ЛД-21 ИН

**Federal State Budgetary Educational Institution of Higher Education
«North-Ossetia State Medical Academy» of the Ministry of Healthcare
of the Russian Federation**

Department of Chemistry and physics

<div align="right">

APPROVED

by the protocol of the meeting
of the Central coordinating educational
and methodological council
on « 23» May, 2023 yr. № 5

</div>

ASSESSMENT MATERIALS

by discipline   « Physics, mathematics»

the main professional educational program of higher education - specialty program in
the specialty 31.05.01 General Medicine, approved on 24.05.2023 yr.

for   **1-st year students**

by specialty   **31.05.01 General Medicine**

Considered and approved at the meeting of the department
from 22.05. 2023 yr. (protocol №9)

Head of department chemistry and physics   R.V. Kalagova

Vladikavkaz, 2023

THE STRUCTURE OF THE ASSESSMENT MATERIALS

1. Title page
2. Structure of the assessment materials
3. Reviews of assessment materials
4. Passport of assessment materials
5. *Kit of assessment materials:*
 - questions for the modular
 - questions for offset
 - bank of situational problems
 - standards of test tasks (with title page and table of contents)
 - card for offset

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ «СЕВЕРО-ОСЕТИНСКАЯ ГОСУДАРСТВЕННАЯ МЕДИЦИНСКАЯ АКАДЕМИЯ» МИНИСТЕРСТВА ЗДРАВООХРАНЕНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

РЕЦЕНЗИЯ
на оценочные материалы
по дисциплине «Физика, математика» для студентов 1 курса по специальности 31.05.01 Лечебное дело (образовательная программа, частично реализуемая на английском языке)

Оценочные материалы составлены на кафедре химии и физики на основании рабочей программы дисциплины «Физика, математика» и соответствуют требованиям ФГОС ВО специальности 31.05.01. Лечебное дело (образовательная программа, частично реализуемая на английском языке).

Оценочные материалы включают в себя:

- вопросы к модулям

- вопросы к зачету

- билеты к зачету

Эталоны тестовых заданий включают в себя следующие элементы: тестовые задания, шаблоны ответов. Все задания соответствуют рабочей программе дисциплины «Физика, математика», формируемым при ее изучении компетенциям и охватывают все ее разделы. Сложность заданий варьируется. Количество заданий по каждому разделу дисциплины достаточно для проведения контроля знаний и исключает многократное повторение одного и того же вопроса в различных вариантах. Эталоны содержат ответы ко всем тестовым заданиям.

Количество билетов к зачету достаточно для проведения зачета и исключает неоднократное использование одного и того же билета во время зачета в течение одного дня. Билеты к зачету выполнены на бланках единого образца по стандартной форме, на бумаге одного цвета и качества. Формулировки вопросов совпадают с формулировками перечня вопросов, выносимых зачет. Содержание вопросов одного билета относится к различным разделам рабочей программы дисциплины, позволяющее более полно охватить материал дисциплины.
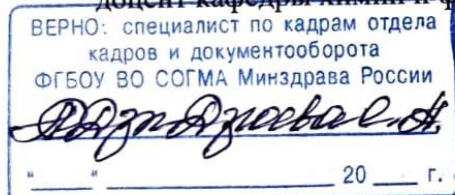
В целом, оценочные материалы по дисциплине «Физика, математика», способствуют качественной оценке уровня владения обучающимися универсальными, общепрофессиональными компетенциями.

Рецензируемые оценочные материалы по дисциплине «Физика, математика» могут быть рекомендованы к использованию для текущего контроля успеваемости и промежуточной аттестации на лечебном факультете (образовательная программа, частично реализуемая на английском языке) у студентов 1 курса.

Рецензент:

Председатель ЦУМК
естественно-научных и математических дисциплин
с подкомиссией экспертизы оценочных материалов,
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Н.И. Боциева

ВЕРНО: специалист по кадрам отдела
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ФГБОУ ВО СОГМА Минздрава России

«____» _____ 20____ г.

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Рецензируемые оценочные материалы по дисциплине «Физика, математика» могут
быть рекомендованы к использованию для текущего контроля успеваемости и промежуточной аттестации у студентов 1 курса лечебного факультета (образовательная программа, частично реализуемая на английском языке).

Рецензент:

Главный врач ГБУЗ «Поликлиника №1» РСО-Алания   З.В. Мецаева

Passport of the assessment materials for the discipline

«Physics, mathematics»

№	Name of the controlled section (topic) of the discipline / module	Code of formed competence	Name of evaluation tool	
1	2	3	4	5
Type of control			**Current**	**Intermediate**
1.	Fundamentals of mathematical analysis, probability theory and mathematical of statistics.	UC-1, ID-1	Cards for the test, test control	Questions to the module, test control
2.	Mechanics of liquids and gases. Biomechanics. Acoustics.	GPC-4, ID-3	Cards for the test, test control	Questions to the module, test control
3.	Electrical and magnetic properties of tissues and the surrounding environment	GPC-4, ID-3	Cards for the test, test control	Questions to the module, test control
4.	Optics	GPC-4, ID-3	Cards for the test, test control	Questions to the module, test control
5.	The quantum physics, ionizing radiation	GPC-4, ID-3	Cards for the test, test control	Questions to the module, test control

Questions to modules

Questions to module 1

1. Concept of derivative of function, its physical meaning.
2. Geometrical meaning of derivative.
3. General rule of differentiation of function. Formulas of differentiation.
4. Derivatives of elementary functions.
5. Differential of function. Properties of differential.
6. Rule of differentiation of composite function.
7. Primitive. Examples. The concept of the indefinite integral.
8. Table of integrals. The main properties of the indefinite integral.
9. The concept of the definite integral. The geometrical meaning.
10. The main properties of the definite integral.
11. Definition of a differential equation.
12. The order of the DE.
13. The linear differential equation.
14. Types of the solutions of the DE-s.
15. The DE of the first order with the separable variable and algorithm of it solution.
16. The main concepts of Probability Theory.
17. Definition of probability. Main theorems of probability theory.
18. Total probability formula.
19. Bernoulli and Poisson formulas.
20. Discrete random variables and their characteristics.
21. Continuous Random Variables. Distribution function and density function.
22. Numerical characteristics of Continuous random variables.

Questions to module 2

1. Sound. Kinds of sounds.
2. Spectrum of sound. Wave resistance.
3. Objective (physical) characteristics of sound. Subjective characteristics, their relationship to the objective.
4. The Weber-Fechner law. Audiometry.
5. Ultrasound, physical principles of application in medicine.
6. Phenomena of the inverse piezoelectric effect and magnetostriction.
7. Doppler effect. Formula for determining the blood flow velocity.

8. Physical basis hemodynamics. Viscosity.

9. Methods for determining the viscosity of a liquid.

10. Stationary flow, laminar and turbulent flow. Reynolds number.

11. Newton's formula, Newtonian and non-Newtonian fluids.

12. The Poiseille formula.

13. Laws of reflection and refraction of light.

14. Limiting angle of refraction and limiting angle of total internal reflection/

15. Phenomenon of total internal reflection.

16. Methods for determining the refractive index of liquids in transmitted and reflected light (draw the ray path in a refractometer in these cases).

Questions to module 3

1. Full and useful magnification of the microscope. Beam path in a microscope. Aperture diaphragm and aperture angle.

2. Light absorption. Bouguer's law. Bouguer-Lambert-Beer law. Concentration colorimetry. Nephelometry.

3. Scattering of light. Tyndall's phenomenon. Molecular scattering, Rayleigh's law. Raman scattering.

4. Light is natural and polarized. Polarizer and analyzer. Law Malus.

5. Polarization of light with double refraction. Nicolas prism. Rotation of the plane of polarization. Bio's Law.

6. Thermal radiation. Heat radiation laws. Planck's formula.

7. Radiation of the Sun. Infrared and ultraviolet radiation and their application in medicine.

8. Heat transfer of the body. Physical foundations of thermography.

9. Luminescence, its types. Mechanism and properties of luminescence. The rule Stokes.

10. Application of phosphors and luminescence analysis in medicine.

11. Forced radiation. Inverse population of levels. The main laser elements.

12. Design and principle of operation of ruby and helium-neon lasers.

13. Properties of laser radiation. Application of laser radiation in medicine.

14. X-ray radiation. X-ray tube device. Brake X-ray radiation.

15. Characteristic X-ray radiation. Moseley's Law.

16. Primary processes of interaction of X-ray radiation with substance: coherent scattering, Compton effect, photoelectric effect.

17. X-ray diagnostics. Fluoroscopy and radiography. Modern X-ray computed tomographs.

18. The phenomenon of radioactivity. Types of radioactive decay. The basic Law radioactive decay.

19. Alpha-decay of nuclei and its features. Beta decay of nuclei, its types, features and spectrum. Gamma radiation from nuclei.

20. Interaction of ionizing radiation with matter.

21. Dosimetry of ionizing radiation. Absorbed and exposure dose. Dose rate.

22. Quantitative assessment of the biological effect of ionizing radiation. Radiation quality factor. Equivalent dose.

23. The primary effect of ionizing radiation on the body. Defence from ionizing radiation.

24. Radiation sickness, its types. Periods and symptoms of acute radiation sickness.

Questions to offset

23. Concept of derivative of function, its physical meaning.
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58. Interaction of ionizing radiation with matter.
59. Dosimetry of ionizing radiation. Absorbed and exposure dose. Dose rate.

60. Quantitative assessment of the biological effect of ionizing radiation. Radiation quality factor. Equivalent dose.
61. The primary effect of ionizing radiation on the body. Defence from ionizing radiation.
62. Radiation sickness, its types. Periods and symptoms of acute radiation sickness.

Situation problem №1

Determine the maximum blood mass that can pass through the aorta in one second while maintaining the laminar character of the current. Aorta diameter D = 2 cm, blood viscosity $\eta = 41 \cdot 10^{-3}$ Pa · s.

Solution:

The critical flow rate is from the condition *Re = Rekr*
Then *v= Rekr/4ρD.*
The mass of blood flowing 1 s equals
$m = v \, \rho S = Re\eta\rho \, \pi D^2/4\rho \, D = Re\eta \, \pi D/4$
$m = 2300 \cdot 4 \cdot 10^{-3} \cdot 3.14 \cdot 2/4 = 0.18 \, kg$
Answer: m = 0.18 kg

Situation problem №2

In atherosclerosis, due to the formation of plaques on the walls of the vessel, the critical value of the Reynolds number may drop to 1160. Determine for this case the rate at which it is possible to pass the laminar blood flow to turbulent in a vessel diameter of 2, 5 mm. The blood density is equal to $\rho = 1050$ kg/m^3, the blood viscosity is equal to $\eta = 5 \cdot 10^{-3}$ Pa· s.
Solution:
Condition of transition of laminar current into turbulent: $Re = Re_{kr}$
$Re = \rho v D/\eta \rightarrow v = Re_{kr}\eta/\rho D = 1160 \cdot 5 \cdot 10^{-3}/(1050 \cdot 2,5 \cdot 10^{-3}) = 2,2 \, m/s$

Answer: v=2,2 m/s

ЛД-21 ИН

Federal State Budgetary Educational Institution of Higher Education
«North-Ossetia State Medical Academy» of the Ministry of Healthcare
of the Russian Federation

Department of Chemistry and physics

Standards of test tasks

in the discipline "Physics, mathematics"

the main professional educational program of higher education - specialty program in the specialty 31.05.01 General Medicine, approved on 24.05. 2023 yr.

for_____1st year students_____

by specialty_____31.05.01 General Medicine_____

Vladikavkaz, 2023

Table of contents

№	Name of the controlled section (topic) of the discipline / module	Number of tests (total)	Pages from <u>14</u> to <u>29</u>	
1	2	3	4	5
Type of control			**Current**	**Intermediate**
1.	Entrance control of the level of training of students	20	14-16	14-16
2.	Fundamentals of mathematical analysis, probability theory and mathematical of statistics.	20	17-19	17-19
3.	Mechanics of liquids and gases. Biomechanics. Acoustics.	20	20-22	20-22
4.	Optics	20	23-25	23-25
5.	Electrical and magnetic properties of tissues and the surrounding environment	15	25-28	25-28
6.	The quantum physics, ionizing radiation	15	28-29	28-29

TEST TASKS
for input control on «Physics, mathematics»

1. Calculated: $\frac{7}{12} - \frac{2}{5} =$

   a) $\frac{5}{7}$ b) $\frac{11}{60}$ c) $-\frac{11}{60}$

2. Find out the meaning of: $\sqrt{a^2 + c^3}$, if $a = -4$, $c = -2$

   a) $\sqrt{8}$ b) $\sqrt{24}$ c) -6

3. Find 42% of the number 300

   a) 14   b) 126   c) $\frac{5000}{7}$

4. Reducing the fraction $\frac{x^2+xy}{x^2-y^2}$ and calculate the value of the resulting expression when x=6, y=3

   a) $\frac{2}{3}$ b) -2   c) 2

5. Solve systems of equations: $\begin{cases} x + y = 3 \\ 2x + 2y = 7 \end{cases}$

   a) (1;2)   b) (6;-3)   c) there are no solutions

6. One side of the rectangle is twice the other and its perimeter is 12 cm. What is the area of the rectangle equal?

   a)   8 cm^2 b) 6 cm^2 c) 64 cm^2

7. Find the Function Definition Area $y = \sqrt{7x - 14}$

   a) x $\geq$ 2   b) x< 2   c) x$\neq$ 2

8. Volume Formula of Cone $V = \frac{1}{3}\pi R^3$, where R is the radius of the base of the cone. Express R through V.

a) $\dfrac{\sqrt[3]{3V}}{\pi}$ 　　　　　　　 b) $\sqrt[3]{\dfrac{3V}{\pi}}$ 　　　　　　　 c) $\dfrac{\sqrt[3]{3V}}{\pi}$

9. There were 5440 voters, representing 85 per cent of the total. How many voters were supposed to vote?

a) 4624 　　　　　　　　　 b) 6400 　　　　　　　　　 c) 6200

10. Cyclists drove 48 km in 2 days. On the first day they drove 2/3 of the whole way. How many kilometers did they go on the second day?
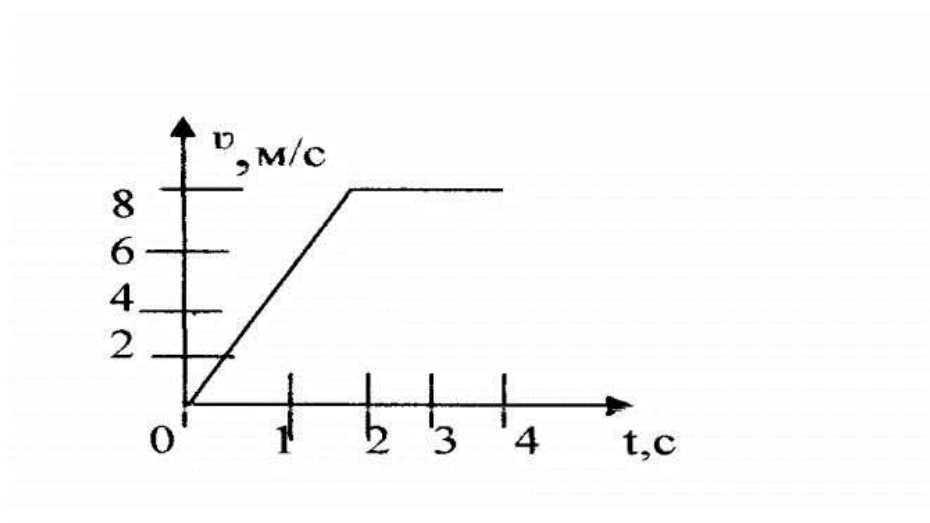
a) 32 km 　　　　　　 b) 16 km 　　　　　　 c) 12 km

11. Find x in proportion: 4x:(2,5·4)=80:50

a) 8 　　　　　 b) 2 　　　　　 c) 4

12. According to the chart, determine the types of traffic and the path on the section of uniform rectilinear movement.

a) 4м 　　　　　　 b) 16м 　　　　　 c) 8м 　　　　　 d) 12м

13. A body weighing 3 kg in an inertial system achieves an acceleration of 10 m/s^2 under the action of...

a) 0,03 N 　　　　 b) 10,3 N 　　　　 c) 3 N 　　　　 d) 30 N

14. Current 2(A) and resistance 2(Ohm). What is the voltage in the circuit?

a) 1V 　　　　　　 b) 2V 　　　　　　 c) 4V 　　　　　 d) 6V

15. Body temperature has decreased, and the speed of movement of molecules...

a) doesn't change   b) increase   c) decrease   d) is equal to zero

16. How many joules does 3.5 KJ contain?

a) 35J   b) 3,5J   c) 350J   d) 3500J

17. When the friction coefficient is doubled the friction.......
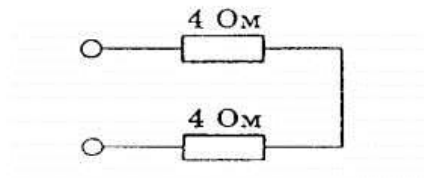
a) will double
b) doesn't change
c) will be halved

18. The body weighing 2 kg is raised to 2m. Find its potential energy.

a) 4 J   b) 40 J   c) 1 J   d) 2 J

19. The body moves with acceleration (-2 m/s^2). Determine the time in which the speed changed from 16 m/s to 10 m/s.

a) 3s b) 5s c) 8s d) 13s

20. Determine the overall resistance of the resistors shown in the diagram

4 Ом

4 Ом

a) 2 Ohm   b) 4 Ohm   c) 6 Ohm   d) 8 Ohm

Answers:

1-b, 2-a, 3-b, 4-c, 5-c, 6-a, 7-a, 8-b, 9-b, 10-b, 11-c, 12-b, 13-d, 14-c, 15-c, 16-d, 17-a, 18-b, 19-a, 20-d

Test

1. $\lim_{x\to 0} \frac{x^3-x^2}{x^2+3}$ is equal to:
a) e
b) ∞
c) 1
d) 0

2. Find the correct continuation of the formula $(e^x)'=$
a) $x\cdot e^{x-1}$
b) e^x
c) $e^x\cdot\ln x$
d) $\frac{x^{e+1}}{e+1}$

3. Derivative of the function y=cos3x is equal to:
   a) y'= -sin3x
   b) y'= -3sin3x
   c) y'= -cos3x
   d) y'= sin3x

4. $\int dx =$
a) C
b) x+C
c) –C
d) 1+C

5. $\int x^n dx =$
a) $\frac{x^{n+1}}{n+1} + C$

b) $\frac{x^{n+1}}{n+1}$
c) $n\cdot x^n+C$
d) $n\cdot x^{n-1}+C$

6. Newton-Leibniz formula:
a) $\int_a^b f(x)dx = F(a) + F(b)$
b) $\int_a^b f(x)dx = F(b) - F(a)$
c) $\int_a^b f(x)dx = F(a) - F(b)$
d) $\int_b^a f(x)dx = F(a) + F(b)$

7. $\lim_{x\to\infty} \frac{1}{x^2+3}$ is equal to:
a) e

b) 1

c) ∞

d) 0

8. You can use the following method in order to calculate the $\lim_{x \to \infty} \frac{3x+14x^2}{7x^2+3x+1}$

a) substitution

b) division by x

c) factorization

d) conjugated expression

9. $6y'''x+4y^2lnx-y^2=0$ is the differential equation of

a) first order

b) second order

c) fourth order

d) third order

10. Formula of integration "by parts" for indefinite integral:

a) $\int udv = \int uv - vdu$

b) $\int udv = \int uv - \int vdu$

c) $\int udv = uv + \int vdu$

d) $\int udv = uv - \int vdu$

11. The probability of impossible event is equal to:

a) 1

b) 0

c) m/n

d) itself

12. There 10 black balls in box. One ball has been taken from the box. What is the probability that ball will be red?

a) 1

b) 0

c) 0.5

d) 1/10

13. The derivative of a fraction $\frac{u}{v}$ is equal to:

a) $\frac{u'v-v'u}{u^2}$

b) $\frac{u'v+v'u}{u^2}$

c) $\frac{v'u-u'v}{u^2}$

d) $\frac{u'v-v'u}{v^2}$

14. Designation of the derivative of the function y=f(x) is

a) Δf

b) $\lim f(x)$

c) $f'(x)$

d) $\dfrac{\Delta y}{\Delta x}$

15. Derivative of any constant is equal to:

a) constant

b) 1

c) 0

d) ∞

16. Derivative of the function $\sqrt{lnx}$ is equal to:

a) $y' = \dfrac{1}{2\sqrt{lnx}} \times \dfrac{1}{x}$

b) $y' = \dfrac{1}{2\sqrt{lnx}} \times lnx$

c) $y' = \dfrac{1}{2\sqrt{x}} \times lnx$

d) $y' = \dfrac{1}{2\sqrt{x}}$

17. Find the correct continuation of the formula (u(x)·v(x))'=

a) u'(x)·v'(x)

b) u'(x)·v(x)+v'(x)·u(x)

c) u'(x)+v'(x)

d) 0

18. Differential of the function y=cotx is equal to:

a) $dy = \dfrac{1}{cos^2x} dx$

b) $dy = \dfrac{1}{cos^2x}$

c) $dy = -\dfrac{1}{sin^2x} dx$

d) $y' = \dfrac{1}{sin^2x}$

19. Physical meaning of derivative is

a) a velocity

b) acceleration

c) area of a curvilinear trapezoid

20. Formula $\sum_{i=1}^{n} x_i p_i$ is used to count the

a) standard deviation

b) variance

c) mathematical expectation

d) norming condition

Answers:
1-d, 2-b, 3-b, 4-b, 5-a,6-b, 7-d, 8-b, 9-d, 10-d, 11-b, 12-b, 13-d, 14-c, 15-c, 16-a, 17-b, 18-c, 19-a, 20-c

Test

1. Maximum blood flow rate:
    a) in the center of the blood vessel
    b) in areas adjacent to the walls of the blood vessel
    c) the flow rate of the blood at any point in the section of the blood vessel remains constant-

2. As the blood moves through the human circulatory system from the aorta to the vena cava, the average total blood pressure is:
    a) Increases and becomes more atmospheric
    b) the arterial region has more atmospheric and less atmospheric vein
    c) remains unchanged in any part of the circulatory system and corresponds to atmospheric pressure
    d) in the arterial region equals atmospheric, then decreases and becomes less atmospheric

3. For laminar flow of liquid:
    a) the layers of the liquid are not mixed, the current is not accompanied by characteristic acoustic noise
    b) the layers of the liquid are not mixed, the current is accompanied by characteristic acoustic noise
    c) the layers of liquid are mixed to form a vortex; the current is not accompanied by characteristic acoustic noise
    d) The layers of liquid are mixed to form a vortex; the current is accompanied by characteristic acoustic noise

4. For turbulent fluid flow:
    a) the layers of the liquid are not mixed, the current is not accompanied by characteristic acoustic noise
    b) the layers of the liquid are not mixed, the current is accompanied by characteristic acoustic noise
    c) the layers of liquid are mixed to form a vortex; the current is not accompanied by characteristic acoustic noise
    d) the layers of liquid are mixed to form a vortex; the current is accompanied by characteristic acoustic noise

5. The ratio between hydrostatic, hydrodynamic and static pressures is:
    a) Poiseille Act
    b) Newton's formula
    c) Bernoulli equation
    d) Stokes formula

6. When the inner diameter of the vessel is reduced, the static blood pressure:

a) decreases

b) increases

c) unchanged

7. When the inner diameter of the vessel is reduced, the hydrodynamic blood pressure:
   a) decreases
   b) increases
   c) unchanged

8. The appearance of noise in the flow of liquid indicates:
   a) about laminar flow of liquid
   b) turbulent fluid flow
   c) stationary flow of liquid

9. The volume velocity of the blood flow in the vessel is equal to:
   a) linear blood flow rate
   b) product of linear velocity per area of cross-section of the vessel
   c) ratio of linear velocity to the cross-section area of the vessel
   d) product of linear velocity at blood viscosity

10. At the site of pipe contraction:
    a) the linear flow rate of the liquid is reduced
    b) increases the linear flow rate of the liquid
    c) the volume flow rate of the liquid increases
    d) the volume flow rate of the liquid is reduced

11. Which of the expressions is the Gagen-Poiseul formula?:
    a) $Q = \dfrac{P_1 - P_2}{X}$

    b) $Q = \dfrac{X}{P_1 - P_2}$

    c) $Q = (P_1 - P_2)X$

12. Formula for determining hydraulic resistance:
    a) $X = \dfrac{p_1 - p_2}{8l\eta} R^2$;

    b) $X = \dfrac{8l\eta}{\pi R^4}$;

    c) $X = \dfrac{\upsilon_1 - \upsilon_2}{\Delta z}$.

13. Sound is represented by:
    a) mechanical waves less than 20 Hz;
    b) mechanical waves with frequencies from 20 Hz to 20 kHz;

c) mechanical waves more than 20 kHz;

d) electromagnetic waves from 20 Hz to 20 kHz.

14. The threshold of audibility is called:

a) the minimum frequency of sounds to be heard;

b) minimum sound wave intensity;

c) maximum sound volume;

d) the maximum sound wave intensity.

15. The objective characteristics of sound perceived by a person include:

a) volume, frequency, timbre;

b) frequency, intensity, acoustic spectrum;

c) acoustic spectrum, acoustic pressure, height

16. The subjective characteristics of sound include:

a) volume, height, timbre;

b) frequency, intensity, acoustic spectrum;

c) acoustic spectrum, acoustic pressure, height

17. Audiometry is called:

a) one of the methods used to study auditory acuity;

b) one of the methods of diagnostics of human hearing organs;

c) one of the methods of electrophysical therapy;

d) one of the methods for measuring the speed of sound

18. The Weber-Fechner Act establishes a relationship between the following values:

a) sound intensity and frequency;

b) the volume and intensity of sound;

c) the volume and frequency of sound;

d) volume and speed of sound

19. Ultrasound is called:

a) mechanical waves less than 20 Hz;

b) mechanical waves with frequencies from 20 Hz to 20 kHz;

c) mechanical waves more than 20 kHz;

d) electromagnetic waves with a frequency greater than 20 kHz.

20. The Doppler effect applies:

a) to determine the blood flow rate;

b) for micromassage of tissues of the body;

c) for the manufacture of emulsions, ointments;

d) to determine the concentration of impurities of materials

Answers: 1-a, 2-b, 3-a, 4-d ,5-c, 6-a, 7-b, 8-b, 9-b, 10-b, 11-a, 12-b, 13-b, 14b, 15-b, 16-a, 17-a, 18-b, 19-c, 20-a.

Test

1. The refractive ratio is the ratio:
    a) the speed of light in the first medium to the speed of light in the second;
    b) the speed of light in vacuum to the speed of light in a given medium;
    c) the speed of light in a given medium to the speed of light in vacuum.

2. When passing light from an optically less dense medium to an optically denser medium:
    a) refractive angle is greater than the angle of fall;
    b) the angle of fall is equal to the angle of refraction;
    c) the angle of incidence is greater than the angle of refraction.

3. If light propagates from a medium with a high refractive index to an environment with a lower refractive index:
    a) refractive angle is greater than the angle of fall;
    b) the angle of fall is equal to the angle of refraction;
    c) the incidence angle is greater than the refractive angle

4. The phenomenon that causes a change in the direction of light when passing it over the boundary of the partition of two environments is called:
    a) refraction of light;
    b) refraction of light;
    c) interference of light.

5. The absolute refractive index characterizes:
    a) the optical properties of the medium;
    b) partition boundary properties of two environments;

6. The refractive ratio characterizes:
    a) the optical properties of the medium;
    b) the partition boundary properties of two environments.

7. When there is complete internal reflection of the light from the boundary of the partition of the two media, the reflection angle is equal to:
    a) fall angle;
    b) 90 degrees;
    c) 0 degrees.

8. Which of the above optical phenomena underlies the action of the refractometer?:
    a) refractive index variance;
    b) light refraction;
    c) polarization of light;
    d) interference of light.

9. What is the phenomenon underlying the determination of concentration of solutions by means of a refractometer?:
    a) optical solution activity;
    b) dependence of light absorption on solution concentration;

c) refractive index depends on solution concentration.

10. The full internal reflection angle is a certain value:
    a) the angle of fall;
    b) refractive angle;
    c) the angle of reflection;

11. The limit angle of refraction is the maximum angle of refraction observed at the light beam transition:
    a) from the optically less dense medium to the optically denser;
    b) from an optically denser medium to an optically less dense medium.

12. Concentration. Which solutions can be measured with a refractometer?:
    a) only transparent;
    b) only absorbing;
    c) optical active;
d) any of these.

13. The refractometer measures the concentration of the solutions based on:
    a) dependence of light absorption on concentration;
    b) the refractive index of solutions depends on the concentration;
    c) optical solution activity.

14. What law describes the dependence of light absorption on the thickness of the substance?:
    a) the Buger Law;
    b) Brewster Law;
    c) Malus Law.

15. What phenomenon does Booger's law describe?:
    a) Light refraction;
    b) Polarization of light;
    c) Light diffraction;
    d) Absorption of light by matter.

16. When passing light in an optically homogeneous substance, the following cannot occur:
    a) light absorption;
    b) light refraction;
    c) light scattering.

17. What is the optical phenomenon underlying the microscope?:
    a) refraction of light;
    b) light diffraction;
    c) interference of light.

18. How many optical axes can there be?:

a) one;
b) two;
c) an infinite set.

19. The point at which the rays fall on the lens parallel to the main optical axis is called:
a) as a secondary focus;
b) optical centre;
c) the main focus.

20. The resolution limit is defined by the formula:

a) $z = \dfrac{\lambda}{2n\sin\theta}$;

b) $z = \dfrac{\lambda}{2A}$;

c) $z = \dfrac{\lambda}{2\sin\theta}$.

21. When reducing the resolution limit, the resolution of the microscope:
a) decreases;
b) increases;
c) does not change.

Answers: 1-a, 2-c, 3-a, 4-ab, 5-a, 6-b, 7-a, 8-b, 9-a, 10-a, 11-d, 12-b, 13-a, 14-d, 15-c, 16-a, 17-a, 18-c, 19-ab, 20-b.

Test

1.　　Impedance is called:
a) AC circuit inductive resistance;
b) complete AC circuit resistance;
c) capacitive AC circuit resistance.

2. The body tissue impedance is determined by:
a) only ohmic and inductive resistance;
b) only ohmic and capacitive resistance;
c) inductive and capacitive resistance only.

3. For a resistor chain, the equation for the resistance is:

a) $R = \dfrac{U_{max}}{I_{max}}$;

b) $X_L = \dfrac{U_{max}}{I_{max}} = L\omega$;

c) $X_C = \dfrac{U_{max}}{I_{max}} = \dfrac{1}{C\omega}$.

4. The Omnibus Act states:

a) the electric current is directly proportional to the voltage and inversely proportional to the resistance;

b) the voltage is directly proportional to the impedance;

c) the electric current is directly proportional to the voltage and impedance.

5. For circuit with inductance coil the formula for inductive resistance is:

a) $R = \dfrac{U_{max}}{I_{max}}$;

b) $X_L = \dfrac{U_{max}}{I_{max}} = L\omega$;

c) $X_C = \dfrac{U_{max}}{I_{max}} = \dfrac{1}{C\omega}$.

6. The electroconductivity dispersion of the tissue is the result of dependence:

a) AC-frequency capacitive resistance;

b) voltage from resistance;

c) current voltage.

7. In transplant surgery, as one of the tests of viability of preserved skin is used:

a) electrical conductivity;

b) inductance;

c) container.

8. The full AC circuit resistance is determined by the formula:

a) $U = \sqrt{U_r^{\ 2} + U_x^{\ 2}}$;

b) $Z = \sqrt{R^2 + (\omega L - \dfrac{1}{\omega C})^2}$;

c) $Z = \sqrt{R^2 + (\omega L + \dfrac{1}{\omega C})^2}$;

9. The impedance value of the biological tissue depends on the frequency of the alternating sinusoidal current if the cell in it:

a) died

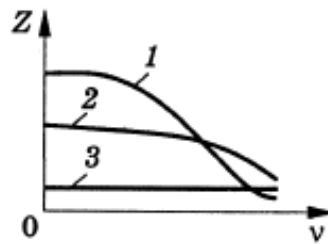b) not killed

c) impedance value is independent of cell state

10. Body tissues are carried out only ...

a) AC current;
b) direct current;
c) and DC and AC current.

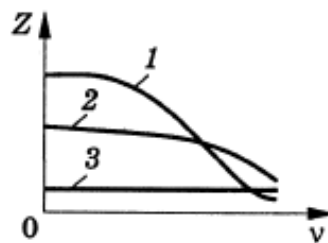11. The diagnostic method, based on the recording of impedance change in the process of cardiac activity, is called:
    a) cardiography;
    b) tomography;
    c) rheography.

12. For dead tissue, the impedance frequency dependence is:

    a) 1;
    b) 2
    c) 3

13. For live healthy tissue, impedance's frequency dependence is as follows:

    a) 1;
    b) 2
    c) 3

14. For a capacitor chain, the capacitance resistance formula is:

a) $R = \dfrac{U_{max}}{I_{max}}$;

b) $X_L = \dfrac{U_{max}}{I_{max}} = L\omega$;

c) $X_C = \dfrac{U_{max}}{I_{max}} = \dfrac{1}{C\omega}$.

15. In laboratory work impedance is defined by the formula:

a) $Z = \dfrac{y_0 R_{\text{Д}} S_y}{x_o S_v}$;

b) $Z = (\dfrac{1}{\omega c})^2$;

c) $Z = (L\omega - \dfrac{1}{\cos})^2$;

Answers: 1-b, 2-b, 3-a, 4-a, 5-b, 6-a, 7-a, 8-b, 9-b, 10-c, 11-c, 12-c, 13-a, 14-c, 15-a.

Test

1. The number of protons in the nucleus of an atom is equal to:
   a) mass number of chemical element;
   b) the sequence number of the chemical element in the mendeleev table;
   c) mass number difference and serial number.

2. The isotope nuclei of a given chemical element have the same number:
   a) protons;
   b) neutrons;
   c) electrons.

3. Which of the following elementary particles are not nucleons?:
   a) electrons;
   b) protons;
   c) neutrons.

4. Radioactive radiation, which is a flow of electrons is called:
   a) α - radiation;
   b) β - radiation;
   c) γ - by radiation.

5. How many neutrons are part of the chemical element nucleus $^{14}_{6}N$?:
   a) 6;
   b) 8;
   c) 14.

6. γ - radiation at radioactive decay is:
   a) flow of electrons;
   b) Neutron flow;
   c) the flow of short-wave electromagnetic radiation;
   d) the flow of protons.

7. What kind of radioactive decay corresponds to the equation $^{A}_{Z}X + ^{0}_{-1}e \rightarrow ^{A}_{Z-1}Y + \nu$? :
   a) α- decay;

b) β+- decay;

c) β-decay;

d) electronic capture.

8. The purpose of radionuclide diagnosis is:

    a) determination of the mode of radiation of the radionuclide;

    b) determination of the anatomical and functional state of the organ;

    c) determination of the degree of contamination by radioactive isotopes.

9. Radiopharmaceuticals are the following:

    a) pharmaceuticals containing radioactive nuclide;

    b) preparations that absorb radioactive radiation;

    c) preparations for transmitting information on a radio channel.

10. Positron emission tomographs (PET) record:

    a) positron streams emitted by radiopharmaceuticals;

    b)gamma photons arising from the reincarnation of the pair;

    c) content of positrons and electrons in bone tissue.

11. Potassium $_{19}^{40}K$ isotope in the human body contains:

    a) bone marrow only;

    b) only in the brain;

    c) only in muscles and spleen;

    d) the brain, muscles, spleen and bone marrow.

12. Of the functions of cells to the action of nuclear radiation are the most sensitive:

    a) ability to divide, synthesize proteins and nucleic acids;

    b)respiration;

    c) photosynthesis.

13. Oxygen enhances biological action:

    a) slightly ionizing radiation;

    b) highly ionizing radiation.

14. Of the functions of cells to the action of nuclear radiation are the most stable:

    a) the ability to divide;

    b) synthesis of proteins and nucleic acids;

    c) respiration and photosynthesis.

15. Average linear mileage α - particles depend on:

    a) from its energy;

    b) from the density of the substance;

    c) from its energy and density of matter.

Answers: 1-b, 2-a, 3-a, 4-b, 5-b, 6-c, 7-d, 8-b, 9-a, 10-b, 11-d, 12-a, 13-a, 14-c, 15-c.

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Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №1

1. Concept of derivative of function, its physical meaning.

2. Sound. Kinds of sounds. Spectrum of sound. Wave resistance.

Card to offset №2

1. General rule of differentiation of function. Formulas of differentiation.

2. Objective (physical) characteristics of sound. Subjective characteristics, their relationship to the objective.

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Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №3

1. Concept of derivative of function. Derivatives of elementary functions.

2. The Weber-Fechner law. Audiometry.

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Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physic, mathematics

Card to offset №4

1. Differential of function. Properties of differential.

2. Ultrasound, physical principles of application in medicine.

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Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №5

1. Differential of function. Rule of differentiation of composite function.

2. Phenomena of the inverse piezoelectric effect and magnetostriction.

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Ministry of Health Russian Federation

Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №6

1. Primitive. The concept of the indefinite integral.

2. Doppler effect. Formula for determining the blood flow velocity.

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Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №7

1. The concept of the indefinite integral. Table of integrals.

2. Physical basis hemodynamics. Viscosity. Methods for determining the viscosity of a liquid.

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Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №8

1. The main properties of the indefinite integral.

2. Stationary flow, laminar and turbulent flow. Reynolds number.

Card to offset №9

1. The concept of the definite integral. The Newton-Leibniz formula.

2. Newton's formula, Newtonian and non-Newtonian fluids.

Card to offset №10

1. The geometrical meaning of the definite integral.

2. Methods for determining the viscosity of a liquid. The Poiseille formula.

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Discipline Physics, mathematics

Card to offset №11

1. The main properties of the definite integral.

2. X-ray radiation. X-ray tube device. Brake X-ray radiation.

Card to offset №12

1. Definition of a differential equation. The order of the DE. The linear differential equation.
2. Characteristic X-ray radiation. Moseley's Law.

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Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №13

1. The main concepts of Probability Theory. Definition of probability. Main theorems of probability theory.
2. Primary processes of interaction of X-ray radiation with substance: coherent scattering, Compton effect, photoelectric effect.

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Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №14

1. Discrete random variables and their characteristics.
2. Stationary flow, laminar and turbulent flow. The Poiseille formula. The Hagen-Poiseuille formula.

Department Chemistry and physics
Faculty/Specialty General Medicine/31.05.01
Course 1/2023-2024 yr.
Discipline Physics, mathematics

Card to offset №15

1. Continuous Random Variables. Distribution function and density function. Numerical characteristics of Continuous random variables.
2. X-ray diagnostics. Fluoroscopy and radiography. Modern X-ray computed tomographs.