from a specific stage of preparation;
- б) volume and nature of training, competitions;
- в) climatic and natural conditions;
- г) individual characteristics of the athlete;
- д) all of the above.

**135. There is a so-called European Union (EU), which creates a list of approved for use HD (defoamers, emulsifiers, preservatives, dyes, antioxidants, stabilizers, flavor enhancers), under a digital code. Put its function next to each numerical code:**

- a) IS 100 - 199.
- б) IS 200 - 299.
- в) IS 300 - 399.
- г) IS 400 - 499.
- д) IS 500 - 599.
- е) IS 900 - 999.

**136. Some food supplements can affect the human body:**

- a) arise malignant tumors;
- б) arise skin diseases;
- в) arise thyroid disease, allergic reactions;
- г) arise diseases of the liver, kidneys, decrease in the level of leukocytes blood;
- д) all of the above.



**137. The combination of some food dyes (E 102, E 124, E 110, E 122, E 104, E 129) and the preservative sodium benzoate (E 211) can cause the following in children:**

- a) negatively affect children's health (they become hyperactive, disobedient, have poor concentration, etc.);
- б) allergic reactions, diseases appear;
- В) blood pressure increase;
- Г) drowsiness;
- Д) all of the above.

**138. Such basic changes in the body as: lesions of the central nervous system (gross changes in the brain that lead to impaired attention, memory, emotions and motivations, mental processes and consciousness), lesions (gastritis, cirrhosis of the liver, etc.) are characteristic of:**

- a) general fatigue;
- б) drug addiction;
- В) alcohol addiction;
- Г) acute infectious diseases;
- Д) drug addiction

**139. What diseases are transmitted through food?**

- a) food toxic infections;
- б) botulism;
- В) cholera, dysentery;
- Г) viral hepatitis A;
- Д) all of the above.

**140. Trans-fats, which are found in food products, affect the human brain when consumed for a long time. In which products are they found?**

- a) fried products;
- б) canned meat, pate;
- В) mayonnaise;
- Г) puff pastry;
- Д) chocolate.

**141. The following products contribute to the development of children's intelligence:**

- a) products that contain iodine (seafood);
- б) porridge (rice, buckwheat);
- В) walnuts;
- Г) cereal seeds;
- Д) macaroni.

**142. Trans-fats, with long-term consumption, cause the following changes in the body of children:**

- a) short-term aggressiveness;

- б) cruelty;
- В) possible predisposition to suicide, sometimes brain tumors;
- Г) depression;
- Д) Alzheimer's disease, in future the disease Parkinson's.

**143. Food products that cause weakness and fatigue include:**

- а) alcohol;
- б) sweets;
- В) turkey meat;
- Г) fried potatoes with meat;
- Д) macaroni.

**144. Nutrition can cause changes in health in the following ways:**

- а) formation of a high level of health;
- б) restoration of working capacity;
- В) increase in life expectancy;
- Г) improving the quality of life;
- Д) all of the above.

**145. Public health as defined by WHO:**

- а) it is a science that studies the composition and movement of humanity (population) and the patterns of its development;
- б) it is the science and practice of preventing diseases, increasing life expectancy and strengthening health through the organized efforts of society;
- В) branch of scientific and practical activity that studies normal and pathological processes in the human body, various diseases, pathological conditions, methods of their treatment;
- Г) a system of scientifically based measures in medicine, aimed at preventing diseases, their development and strengthening health.

**146. List the main groups of effective policy-making measures to create conditions conducive to healthy eating:**

- а) ensuring coherence of national policies and investment plans, including policies in the field of trade, food industry and agriculture;
- б) provision of medical assistance in case of poisoning and other diseases;
- В) promotion of proper nutrition practices for infants and young children;
- Г) stimulation of consumer demand for healthy food, products and dishes;
- Д) strict supervision of the nutrition of certain population groups.

**147. As a result of substandard nutrition in Ukraine, the following have increased significantly:**

- а) incidence of endocrine diseases;
- б) eating disorders and metabolic disorders;

- В) the tendency to gain excess body weight and the spread of obesity;
- Г) the level of circulatory diseases;
- Д) all of the above.

**148. What percentage of extraneous harmful substances, according to research, enters the human body with food?**

- а) 10-20%;
- б) 20-30%;
- В) 40-60%;
- Г) 60-80%;
- Д) 80-90%.

**149. What is catering?**

- а) it is a science that studies population nutrition;
- б) the sphere of production and trade activity, in which products of own production and purchased goods, as a rule, are intended for local consumption, are produced and sold;
- В) organizational and structural unit in the field of public catering, which produces, prepares and sells culinary products, bakery, flour, confectionery products and purchase goods;
- Г) the field of activity that provides medical assistance in the case of insufficiently rational nutrition;
- Д) all of the above.

**150. A catering establishment is:**

- а) organizational and structural unit in the field of sanitary and epidemiological control;
- б) organizational and structural unit in the field of public health;
- В) organizational and structural unit in the field of public catering, which produces, prepares and sells culinary products, bakery, flour, confectionery products and purchase goods;
- Г) an organizational and structural unit in the field of activity that provides medical assistance in the case of insufficiently rational nutrition;
- Д) all of the above.

**151. The term "food product" does not include:**

- а) drinks;
- б) tobacco;
- В) fodder;
- Г) chewing gum;
- Д) drinking water

**152. Products for medical nutrition are:**

- а) food products intended for feeding the main groups of the population, produced according to traditional technology;
- б) food products (including biologically active food additives) intended for feeding the main groups of the population, useful for health, which, in addition to the nutritional value of the main nutrients, have preventive and health-improving properties due to the addition of functional

ingredients;

Б) food products with a differentially directed health-improving action and documented evidence of functional impact on the human body;

Г) food products of special purpose (for certain groups of the population) as a medical treatment in the complex therapy of diseases characterized by changed chemical composition and physical properties;

Д) all of the above.

**153. Traditional products of mass consumption are:**

а) food products intended for feeding the main groups of the population, produced according to traditional technology;

б) food products (including biologically active food additives) intended for feeding the main groups of the population, useful for health, which, in addition to the nutritional value of the main nutrients, have preventive and health-improving properties thanks to the addition of functional ingredients;

Б) food products with a differentially directed health-improving action and documented evidence of functional impact on the human body;

Г) food products of special purpose (for certain groups of the population) as a medical treatment in the complex therapy of diseases characterized by changed chemical composition and physical properties.

**154. Health products (physiologically functional) are:**

а) food products intended for feeding the main groups of the population, produced according to traditional technology;

б) food products (including biologically active food additives) intended for feeding the main groups of the population, useful for health, which, in addition to the nutritional value of the main nutrients, have preventive and health-improving properties due to the addition of functional ingredients;

Б) food products with a differentially directed health-improving action and documented evidence of functional impact on the human body;

Г) food products of special purpose (for certain groups of the population) as a medical treatment in the complex therapy of diseases characterized by changed chemical composition and physical properties.

**155. What is the name of the collection of international standards approved and presented in the same form for food products, developed under the guidance of WHO, aimed at protecting the health of consumers and guaranteeing fair practices in their trade?**

а) collection of the International Organization for Standardization (ISO);

б) collection of the European Economic Commission of the United Nations;

Б) Code Alimentarius;

Г) code of the European Committee for Standardization (CEN);

Д) Law of Ukraine "On the safety and quality of food products".

**156. What regulatory document defines the main provisions of food safety and quality in Ukraine?**

а) collection of the International Organization for Standardization (ISO);

б) collection of the European Economic Commission of the United Nations;

- B) codex Alimentarius;
- Г) code of the European Committee for Standardization (CEN);
- Д) Law of Ukraine "On the safety and quality of food products".

**157. What does the concept of "Food safety" include?**

- a) origin of food;
- б) food hygiene;
- B) food additives and residual amounts of pesticides;
- Г) government import management, export review and certification systems for products;
- Д) all of the above.

**158. What information does the manufacturer's declaration accompanying the food product include?**

- a) name and address of the manufacturer;
- б) the name of the food product itself, auxiliary material for processing, etc. - information that is necessary for the identification of the product;
- B) reference to sanitary measures, standards and technical regulations to which a certain food product complies;
- Г) date of issue, name, signature and position of the person who issued the declaration;
- Д) all of the above.

**159. Hygienic regulations regarding microbiological indicators of food safety include the following sanitary-indicative microorganisms:**

- a) mesophilic aerobic and facultative aerobic microorganisms;
- б) bacteria of the genus Salmonella and Listeria monocytogenes;
- B) bacteria of the group of Escherichia coli;
- Г) bacteria of the Enterobacteriaceae family, enterococci;
- Д) bacteria of the genus Proteus, B.cereus and sulfite-reducing clostridia.

**160. Hygienic standards for microbiological indicators of food safety include the following conditionally pathogenic microorganisms:**

- a) mesophilic aerobic and facultative aerobic microorganisms;
- б) bacteria of the genus Salmonella and Listeria monocytogenes;
- B) E.coli, S.aureus;
- Г) bacteria of the Enterobacteriaceae family, enterococci;
- Д) bacteria of the genus Proteus, B.cereus and sulfite-reducing clostridia.

**161. Hygienic regulations regarding microbiological indicators of food safety include the following pathogenic microorganisms:**

- a) bacteria of the genus Yersinia;
- б) Salmonella bacteria;
- B) Listeria monocytogenes;
- Г) pathogenic microorganisms, depending on the epidemiological situation in the region of production;

Д) all of the above.

**162. What should form the basis of the national food pyramid in Ukraine?**

- а) products of animal origin;
- б) grains and legumes;
- В) fatty product;
- Г) fruits and vegetables;
- Д) none of the above.

**163. What should be the second step of the national food pyramid in Ukraine?**

- а) products of animal origin;
- б) grains and legumes;
- В) fatty products;
- Г) fruits and vegetables;
- Д) simple carbohydrates

**164. What should be the third step of the national food pyramid in Ukraine?**

- а) products of animal origin;
- б) grains and legumes;
- В) fatty products;
- Г) fruits and vegetables;
- Д) simple carbohydrates

**165. What should form the basis of the national food pyramid in Ukraine?**

- а) products of animal origin;
- б) grains and legumes;
- В) fatty products;
- Г) fruits and vegetables;
- Д) simple carbohydrates

**166. What should be the fourth step (top) of the national food pyramid in Ukraine?**

- а) products of animal origin;
- б) grains and legumes;
- В) fatty products;
- Г) fruits and vegetables;
- Д) simple carbohydrates

**167. Technologies for creating genetically modified products include:**

- а) biotechnology;
- б) gene technology;
- В) recombinant DNA technology;
- Г) genetic engineering;

Д) all of the above.

**168. When conducting a safety assessment of GMOs, WHO recommends that national authorities use:**

- а) collection of the International Organization for Standardization (ISO);
- б) collection of the European Economic Commission of the United Nations;
- в) codex Alimentarius;
- г) the code of the European Committee for Standardization (CEN);
- д) none of these documents.

**169. What is usually investigated in the process of assessing the safety of GMO products?**

- а) direct impact on health (toxicity);
- б) tendencies to cause an allergic reaction (allergenicity);
- в) specific components that are likely to have nutritional or toxic properties;
- г) stability of the introduced gene;
- д) all of the above.