

**Odessa National Medical University**  
Faculty Medical, International  
Department of Medical Biology and Chemistry

**“BIOCHEMISTRY OF RATIONAL NUTRITION AND ESSENTIAL NUTRIENTS”**

<b>Scope of the academic discipline</b>	Total number of hours per discipline: 90 hours, 3 credits. Semesters: VIII 4th year of study.
<b>Days, time, place of educational discipline</b>	According to the schedule of classes. Department of Medical Biology and Chemistry Odesa, st. Olhivska, 4. Main building of ONMedU, 2nd floor.
<b>Teacher(s)</b>	H.F. Stepanov, doctor of medical sciences, Associate Professor, head of the department. Associate Professor candidate of biological sciences Storchylo O.V. Senior teachers: candidate of biological sciences Vasylieva A.G., Kostina A.A.
<b>Contact information</b>	Reference by phone: Kostina Alina Anatolyivna, head teacher of the department 712-31-05, responsible for organizational and educational work of the department Buryachkivska Oksana Leonidivna, laboratory technician of the department 728-54-78 E-mail: medchem@ukr.net Face-to-face consultations: from 2:00 p.m. to 5:00 p.m. every Thursday, from 9:00 a.m. to 2:00 p.m. every Saturday Online consultations: from 2:00 p.m. to 5:00 p.m. every Thursday, from 9:00 a.m. to 2:00 p.m. every Saturday. The link to the online consultation is provided to each group during classes separately.

## COMMUNICATION

Communication with applicants will be conducted in the classroom (face-to-face).

During distance learning, communication is carried out through the Microsoft Teams platform, as well as through e-mail correspondence, Viber messengers (through groups created in Viber for each group, separately through the head of the group).

## ABSTRACT OF THE ACADEMIC DISCIPLINE

*Subject of study of the discipline* - structural and functional characteristics of essential nutrients as indispensable food factors and biochemical mechanisms of their involvement in the processes of functioning of various metabolic pathways of the body.

*Prerequisites and post-requisites of the discipline (place of the discipline in the educational program):*

*Prerequisites:* to study the course, applicants must have knowledge of biological chemistry,

physiology, pathological physiology, pharmacology, pharmaceutical chemistry.

*Post-requisites:* assimilation by applicants of modern biochemical foundations of the metabolic and regulatory role of essential nutrients as important components of the body that function as coenzymes, hormones, antioxidants, mediators of cell signaling and regulators of growth and differentiation of cells and tissues.

*Purpose of the discipline:* the formation of a complete system of knowledge about high- and low-molecular-weight essential nutrients, their structures, metabolism and functional impact on the human body.

*Tasks of the discipline:* familiarize with the peculiarities of the metabolism of vitamins, essential fatty acids and amino acids; to acquire the fundamental knowledge necessary for the interpretation of the results of detection of abnormalities in the functioning of one or more organs; teach to characterize the involvement of vitamins and other nutrients in the development, progression and correction of pathological processes; evaluate the reserve of functional capabilities of the body.

*Expected results:*

*As a result of studying the academic discipline, the applicant must:*

*Know:*

- chemical structure and chemical properties of essential macro- and micronutrients;
- processes of metabolic transformations of vitamins, quasi-vitamins, essential amino and fatty acids;
- the main metabolic pathways of essential macro- and micronutrients and the key mechanisms regulating these pathways;
- biochemical mechanisms and patterns of their metabolic and regulatory role in human cells and tissues;
- characteristics of pathologies, the development of which is associated with a deficiency of macro- and micronutrients, the toxicity of these compounds and general metabolic disorders.

*Be able:*

- to classify essential nutrients and their metabolically active forms according to the structure and nature of functional activity;
- analyze and interpret molecular mechanisms of metabolic activity of vitamins, essential amino acids,  $\omega$ -3 fatty acids;
- use acquired theoretical knowledge to set and solve practical tasks;
- to diagnose the state of biological systems based on the results of the study of organisms at different levels of the organization;
- analyze biological phenomena and processes at the molecular, cellular, organismal, population-species and biosphere levels from the point of view of fundamental general scientific knowledge, as well as using special modern research methods.

## **DESCRIPTION OF THE ACADEMIC DISCIPLINE**

*Forms and methods of education*

The course will be taught in the form of practical classes (30 hours), organization of independent work of applicants (60 hours).

*Teaching methods:* explanations, conversations, multimedia presentations, laboratory work, problem solving, oral survey, testing, etc.

*Content of the academic discipline*

### **Content module 1.**

#### **Biochemistry of rational nutrition and essential nutrients**

- Topic 1. Nutritional biochemistry. Food components.
- Topic 2. Biochemical aspects of the regulation of eating behavior and digestive processes.
- Topic 3. Carbohydrates as components of food and their role in the formation of health.
- Topic 4. Lipids as components of food and their role in health formation.
- Topic 5. Proteins as components of food and their role in health formation.
- Topic 6. Water-soluble vitamins as components of human nutrition. Bioflavonoids.

Nutritional supplements.

- Topic 7. Fat-soluble vitamins as components of human nutrition.
  - Topic 8. Micro- and macroelements as components of human nutrition.
  - Topic 9. Biochemical aspects of dietetics depending on age.
  - Topic 10. Biochemical aspects of athletes' nutrition.
  - Topic 11. General characteristics of dietetics and diet therapy.
  - Topic 12. Peculiarities of medical and dietary nutrition in restoring health.
  - Topic 13. Diet for various diseases.
  - Topic 14. Nutrition as an element of public health.
- Final control of knowledge: credit.

*List of recommended literature:*

1. Gubsky Yu.I., I.V. Nizhenkovska, Korda M.M. Biological and Bioorganic Chemistry: in 2 books. Book 2. Biological Chemistry: textbook. 2021. 544 p.
2. Satyanarayana U. Biochemistry. 5th edition. India 2020. 777 p.
3. Lehninger. Principles of Biochemistry. 7th edition. NY, United States. 2017.
4. Jeremy M. Berg, John L. Tymoczko, Gregory J. Gatto. Biochemistry. 8th Revised edition. 2015.
5. Lippincott Illustrated Reviews: Biochemistry. Philadelphia :Wolters Kluwer, 2017. 560 p.
6. Baynes J., Dominiczak M. Medical Biochemistry. 5th Edition. Elsevier, 2018. 712 p.
7. Olivia Vanbergen, Gareth Wintle, Marek H. Dominiczak. Crash Course Metabolism and Nutrition. 5th Edition. Elsevier. 2019.
8. Carol Byrd-Bredbenner. Wardlaw's Perspectives in Nutrition 11 Edition. McGraw-Hill Education. 2019.

## EVALUATION

**Current control:** oral survey, testing, control of learning practical skills, solving situational clinical tasks, assessment of activity in class.

**Final control:** credit

Credit is carried out in the last class after the end of the practical classes before the beginning of the examination session

***The structure of the current assessment in the practical session:***

1. Evaluation of theoretical knowledge on the subject of the lesson:
  - methods: survey, written work, solving a situational problem, solving test problems;
  - the maximum score is 5, the minimum score is 3, the unsatisfactory score is 2.
2. Assessment of the acquisition of practical skills:
  - methods: methods: survey, solving a situational problem, solving test problems.

**Current assessment criteria for practical training:**

"5"	The acquirer is fluent in the material, takes an active part in discussing and solving the situational problem, knows how to determine the main biochemical indicators in biological objects and give them a medical (medical-biological) assessment.
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"4"	The acquirer has a good command of the material, takes part in the discussion and solution of the situational problem, knows how to determine the main biochemical indicators in biological objects and give them a medical and biological assessment, but allows some insignificant mistakes (inaccuracies) in answering questions.
"3"	The acquirer does not have sufficient knowledge of the material, takes part in the discussion and solution of the situational problem without confidence, makes mistakes when explaining the laws of human metabolism.
"2"	The acquirer does not know the material, does not take part in the discussion and solution of the situational clinical problem, has significant gaps in the knowledge of the program material, makes fundamental mistakes when explaining the laws of human metabolism, does not have the necessary practical skills.

Credit is given to the applicant who completed all tasks of the work program of the academic discipline, took an active part in practical classes, completed and defended an individual assignment and has an average current grade of at least 3.0 and has no academic debt.

Test is carried out: at the last lesson before the beginning of the examination session - with the tape system of learning, at the last lesson - with the cyclical system of learning. The credit score is the arithmetic mean of all components on a traditional four-point scale and has a value that is rounded using the statistical method with two decimal places after the decimal point.

### 9. Distribution of points received by applicants of higher education

The obtained average score for the academic discipline for applicants who have successfully mastered the work program of the academic discipline is converted from a traditional four-point scale to points on a 200-point scale, as shown in the table:

#### Conversion table of a traditional assessment into a multi-point scale

Traditional four-point scale	Multipoint 200-point scale
Excellent ("5")	185 - 200
Good ("4")	151 - 184
Satisfactory ("3")	120-150
Unsatisfactory ("2")	Below 120

A multi-point scale (200-point scale) characterizes the actual success of each applicant in learning the educational component. The conversion of the traditional grade (average score for the academic discipline) into a 200-point grade is performed by the information and technical department of the University.

According to the obtained points on a 200-point scale, the achievements of the applicants are evaluated according to the ECTS rating scale. Further ranking according to the ECTS rating scale allows you to evaluate the achievements of applicants from the educational component who are studying in the same course of the same specialty, according to the points they received.

The ECTS scale is a relative-comparative rating, which establishes the applicant's belonging to the group of better or worse among the reference group of fellow applicants (faculty, specialty). An "A" grade on the ECTS scale cannot be equal to an "excellent" grade, a "B" grade to a "good" grade, etc. When converting from a multi-point scale, the limits of grades "A", "B", "C", "D", "E" according to the ECTS scale do not coincide with the limits of grades "5", "4", "3" according to the traditional scale. Acquirers who have received grades of "FX" and "F" ("2") are not included in the list of ranked acquirers. The grade "FX" is awarded to applicants who have obtained the minimum number of points for the current learning activity, but who have not passed the final examination. A grade of "F" is assigned to applicants who have attended all classes in the

discipline, but have not achieved a grade point average (3.00) for the current academic activity and are not admitted to the final examination.

Applicants who study in one course (one specialty), based on the number of points scored in the discipline, are ranked on the ECTS scale as follows:

**Conversion of the traditional grade from the discipline and the sum of points on the ECTS scale**

<b>Evaluation on the ECTS scale</b>	<b>Statistical indicator</b>
A	Top 10% achievers
B	The next 25% of earners
C	The next 30% of earners
D	The next 25% of earners
E	The next 10% of earners

*The possibility and conditions of obtaining additional (bonus) points:*

The recipient can receive additional (bonus) points for completing individual tasks:

- participation and presentation at a scientific conference;
- a report at a scientific group;
- preparation of multimedia slides and design of tests;
- translations of scientific articles from foreign languages; abstract work on a certain topic.

**INDEPENDENT WORK OF APPLICANTS OF HIGHER EDUCATION**

Independent work involves preparation for each practical session.

**POLICY OF EDUCATIONAL DISCIPLINE**

*Deadlines and Rescheduling Policy:*

- Absences of classes for non-respectable reasons will be worked out according to the schedule of the teacher on duty.
- Absences for valid reasons are worked out according to an individual schedule with the permission of the dean's office.

*Academic Integrity Policy:*

Applicants must observe academic integrity, namely:

- independent performance of all types of work, tasks, forms of control provided for by the work program of this educational discipline;
- references to sources of information in case of use of ideas, developments, statements, information;
- compliance with the legislation on copyright and related rights;
- provision of reliable information about the results of one's own educational (scientific) activity, used research methods and sources of information.

Unacceptable in educational activities for participants of the educational process are:

- the use of family or official ties to obtain a positive or higher grade during any form of control of academic performance or academic merit;
- use of prohibited auxiliary materials or technical means (cheat sheets, notes, micro-earphones, telephones, smartphones, tablets, etc.) during control measures;
- going through procedures for monitoring the results of training by fake persons.

For violation of academic integrity, applicants may be held to the following academic

responsibility:

- a decrease in the results of assessment of the control work, assessment in class, credit, etc.;
- retaking the assessment (test, credit, etc.);
- assignment of additional control measures (additional individual tasks, control works, tests, etc.);
- conducting an additional inspection of other works authored by the violator.

*Attendance and Tardiness Policy:*

Uniform: medical gown that completely covers outer clothing, cap, mask.

Equipment: notebook, pen.

State of health: applicants suffering from acute infectious diseases, including respiratory diseases, are not allowed to attend classes.

An applicant who is late for class can attend it, but if the teacher has put "ab" in the journal, he must complete it in the general order.

*Use of mobile devices:*

Mobile devices may be used by applicants with the permission of the instructor if they are needed for the assignment.

*Behavior in the audience:*

The behavior of applicants and teachers in the classrooms should be working and calm, strictly comply with the rules established Regulations on academic integrity and ethics of academic relations at Odessa National Medical University, in accordance with Code of Academic Ethics and Relations of the University Community of Odessa National Medical University, Regulation on prevention and detection of academic plagiarism in research and educational work of higher education applicants, scientists and teachers of Odesa National Medical University.