

**FEDERAL STATE BUDGET EDUCATIONAL
HIGHER EDUCATION INSTITUTION
"ROSTOV STATE MEDICAL UNIVERSITY"
MINISTRY OF HEALTH OF THE RUSSIAN FEDERATION**

FACULTY OF TREATMENT AND PREVENTION

Appraisal Fund
in the discipline "Physics, Mathematics"

Specialty 05/31/01 General Medicine

1. Form of intermediate certification: test.

2. Type of intermediate certification

The credit is awarded based on the total current rating for the semester in accordance with the checklist

3. List of developed competencies: OK-1, OPK-7.

Code competencies	Content of competencies (results of mastering OOP)	Contents of competency elements, in the implementation of which he participates discipline
OK -1	Capable of abstract thinking, analysis, synthesis.	Capable of analyzing physical phenomena and patterns underlying V based on processes occurring in the human body.
OPK-7	Ready to use basic physico-chemical, mathematical And other natural sciences concepts and methods at decision professional tasks.	Ready to use basic concepts and methods of mathematical statistics in medical practice. Ready to use knowledge of basic physical laws, fundamentals dosimetry when deciding professional tasks.

4. Stages of developing competencies in the process of mastering the educational program

Competence	Disciplines	Semester
OK-1	Philosophy	3
	Psychology and pedagogy	3, 4
	Physics mathematics	1
	Medical informatics	2
	Chemistry	1
	Biology	12
	Phthisiology	eleven
	Dentistry	7, 10
	Jurisprudence	4
	Forensic Medicine	6
	Scientific work	3, 5
OPK-7	Physics mathematics	1
	Medical informatics	2
	Chemistry	1
	Biochemistry	3, 4
	Biology	12
	Topographic anatomy and operative surgery	5, 6
	Histology, embryology, cytology	2, 3
	Normal physiology	3, 4

	Fundamental medicine	7, 9
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5. Stages of developing competencies in the process of mastering the discipline

Sections of the discipline	Codes generated competencies	
	OK-1	OPK-7
Semester 1		
Section 1		+
Section 2	+	+
Section 3	+	+
Section 4	+	+

6. Forms of assessment tools in accordance with the competencies being developed

Code competencies	Forms of assessment tools	
	Current certification	Interim certification
OK -1	Oral survey Defense of laboratory work Testing, Lecture rating	
OPK-7	Oral survey Defense of laboratory work Testing, Lecture rating	

7. Current control

7.1 Oral interview. Examples of test questions on the topics of the section.

Section 1. Fundamentals of mathematical analysis, probability theory and mathematical statistics:

1. Determination of the derivative and differential of a function. Basic rules and formulas differentiation.
2. Integration rules. Calculation of indefinite and definite integrals.
3. The concept of evidence-based medicine.
4. Random event. Definition of probability (statistical and classical). The concept of joint and incompatible events, dependent and independent events. Probability addition and multiplication theorems.
5. Continuous and discrete random variables. Distribution of discrete and continuous random variables, their characteristics: mathematical expectation, dispersion, standard deviation.
6. Normal distribution law of continuous random variables. Distribution function. Probability density.
7. General population and sample. Sample size, representativeness.
8. Statistical distribution (variation series). Bar chart. Characteristics of position (mode, median, sample mean) and dispersion (sample variance and sample standard deviation).
9. Estimation of the parameters of the general population based on the characteristics of its sample (point and interval).
10. Confidence interval and confidence probability.

11. Comparison of means of two normally distributed populations.
12. Fisher's comparison criterion.
13. Pearson comparison criterion.
14. Nonparametric tests.

Section 2: Fluid mechanics. Acoustics. Electrodynamics.

1. Mechanical waves. Plane wave equation. Parameters of oscillations and waves. Energy characteristics. Doppler effect. Diffraction and interference of waves.
2. Sound. Types of sounds. Sound spectrum. Wave resistance. Objective (physical) characteristics of sound. Subjective characteristics, their connection with objective ones. Weber-Fechner law.
3. Ultrasound, physical basis of application in medicine.
4. Physical foundations of hemodynamics. Viscosity. Methods for determining the viscosity of liquids. Stationary flow, laminar and turbulent flow. Newton's formula, Newtonian and non-Newtonian fluids. Poiseuille's formula. Reynolds number. Hydraulic resistance in series, parallel and combined tube systems. Branching vessels.
5. Hooke's law. Elastic modulus. Elastic and strength properties of bone tissue. Mechanical properties of blood vessel tissues.
6. Biological membranes and their physical properties. Types of passive transport. Equations of simple diffusion and electrodiffusion. Fick equation and Nernst-Planck equation. The concept of active transport of ions through biological membranes
7. The concept of the resting potential of a biological membrane. Nernst equilibrium potential. Membrane permeability to ions. The Goldman-Hodgkin-Katz model of stationary membrane potential. Mechanisms of action potential formation on the membranes of nerve and muscle cells.
8. Processes occurring in tissues under the influence of electric currents and electromagnetic fields. Total resistance (impedance) of living tissues, dependence on frequency.
9. Electric dipole. Electric field of a dipole. Current dipole. Electric field of a current dipole in an unbounded conducting medium.
10. Concept of a dipole equivalent electrical generator of the heart, brain and muscles. Einthoven's model. Genesis of electrocardiograms in three standard leads within the framework of this model.

Section 3: Optics. Quantum physics, ionizing radiation

1. The phenomenon of total reflection of light. Refractometry. Fiber optics.
2. Optical system of the eye: light-conducting and light-receiving apparatus. Accommodation. Best viewing distance. Near point of the eye. Disadvantages of the optical system of the eye and ways to compensate for them. Visual acuity.
3. Microscopy. Resolution power of the microscope.

4. Polarization of light. Methods for producing polarized light. Polarization microscopy. Optical activity. Polarimetry.
5. Light absorption. Bouguer-Lambert-Baer law. Optical density.
6. Electronic energy levels of atoms and molecules. Luminescence. Stokes' law for photoluminescence. Luminescence spectra. Quantitative and qualitative luminescent analysis. Luminescence microscopy.
7. X-ray radiation. Interaction of X-ray radiation with matter. The law of attenuation of the X-ray flux by matter. Physical basis of the use of x-rays in medicine: fluoroscopy, radiography, x-ray computed tomography and x-ray therapy.
8. Radioactivity. Law of radioactive decay. Interaction of α -, β - and γ - radiation with matter.
9. Dosimetry of ionizing radiation. Absorbed and exposure doses. Dose rate, relationship between exposure dose rate and activity of a radioactive drug. Quality factor. Equivalent dose.
10. Protection against ionizing radiation.

7.2 Protection of laboratory work.

The student presents for verification a laboratory report, which must contain:

1. Title of the work
2. Purpose of the work.
3. Indication of devices and accessories used in the work.
4. Theory, derivation of the working formula.
5. Block diagram of a device or experimental setup.
6. Description of the work progress
7. Tables of experimental data.
8. Calculations, graphs.
9. Conclusion.

7.3 Testing (colloquia, midterm control).

Examples of test tasks for current certification with standard answers.

1..PHYSICAL MEANING OF THE DERIVATIVE FUNCTION $Y'(X)$ - THIS

1. The rate of change of a function relative to its argument.
2. The area of the figure limited by $y = f(x)$.
3. Tangent of the angle of inclination of the tangent to the curve $y=f(x)$.
4. Family of curves.

Answer: 1

2.GEOMETRICAL MEANING OF THE DERIVATIVE FUNCTION $Y'(X)$ -THIS

1. The rate of change of a function relative to its argument.
2. The area of the figure limited by the graph $y = f(x)$.

3. Tangent of the angle of inclination of the tangent to the curve $y=f(x)$.
4. Family of curves.

Answer:3

3. THE WORD "DIFFERENTIAL". ONE LETTER IS SELECTED AT RANDOM. THE PROBABILITY THAT THIS LETTER WILL BE A CONSONANT IS

1. $7/12$
2. $5/12$
3. 0
4. $8/12$

Answer: 1

4.515 BOYS WERE AMONG 1000 NEWBORN. BOY BIRTH RATE EQUAL

1. 515
2. 1
3. 0.515
4. 0.485

Answer: 3

5.CONFIDENCE PROBABILITY R \geq 0.95 THEREFORE LEVEL SIGNIFICANCE - EQUAL

1. 0.5
- 2.0.05
3. 0.01
- 4.0.001

Answer: 2

6. ACTIVE TRANSPORT OF SUBSTANCES IS DIRECTED

1. From an area of higher concentration of substances to an area of lower concentration with energy consumption.
2. From an area of higher concentration of substances to an area of lower concentration without energy consumption.
3. From an area of lower concentration of substances to an area of higher concentration with energy consumption.
4. From an area of lower concentration of substances to an area of higher concentration without energy consumption.

Answer: 3

7.ULTRASOUND IS

1. Mechanical waves with a frequency higher than the frequency of sound waves.
2. Mechanical waves with a frequency lower than the frequency of sound waves.
3. Electromagnetic waves with a frequency above 20,000 Hz.
4. Electromagnetic waves with a frequency below 20,000 Hz.

Answer: 1

8.AUDIOOMETRY IS A METHOD OF MEASUREMENT

1. Noise volume level.
2. Hearing acuity.
3. Noise spectrum.
4. Mechanical activity of the heart.
5. Heart murmurs.

Answer: 2

9.PERCUSSION IS

1. Graphic recording of body noises.
2. Graphic registration of heart sounds and murmurs.
3. Listening to low-frequency vibrations that occur during the physiological activity of internal organs.
4. Listening to the sound of individual parts of the body when they are tapped.

Answer:4

10. NORMAL BLOOD PRESSURE IN HUMANS

1. 220/100 mmHg. Art.
2. 100/100 mmHg. Art.
3. 80/100 mm.
4. 120/80 mmHg.

Answer: 4

7.4 Lecture rating carried out during the lecture in the form of a written summary survey on three questions of lecture topics.

8. Description of indicators and criteria for assessing competencies at the stages of their formation, description of assessment scales

	Levels of competency development		
	<i>Threshold</i>	<i>Sufficient</i>	<i>High</i>
Criteria	Competence formed. Demonstrated threshold, satisfactory sustainable level practical skill	Competence formed. Demonstrated enough level independence, sustainable practical skill	Competence formed. Demonstrated high level independence, high adaptability practical skill

Competency assessment indicators and rating scales

Grade "unsatisfactory" (not accepted) or absence formation competencies	Grade "satisfactorily" (passed) or satisfactory (threshold) level of development competencies	Rated "good" (passed) or sufficient level development competencies	Excellent rating (passed) or high level development competencies
failure to student on one's own demonstrate knowledge when solving assignments, lack independence in application of skills. Absence availability confirmation	student demonstrates independence in application of knowledge skills and abilities to solve educational tasks in full According to sample given teacher, by	student demonstrates independent application knowledge, skills and skills at solving tasks, similar samples that confirms	student demonstrates ability to full independence in choosing a method solutions non-standard assignments within disciplines with

formation competencies indicates negative development results academic discipline	tasks, solution of which there were shown teacher, it should be considered that competence formed on satisfactory level.	Availability formed competencies for higher level. Availability such competence on sufficient level indicates sustainable fixed practical skill	using knowledge, skills and skills, received as in development progress of this discipline, and adjacent disciplines should count competence formed on high level.
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Criteria for evaluating forms of control:

Interview.

Points	Descriptors		
	strength of knowledge	ability to explain the essence of phenomena, processes, do conclusions	logic and subsequence answer
26-30	Knowledge of basic mathematical and physical formulas, the answer differs in depth and completeness of the topic; possession terminological apparatus; logic and consistency answer	high skill explain the essence phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples	high logic and subsequence answer
21-25	Knowledge of basic mathematical and physical formulas, possession terminological apparatus; free mastery of monologue speech, but one or two inaccuracies in the answer are allowed	ability to explain essence, phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples; however one or two inaccuracies in the answer are allowed	logic and subsequence answer
11-20	satisfactory basic knowledge mathematical and physical formulas, answer, different insufficient depth and completeness of the topic; Several are allowed errors in content answer	satisfactory ability to give reasoned answers and provide examples; satisfactorily formed analysis skills phenomena, processes. Several are allowed errors in content answer	satisfactory logic and subsequence answer

0-10	poor knowledge of the subject area being studied, shallow opening Topics; poor knowledge basic theoretical issues, poor analysis skills phenomena, processes. Serious errors in content answer	inability to give reasoned answers	lack of logic and consistency answer
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Oral survey

Points	Descriptors		
	strength of knowledge	ability to explain the essence of phenomena, processes, do conclusions	logic and subsequence answer
2	Knowledge of basic mathematical and physical formulas, the answer differs in depth and completeness of the topic; possession terminological apparatus; logic and consistency answer	high skill explain the essence phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples	high logic and subsequence answer
1	Knowledge of basic mathematical and physical formulas, possession terminological apparatus; free mastery of monologue speech, but one or two inaccuracies in the answer are allowed	ability to explain essence, phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples; however one or two inaccuracies in the answer are allowed	logic and subsequence answer
0	Missing knowledge basic mathematical formulas.	Absent	Absent

Defense of laboratory work

Points	Descriptors		
	Understanding the goal	Practical skills	Ability to analyze data, do conclusions
3 points	full understanding of the goal research. Knowledge basic physical formul. All requirements reported for work, completed	All completed measurements, correct presented in the form tables and graphs, carried out statistical data processing.	high skill analyze experimental data, draw conclusions and generalizations

2 points	full understanding of the goal research. . Knowledge basic physical formul.	All completed measurements, correct presented in the form tables and graphs, carried out statistical data processing.	ability to analyze experimental data, draw conclusions and generalizations, however one two allowed inaccuracies in the analysis experimental data
1 point	astic understanding of the purpose of the research. Basic job requirements have been met	Satisfactorily measurements have been taken, Right presented in the form tables and graphs.	satisfactory ability to analyze experimental data, draw conclusions and generalizations. Several are allowed errors in analysis data
0 points	misunderstanding of the goal research. No protocol laboratory work	Lack of protocol	Absent

Lecture rating

Points	Descriptors		
	strength of knowledge	ability to explain the essence of phenomena, processes, do conclusions	logic and subsequence answer
3	Knowledge of basic mathematical and physical formulas, laws of phenomena	high skill explain the essence phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples	high logic and subsequence answer
2	Knowledge of basic mathematical and physical formulas, laws, phenomena, absence allowed one formula or law in the answer	ability to explain essence, phenomena, processes	logic and subsequence answer
1	Knowledge of basic mathematical and physical formulas, laws, phenomena, absence allowed two formulas or laws in the answer	ability to explain essence, phenomena, processes	logic and subsequence answer
0	Missing knowledge basic mathematical and physical formulas.	Absent	Absent

Testing

Test control grading scale:

percentage of correct answers	Marks
91-100	Great
81-90	Fine
71-80	satisfactorily
Less than 71	unsatisfactory