

Federal State Budgetary Educational Institution of Higher Education  
"Privolzhsky Research Medical University"  
Ministry of Health of the Russian Federation

**BANK OF ASSESSMENT TOOLS FOR DISCIPLINE**  
**CLINICAL ASPECTS OF BIOCHEMISTRY**

Training program (specialty): 31.05.01 General Medicine  
*code, name*

Department: Biochemistry named after G.Ya. Gorodisskaya

Mode of study: full-time attendance  
*(full-time/mixed attendance mode/extramural)*

Nizhniy Novgorod  
202\_

### 1. Bank of assessment tools for the current monitoring of academic performance, mid-term assessment of students in the discipline **Clinical aspects of biochemistry.**

This Bank of Assessment Tools (BAT) for the discipline "Biochemistry" is an integral appendix to the working program of the discipline "Biochemistry". All the details of the approval submitted in the WPD for this discipline apply to this BAT.

### 2. List of assessment tools

The following assessment tools are used to determine the quality of mastering the academic material by students in the discipline/ practice:

No.	Assessment tool	Brief description of the assessment tool	Presentation of the assessment tool in the BAT
1	Test №1 Test №2	A system of standardized tasks that allows you to automate the procedure of measuring the level of knowledge and skills of a student	Bank of test tasks
2	Control work	A tool of checking the ability to apply acquired knowledge for solving problems of a certain type by topic or section	Set of control tasks in variants
3	Situational tasks	A method of control that allows you to assess the criticality of thinking and the degree of the material comprehension, the ability to apply theoretical knowledge in practice.	List of tasks
4	Report	The product of the student's independent work, which is a public presentation about the results obtained by solving a certain educational, practical, research or scientific topic	Topics of reports, presentations

### 3. A list of competencies indicating the stages of their formation in the process of mastering the educational program and the types of evaluation tools

Code and formulation of competence*	Stage of competence formation	Controlled sections of the discipline	Assessment tools
UC-1 Able to carry out critical analysis of problem situations based on a systematic approach, develop an action strategy.	Current, Mid-term	<b>Section 1</b> Structure, properties and functions of proteins. Enzymes. <b>Section 3</b> Protein and amino acid metabolism. <b>Section 4.</b> Matrix syntheses <b>Section 5.</b> Hormones.	1, 3, 4 1, 2, 3, 4 2, 4 2, 3, 4 Credit
GPC-5 Able to assess	Current, Mid-term	<b>Section 1</b> Structure, properties and functions of proteins. Enzymes.	1, 3, 4

morphofunctional, physiological conditions and pathological processes in the human body to solve professional problems		<b>Section 3</b> Protein and amino acid metabolism. <b>Section 4.</b> Matrix syntheses <b>Section 5.</b> Hormones.	1, 2, 3, 4  2, 4 2, 3, 4 Credit
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\* - not provided for postgraduate programs

#### 4. The content of the assessment tools of entry, current control

Entry /current control is carried out by the discipline teacher when conducting classes in the form of: assessment tool 1, assessment tool 2, etc. (*list the forms, for example, control work, organization of a discussion, round table, abstract, etc.*)

Assessment tools for current control.

#### 4.1. Assessment tool 1. Tests for the assessment of competence “UC-1, GPC-5.

##### 1. VITAMINS, OXIDOREDUCTASE COFACTORS ARE:

1. B3, B6, B12
2. K, C, B2, B3
3. B2, B3
4. B1, B6

##### 2. MATCH COFACTORS AND PRECURSOR VITAMINS:

- A - NAD (nicotinamide adenine dinucleotide)  
B - TPP (thiamine pyrophosphate)  
C - FAD (flavinadenine dinucleotide)  
D - PP (pyridoxal phosphate)
1. Vitamin B6
  2. Vitamin B2
  3. Vitamin B1
  4. Vitamin B3

##### 3. THE NITROGEN BALANCE IS:

1. quantitative difference of amino acids received into the body and excreted from the body
2. quantitative difference between nitrogen-containing compounds introduced with food and derived as end products of nitrogen metabolism
3. quantitative assessment of all proteins entering the body
4. the amount of nitrogen coming from food

##### 4. NAME THE AMINO ACIDS, THE COMPLETE ABSENCE OF WHICH IN THE DIET WILL LEAD TO A NEGATIVE NITROGEN BALANCE:

1. aspartate
2. cysteine
3. tryptophan
4. glutamate

##### 5. WHICH AMINO ACID FORMS CATECHOLAMINES:

1. glutamic acid
2. phenylalanine
3. tryptophan
4. tyrosine

##### 6. WHICH ENZYME DEFECT CAUSES ALBINISM:

1. tyrosinase
2. phenylalanine hydroxylase
3. carbamoyl phosphate synthetase
4. tyrosine decarboxylase

5. **4.2. Assessment tool 2.** A set of control tasks for the assessment of competence UC-1, GPC-

**Card 1.**

1. Digestion of proteins in the stomach. Characteristics of enzymes, specificity, activation.
2. Concepts of non-essential and essential amino acids. List the essential amino acids.

**Card 2.**

1. Enzymes of pancreatic juice, pro-enzymes, their activation. Place and specificity of action, hydrolysis products.
2. The biological role of free HCl (hydrochloric acid).

**Card 3.**

1. List the biologically active compounds that are formed in the metabolism of tyrosine, their physiological function.
2. Write the reactions of thyroid hormones formation.

**Card 4.**

1. Hereditary enzymopathies of phenylalanine and tyrosine metabolism (metabolic defect and main clinical manifestations).
2. What reactions can be blocked? Name the enzymes that catalyze these reactions, write their chemistry.

**Card 5.**

1. Classification of hormones by chemical nature, examples.
2. Pituitary hormones. Their main functions in the body and disorders of the hypothalamic-pituitary system.

**Card 6.**

1. Intracellular mechanism of hormone action. Characteristics of receptors, properties and examples of relevant hormones. Hormonal effect.
2. Thyroid hormones. Functions in the body. Disorders of the thyroid gland. Biochemical blood test in case of suspected thyroid pathology.

**Card 7.**

1. Define the primary structure of nucleic acids.
2. Synthesis of pyrimidine nucleotides. Name the sources of carbon and nitrogen of the pyrimidine ring. Write the reaction of the formation of 5-phosphoribosyl 1 pyrophosphate. Conversion of ribonucleotides into deoxyribonucleotides.

**Card 8.**

1. Primary, secondary, tertiary structure of RNA. Types of RNA.
2. Scheme of hydrolysis of nucleic acids in the gastrointestinal tract and tissues. Name the enzymes and hydrolysis products.

**4.3. Assessment tool 5.** Tasks for the assessment of competence " UC-1, GPC-5.

**Task 1.** An elderly patient suffers from the disease formerly known as "shaking palsy". Its main symptoms are muscle rigidity, stiff movements, involuntary trembling of the hands and the head. Suggest how the disease affects the patient. Answer the question and do the tasks.

1. What is the cause of the disease?
2. Write the reactions the rate of which is lowered in this case.
3. List the treatment principles of this pathology.

**Task 2.** In a newborn child in the hospital, dark spots were found on wet diapers. When examined in urine, a large amount of homogentisinic acid was found. Explain the possible cause (plausible reason) of the observed disturbance. For the answer:

- a) name the compounds that are accumulated in the patient's urine. Indicate in what disease this symptom is observed;
- b) write a diagram of the metabolic pathway in which this compound is an intermediate metabolite, name enzymes and cofactors;
- c) name the enzyme, the absence of which is the cause of the disease.

**Task 3.** Acute pancreatitis developed in a patient. Pancreatic duct walls were inflamed and swollen, the size of the duct was diminished, pancreatic juice congestion being observed. Such patients usually need urgent medical attention. Explain what dangerous complication of the abnormal outflow of pancreatic juice appears. For this:

- a) list the enzymes synthesized in the pancreas;
- b) describe the pathway of their activation, name the activators of pro-enzymes;
- c) explain what consequences of their activation in pancreatic tissue will result in.

**Task 4.**

High lactate level is detected in the gastric juice of a patient. Specify what diseases are possible to develop in this case. For the answer:

- a) name the process, the product of which is lactate;
- b) list the components and gastric juice pH in normal state;
- c) list the functions of hydrochloric acid in gastric juice;
- d) suggest which components of gastric juice are necessary to determine additionally to clarify the diagnosis.

**Task 5.** Dietary intake of fresh eggs is known to induce hypovitaminosis H. The special protein avidine, which can interact with vitamin H and prohibit its absorption in the gastrointestinal tract, is present in fresh eggs. Explain why boiled eggs do not have these properties.

**Task 6.** Explain why drugs containing calcium in combination with vitamin D are more effective to compensate calcium deficiency in the body than the drugs containing calcium alone.

**Task 7.** According to the level of thyroid dysfunction, hyperthyroidism is divided into primary (thyroid disease) and secondary (pituitary pathology). Explain the biochemical causes of each type of hyperthyroidism. Is it possible to make a differential diagnosis of dysfunction level based only on the determination of thyroid hormone blood levels? Which hormones are necessary to evaluate?

**Task 8.** In blind children sleep disturbances sometimes develop because their brain does not receive information about the light and the dark. What kind of replacement therapy is necessary to assign such a child to treat the sleep disorder? Why?

**4.4. Assessment tool 4.** Report for the assessment of competence " UC-1, GPC-5".

1. Hypovitaminosis and hypervitaminosis. Causes of occurrence. Pathological manifestations
2. Enzyme inhibitors as medicinal drugs
3. The use of medications in violation of protein digestion
4. Metabolic disorders of sulfur-containing amino acids
5. Thyroid hormones: synthesis, transport, pathological conditions
6. Protein polymorphism. Hereditary diseases.

**5. The content of the assessment tools of mid-term assessment**

Mid-term assessment is carried out in the form of credit.

*The content of the assessment tool (questions, topics of abstracts, round tables, etc.)*

*If the bank of assessment tools for conducting current control and mid-term assessment of students in this discipline is presented on the Educational Portal of the PRMU, specify a link to this electronic resource.*

**5.1. Questions for the credit in the discipline "Clinical aspects of biochemistry".**

Question	UC-1, GPC-5.
<b>1</b>	Enzymes, their molecular organization. Apoenzyme and cofactor (coenzyme and prosthetic group). Nomenclature and classification of enzymes. Vitamins and metal ions as cofactors of enzymes.
<b>2</b>	Enzyme inhibition: competitive, non-competitive. Peculiarities of enzymatic kinetics. Give examples of medicaments.

3	Interstitial transformations of phenylalanine: oxidation as well as transamination and formation of melanin. The sequence of reactions, intermediate metabolites and end products. Hereditary enzymopathies of phenylalanine and tyrosine metabolism.
4	Proteolytic enzymes of pancreatic and intestinal juice. Activation mechanism and specificity of action. The use of medications in violation of protein digestion.
5	Pathological conditions associated with hyperproduction of thyroid hormones. Approaches to therapeutic correction based on biochemical mechanisms of hormone synthesis and transport.
6	Functions of nucleic acids. Characteristics of the eukaryotic DNA genome. Introns, exons. The concept of a gene. Preservation of the DNA genome. Molecular mutations.

## 6. Criteria for evaluating learning outcomes

*For the credit (example)*

Learning outcomes	Evaluation criteria	
	Not passed	Passed
<b>Completeness of knowledge</b>	The level of knowledge is below the minimum requirements. There were bad mistakes.	The level of knowledge in the volume corresponding to the training program. Minor mistakes may be made
<b>Availability of skills</b>	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes.	Basic skills are demonstrated. Typical tasks have been solved, all tasks have been completed. Minor mistakes may be made.
<b>Availability of skills (possession of experience)</b>	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes.	Basic skills in solving standard tasks are demonstrated. Minor mistakes may be made.
<b>Motivation (personal attitude)</b>	Educational activity and motivation are poorly expressed, there is no willingness to solve the tasks qualitatively	Educational activity and motivation are manifested, readiness to perform assigned tasks is demonstrated.
<b>Characteristics of competence formation*</b>	The competence is not fully formed. The available knowledge and skills are not enough to solve practical (professional) tasks. Repeated training is required	The competence developed meets the requirements. The available knowledge, skills and motivation are generally sufficient to solve practical (professional) tasks.
<b>The level of competence formation*</b>	Low	Medium/High

\* - not provided for postgraduate programs

*For the exam (example)*

Learning outcomes	Assessment of competence developed			
	unsatisfactory	satisfactory	good	excellent
<b>Completeness of knowledge</b>	The level of knowledge is below the minimum requirements. There	The minimum acceptable level of knowledge. A lot of light	The level of knowledge in the volume corresponding	The level of knowledge in the volume corresponding to

Learning outcomes	Assessment of competence developed			
	unsatisfactory	satisfactory	good	excellent
	were bad mistakes	mistakes were made	to the training program. A few light mistakes were made	the training program, without errors
<b>Availability of skills</b>	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes	Basic skills are demonstrated. Typical problems with light mistakes have been solved. All tasks have been completed, but not in full.	All basic skills are demonstrated. All the main tasks have been solved with light mistakes. All tasks have been completed, in full, but some of them with shortcomings	All the basic skills were demonstrated, all the main tasks were solved with some minor shortcomings, all the tasks were completed in full
<b>Availability of skills (possession of experience)</b>	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes	There is a minimal set of skills for solving standard tasks with some shortcomings	Basic skills in solving standard tasks with some shortcomings are demonstrated	Skills in solving non-standard tasks without mistakes and shortcomings are demonstrated
<b>Characteristics of competence formation*</b>	The competence is not fully formed. The available knowledge and skills are not enough to solve professional tasks. Repeated training is required	The formation of competence meets the minimum requirements. The available knowledge and abilities are generally sufficient to solve professional tasks, but additional practice is required for most practical tasks	The formation of competence generally meets the requirements, but there are shortcomings. The available knowledge, skills and motivation are generally sufficient to solve professional tasks, but additional practice is required for some professional tasks	The formation of competence fully meets the requirements. The available knowledge, skills and motivation are fully sufficient to solve complex professional tasks
<b>The level of competence formation*</b>	Low	Below average	Intermediate	High

*For testing:*

Mark "5" (Excellent) - points (100-90%)

Mark "4" (Good) - points (89-80%)

Mark "3" (Satisfactory) - points (79-70%)

*Less than 70% – Unsatisfactory – Mark "2"*

Developer(s):

Full name, position, academic degree, academic title

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