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высшего образования
«Оренбургский государственный медицинский университет»
Министерства здравоохранения Российской Федерации

**ФОНД ОЦЕНОЧНЫХ СРЕДСТВ
ДЛЯ ПРОВЕДЕНИЯ ТЕКУЩЕГО
КОНТРОЛЯ УСПЕВАЕМОСТИ И ПРОМЕЖУТОЧНОЙ АТТЕСТАЦИИ
ОБУЧАЮЩИХСЯ ПО ДИСЦИПЛИНЕ
БИОФИЗИКА**

по специальности

31.05.01 Лечебное дело (факультет иностранных студентов)

Является частью основной профессиональной образовательной программы высшего образования по специальности *31.05.01 Лечебное дело*, утвержденной ученым советом ФГБОУ ВО ОрГМУ Минздрава России

протокол № 9 от «30» апреля 2021

Оренбург

1. Паспорт фонда оценочных средств

Фонд оценочных средств по дисциплине содержит типовые контрольно-оценочные материалы для текущего контроля успеваемости обучающихся, в том числе контроля самостоятельной работы обучающихся, а также для контроля сформированных в процессе изучения дисциплины результатов обучения на промежуточной аттестации в форме экзамена.

Контрольно-оценочные материалы текущего контроля успеваемости распределены по темам дисциплины и сопровождаются указанием используемых форм контроля и критериев оценивания. Контрольно – оценочные материалы для промежуточной аттестации соответствуют форме промежуточной аттестации по дисциплине, определенной в учебном плане ОПОП и направлены на проверку сформированности знаний, умений и навыков по каждой компетенции, установленной в рабочей программе дисциплины.

В результате изучения дисциплины у обучающегося формируются следующие компетенции:

ОПК-4 - Способен применять медицинские изделия, предусмотренные порядком оказания медицинской помощи, а также проводить обследования пациента с целью установления диагноза;

ОПК-5 - Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач;

УК-1 - Способен осуществлять критический анализ проблемных ситуаций на основе системного подхода, выработать стратегию действий.

В результате изучения дисциплины у обучающегося формируются следующие компетенции:

Наименование компетенции	Индикатор достижения компетенции
ОПК-4 - Способен применять медицинские изделия, предусмотренные порядком оказания медицинской помощи, а также проводить обследования пациента с целью установления диагноза	Инд.ОПК4.1. Способность применять стандартные медицинские изделия в лечебно-диагностических целях
ОПК-5 - Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач	Инд.ОПК5.2. Способность оценить физиологические состояния организма человека в рамках профессиональной деятельности

УК-1 - Способен осуществлять критический анализ проблемных ситуаций на основе системного подхода, вырабатывать стратегию действий	Инд.УК1.1. Способность выявлять проблемные ситуации в профессиональной деятельности
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2. Оценочные материалы текущего контроля успеваемости обучающихся.

Модуль 1. Physical Basics of Hemodynamics. Biophysics of membranes. Sound.

Тема 1. Physical Basics of Hemodynamics.

Формы контроля успеваемости

Письменный контроль, тестирование, контроль выполнения практических заданий.

Оценочные материалы текущего контроля успеваемости

1. Вопросы письменного контроля по теме

Вариант 1

1. Laminar and turbulent fluid flow.
2. What the sense of Reynolds number?
3. What caused the overall level of blood pressure?
4. What is the systolic (upper) blood pressure?
5. What is the diastolic (lower) pressure?
6. What is the blood pressure normal?
7. What is the high and low blood pressure?
8. What are the methods of measuring blood pressure?

Вариант 2

1. Explain unit apparatus for measuring blood pressure.
2. Explain the mechanism of the appearance and disappearance of Korotkoff sounds when measuring pressure.
3. What are the adaptive capacity of the cardiovascular system?
4. Poiseuille's law.
5. Circulation of the Blood.
6. Schematic diagram showing various routes of the circulation.
7. Blood Pressure.
8. Power Produced by the Heart.

3. Практические задания для аудиторной работы

3.1. The practical part

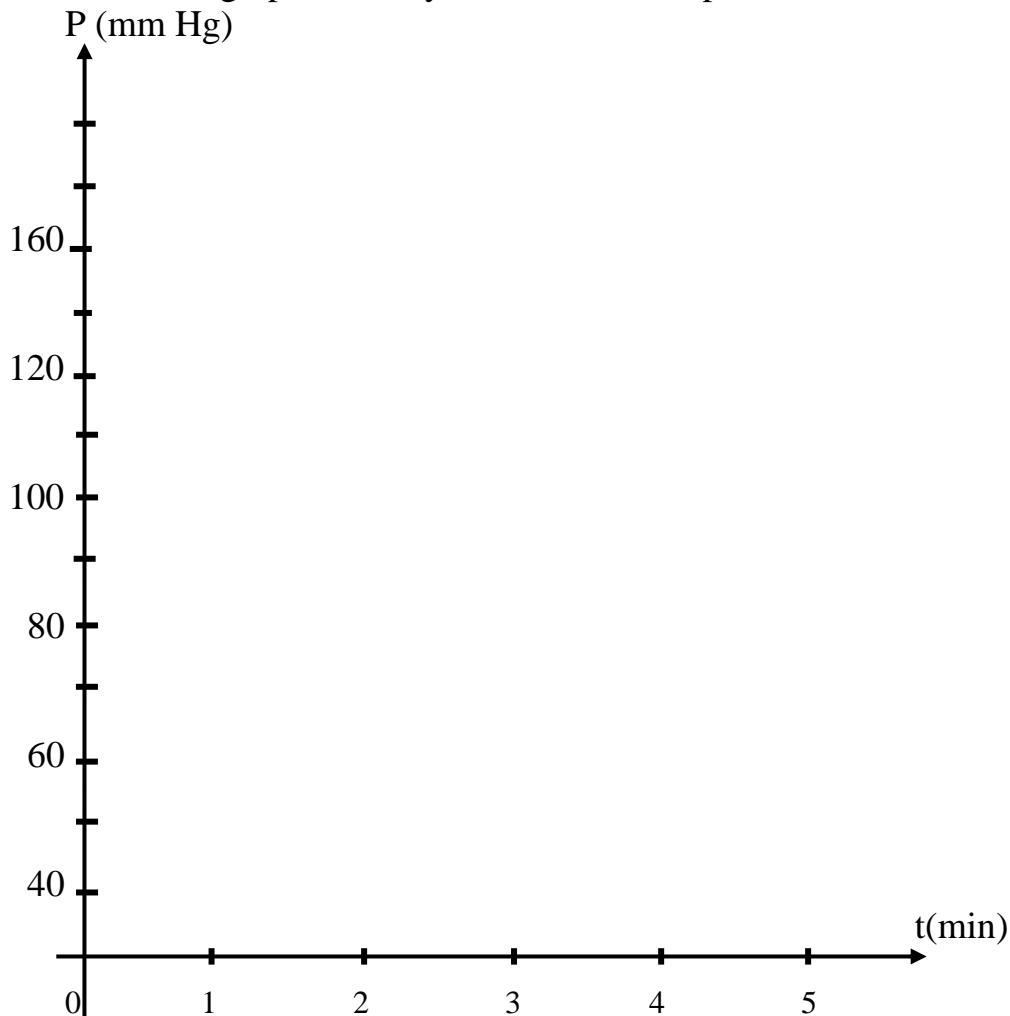
1. Measure systolic and diastolic blood pressure at rest test and measure your heart rate.

2. Measure **systolic and diastolic pressure and pulse rate** test to exercise and physical activity after dosing (20 squats with a 1 second interval) through 1,2,3,4,5 minutes.

3. Data tabulated:

	Resting state (t =0)	After thrust				
		1 min	2 min	3 min	4 min	5 min
P_s						
P_d						
P_{pul}						
n						
Conclusion:						

1. Draw a graph of the system-wide blood pressure from time to time.



1. Draw conclusions about the dynamics of blood pressure and heart rate, on the nature of the circulatory apparatus adaptation to stress test.

3.2 Tests on: «Study of a Apparatus for Measuring Blood Pressure»

1. Normal blood flow is turbulent at:

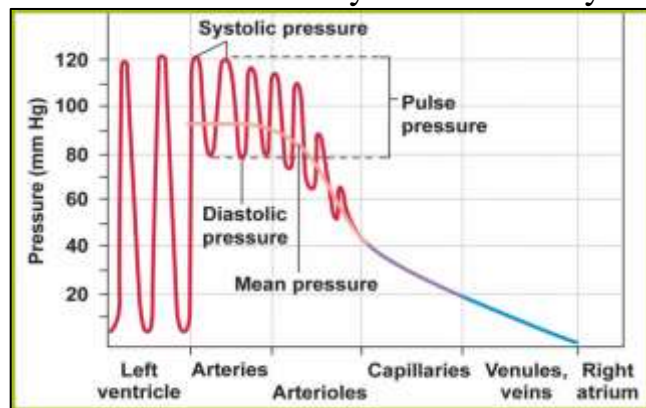
1. arteries

2. capillaries
3. veins
4. aorta
2. *In what vessels of cardiovascular system for a person in the norm-pressure of blood have a minimum - 6 mm Hg*
 1. in an aorta
 2. in артериолах
 3. in veins
 4. in capillaries
3. *Blood flow is laminar:*
 1. in atherosclerosis
 2. in large arteries
 3. in capillaries
 4. in the aorta
4. *Small circle of blood circulation starts at:*
 1. the left ventricle
 2. the right ventricle
 3. the left atrium
 4. the right atrium
5. *Tones of Korotkov disappear when the blood flow becomes:*
 1. turbulent
 2. laminar
 3. regular
 4. accelanated
6. *The nature of the flow of liquid through a pipe is determined:*
 1. Newton's equation
 2. number of Reynolds
 3. Poiseuille formula
 4. the law Stokes
7. *If nature of the flow of liquid is laminar, the Reynolds number:*
 1. more than a critical value
 2. less than a critical value
 3. equal to the critical value of the
 4. much more than a critical value
8. *Between the left atrium and the left ventricle is located valve:*
 1. aortic
 2. pulmonary
 3. tricuspid
 4. mitral
9. *The big circle of blood circulation begins in:*
 1. the left ventricle
 2. the right ventricle
 3. the left atrium
 4. the right atrium
10. *What is the reason of the heart noise appearance?*

1. laminar current of blood in an aorta
2. change of frequency of reductions of a cardiac muscle
3. turbulent flow of blood about heart valves
4. change of sound conductivity of fabrics

3. Практические задания для внеаудиторной работы

1. Write the answer to the question «Arteriosclerosis and Blood Flow».
2. Draw a diagram in the laws of the Overall Systemic Hemodynamics.



4. Тестовые задания по теме

Physical basis of hemodynamics

1. *What vessels of cardiovascular system is the lowest speed of a blood-groove in*

- in arteries
- in capillaries
- in артериолах
- in an aorta

2. *In what vessels of cardiovascular system for a person in the norm-pressure of blood have a minimum - 6 mm Hg*

- in an aorta
- in артериолах
- in veins
- in capillaries

3. *Stroke volume of blood is:*

- 60-70 ml
- 4,5-5 l
- 120 l
- 10 l

4. *Small circle of blood circulation starts at:*

- the left ventricle
- the right ventricle
- left atrium
- the right atrium

5. *Critical Reynolds number for blood plasma is:*

R=2000

R=970

R=2300

R=1970

6. *The nature of the flow of fluid through a pipe is determined with:*

Newton's equation

number of Reynolds

Poiseuille formula

the law Stokes

7. *If nature of the flow of fluid is laminar, the Reynolds number is:*

more critical values

less than a critical value

equal to the critical value of the

much more critical values

8. *The dependence of blood viscosity on a gradient of speed is explained by that ...*

uniform elements of blood form large units - "monetary columns"

plasma of blood possesses high viscosity

uniform elements of blood are varied in form also to the sizes

blood has red color

9. *Fluid is called Newtonian, if the coefficient of viscosity depends on..*

liquid flow regime

sort of liquid and temperature

flow velocity

pressure

10. *The value characterizing change of speed in any direction is called:*

acceleration

angular speed

speed gradient

speed transformation

11. *When fluid is heated its viscosity. . .*

increases

does not change

decreases

12. *Hydraulic resistance with reduction of viscosity of liquid:*

increases

decreases

doesn't change

increases several times

13. *With age, the elasticity of the vessel:*

decreases

increases

does not change

14. *In what part of cardiovascular system the maximum normal human pressure is 120 mm Hg?*

in arterioles
in capillaries
in veins
in an aorta

15. The lowest speed of a blood-groove is in:

arteries
arterioles
to aorta
capillaries

16. The big circle of blood circulation begins in:

the left ventricle
the right ventricle
the left atrium
the right atrium

17. Critical Reynolds number at the flow of ideal fluid on the smooth tube is:

$R=2000$
 $R=970$
 $R=2300$
 $R=1970$

18. Reynolds's number characterizes:

mode of a current of liquid
viscosity of a liquid
force of a superficial tension
direction of a current of liquid

19. What is the reason of occurrence of a heart murmur?

laminar current of blood in an aorta
change of frequency of reductions of a cardiac muscle
turbulent flow of blood about heart valves
change of sound conductivity of fabrics

20. The fluid flow regime is turbulent, if the Reynolds number is:

much less than the critical value
equal to the critical value of the
more critical values

21. Property of liquid to show resistance to movement of its layers relatively each other is called:

capillary phenomenon
fluidity
turbulence
viscosity

22. Fluid is called non-Newtonian if the viscosity coefficient depends on ...

type of liquid, the temperature and the flow rate
type of liquid
temperature
density

23. Speed of a current of blood is maximum:

at a vessel wall
at the beginning of the vessel
along the axis of the vessel
at the end of a vessel

24. Speed of a current of viscous liquid on a horizontal pipe, is more:

at a pipe wall
doesn't depend on distance
the same everywhere
at a pipe axis

25. Blood is a non-Newtonian fluid because:

it flows through the vessels with a great speed
the flow is laminar
it contains erythrocytes and leukocytes
its flow is turbulent

26. Dependence between the volume of the liquid flowing through a section of pipe in one second, and its coefficient of viscosity is:

the directly proportional
inversely proportional
the square
the exponential

27. Normal blood flow is turbulent at:

arteries
capillaries
veins
aorta

28. Blood flow is laminar:

in atherosclerosis
in large arteries
in capillaries
in the aorta

29. Tones of Korotkov disappear when the blood flow becomes:

turbulent
laminar
regular
accelerated

30. If the number of Reynolds for blood plasma is equal to 1200, the action is:

laminar
turbulent
regular
accelerated

31. Between the left atrium and the left ventricle is located valve:

aortic
pulmonary
tricuspid
mitral

32. Between the right ventricle and the pulmonary artery valve is:

aortic

pulmonary

tricuspid

mitral

33. The second phase of the cardiac cycle is:

total diastole

atrial systole and ventricular diastole

ventricular systole

atrial diastole

34. Blood flow becomes turbulent:

in atherosclerosis

in pipes with smooth walls

in the pipes without change in the area of cross-section

in the pipes without bends

35. We hear Korotkov sounds when measuring blood pressure because blood flow becomes:

turbulent

laminar

continuous

either batch

36. If the number of Reynolds for blood plasma equal to 800, the action is:

turbulent

laminar

continuous

either batch

37. Between the right atrium and right ventricle is located valve:

aortic

pulmonary

tricuspid

mitral

38. Between the left ventricle and the aorta is located valve:

aortic

pulmonary

tricuspid

mitral

39. The first phase of the cardiac cycle is:

total diastole

atrial systole and ventricular diastole

ventricular systole

atrial diastole

40. The third phase of the cardiac cycle is:

total diastole

atrial systole and ventricular diastole

ventricular systole
atrial diastole

Тема 2. Biophysics of membranes.

Формы контроля успеваемости

Письменный контроль, устный опрос, тестирование, контроль выполнения практических заданий.

Оценочные материалы текущего контроля успеваемости

1. Вопросы письменного контроля по теме

Вариант 1

1. Structure and physical properties of the biological membrane.
2. Types of lipids and proteins motion in the cell membrane.
3. Transport of molecules and ions through the membrane.
4. Mathematical description of the passive transport.
5. Active transport of ions.
6. Membrane potentials of the cell.

Вариант 2

1. Types of self-organization of lipids in water.
2. General scheme of membrane structure.
3. Some functions of a biological membrane.
4. The physical properties and parameters of membranes.
5. Two major types of the membrane transport.
6. Mathematical description of the passive transport.

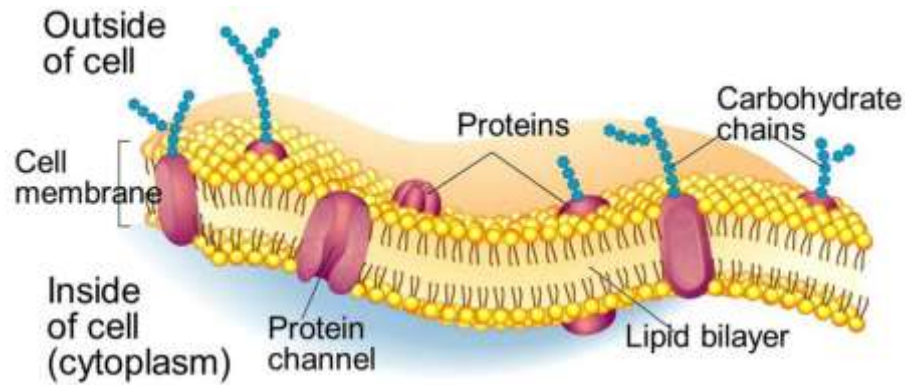
2. Вопросы для устного опроса

1. Nernst–Planck equation
2. Fick Law
3. Nernst Equation
4. Membrane potential due to potassium ions transport K^+ , Na^+ , Cl^-
5. Equation Goldman-Hodgkin's Lymphoma

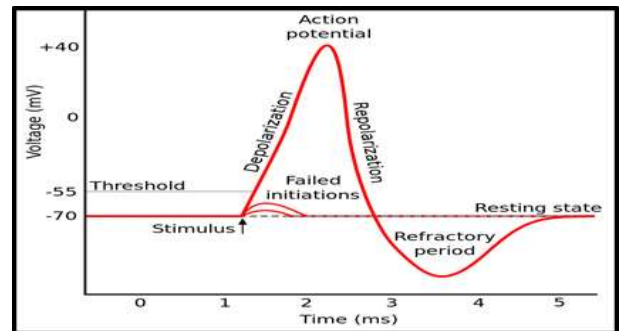
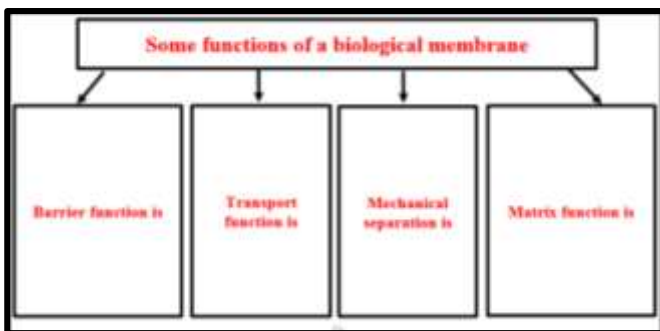
3. Практические задания для аудиторной работы

3.1 Worked example.

Write this information and draw a diagram in your notebook. General scheme of membrane structure.



3.2. Definitions. Write this information and draw a diagram in your notebook.

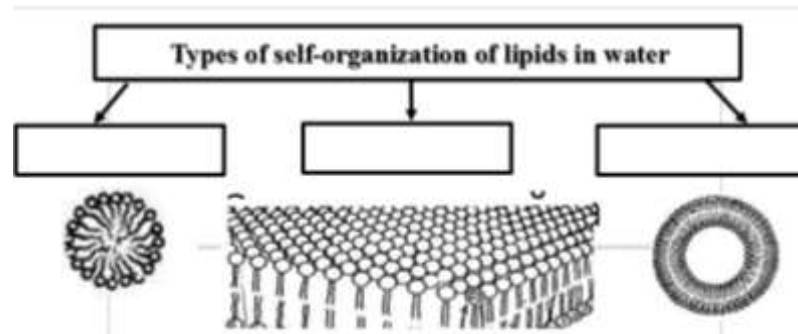


3.3 Equations. Write mathematical description of the active transport of ions in your notebook.

6. Nernst–Planck equation
7. Fick Law
8. Nernst Equation
9. Membrane potential due to potassium ions transport K^+ , Na^+ , Cl^-
10. Equation Goldman-Hodgkin's Lymphoma

4. Практические задания для внеаудиторной работы

Worked example. Break the types of self-organization of lipids in water down into components in a diagram.



5. Тестовые задания по теме

Biophysics of membranes

1. Phospholipid molecules consist of a membrane:

polar hydrophilic "head" and a nonpolar hydrophobic tail
a non-polar hydrophobic "head" and a polar hydrophilic tail
non-polar hydrophilic "head" and a nonpolar hydrophobic tail
polar hydrophobic "head" and a polar hydrophilic tail

2. *Goldman-Hodgkin's equation takes into account the diffusion through the membrane:*

potassium ions

sodium ions

chlorine ions

of potassium, sodium, chlorine

3. *Lateral diffusion of molecules in membranes called:*

rotational motion of the molecules;

hopping molecules across the membrane;

movement of molecules along the plane of the membrane;

active transport of molecules through the membrane;

passive transport of molecules through the membrane.

4. *Viscosity of membrane lipid layer is close to the viscosity:*

of water

ethanol

acetone

vegetable oils

5. *Nernst - Planck shows that:*

resting potential is the result of active transport

transport of ions is determined by the concentration gradient and the gradient of the electric potential

major role in the occurrence of resting potential belongs potassium ions

membranes are selectively permeable permeability of substances through the membrane is determined by their mobility

6. *As modified Nernst-Planck equation, if the ion becomes an uncharged particle?*

turn into the equation Goldman-Hodgkin-Katz

equation loses meaning

turn into Fick equation

not change

7. *Diffusion of uncharged particles through the membrane obeys the equation:*

Fick

Nernst-Planck equation.

Goldman-Hodgkin-Katz;

Nernst

8. *simplification diffusion is the transport of ions:*

special molecules – carriers

with the participation integral proteins

through lipid layer

with the participation of a potassium-sodium pump

9. *Diffusion of a substance through the membrane provided by the harder than ...*

The thicker the membrane

More permeability coefficient

10. Active transport of substances through the membrane is carried out:
without energy

special molecules - carriers

with the participation of peripheral proteins

with the participation of potassium-sodium pump

11. In the sodium-potassium pump Na^+ ions

penetrate the cell concentration gradient

pumped into the cell against a concentration gradient

out of cells by the density gradient

pumped out of the cell against a concentration gradient

12. Basic properties of ion channels:

selectivity (the ability of ion channels selectively pass ions of the same type).

independence of ion channels from each other

dependence of the channel parameters on the membrane potential

all answers are correct

13. Selectivity refers to the ability of ion channels selectively miss:

ions of different types of

molecule of one species

ions of one type

ions of any type

14. To penetrate charged and uncharged substances through the lipid bilayer of the cell interior are...

protein channels and pumps

gaps in the lipid layer

special education

water tubes

15. In the sodium-potassium pump, the ions potassium:

penetrate to the cell on concentration gradient

pumped into the cell against a concentration gradient

out of cells by the density gradient

pumped out of the cell against a concentration gradient

16. The movement of ions through the membrane down a concentration gradient, which does not require energy input is called:

pinocytosis

passive transport

active transport

endocytosis

17. How many potassium ions are transported into the cell by the hydrolysis of one molecule of ATP?

2

3

1

4

18. What are the main parts of the lipid molecules

neutral head, body, tail hydrophilic

hydrophilic head, body, tail hydrophilic
hydrophilic head, body, hydrophobic tail
hydrophobic head, body, hydrophobic tail

19. Integral proteins:

immersed in the lipid bilayer of a biological membrane
are located on the outer surface of a biological membrane
located on the inner surface of a biological membrane
move between the biological membrane and cell organelles

20. Proteins provide transport of hydrophilic substances through the membrane as a result of:

motion
the formation of channels in the membrane
lipophilic
conformational ties

21. The movement of lipids along the plane of the membrane is called:

drift
fluctuation
lateral diffusion
flip-flop transition

22. In cell membrane proteins are presented:

lungs
heavy
peripheral
transferred

23. Resting potential is ...

potential difference in the first ECG at rest
negative potential of the cell cytoplasm unexcited
the potential of the outer cell membrane surface
the potential difference between the inner and outer surfaces of the membrane

24. The resting potential of a variety of cells is:

from -30 to -1000 mV
from 1 to 2 mV
from -3 to -10V
from -60 to -100 mV

25. Active transport of substances across the cell membrane occurs:

due to side diffusion of substances of smaller electrochemical capacity
due to side diffusion of substances greater electrochemical potential due to ATP hydrolysis
due to diffusion of substances into the direction of their lesser concentration
osmotic pressure

26. Upon excitation of the cells opening of sodium channels and the transport of ions into the cell to cause ...

to membrane depolarization
to polarization
to repolarization
hyperpolarization

27. *When excited by the discovery of cell chloride channels and transport of ions into the cell to cause ...*

to membrane depolarization

to polarization

to repolarization

hyperpolarization

28. *The highest permeability of the cell membrane at rest is typical for ions:*

potassium ions

sodium ions

chlorine ions

calcium ions

29. *What cell membrane ion channels open and close in the generation of an action potential*

potassium

potassium, sodium, chlorine

chlorine

proton

30. *Which ions at rest characteristic lowest permeability of the membrane:*

potassium ions

sodium ions

chlorine ions

31. *In the cell cytoplasm compared to the external solution ion concentration below:*

potassium

sodium, calcium, chlorine

magnesium

hydrogen

32. *During repolarization membrane permeability for ions increases:*

potassium

sodium

chlorine

calcium

33. *Transport of substances in the facilitated diffusion is compared with a simple diffusion:*

in the opposite direction

fast

slower

at the same rate

34. *The basic structure of biological membranes are:*

layer protein

carbohydrates

double layer of phospholipids

amino

the DNA double helix

35. *Active transport of ions is carried out by:*

energy of hydrolysis of ATP macroergic bonds

processes of diffusion of ions through the membrane

transport of ions through the membrane with the participation of molecules vectors

lateral diffusion of molecules in the membrane

36. Flip-flop diffusion of molecules in membranes called:

rotational motion of molecules

jump molecules across the membrane

the movement of molecules along the plane of the membrane

active transport of molecules through the membrane

a passive transport of molecules through the membrane

37. Phospholipid molecules consist of a membrane:

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turn into Fick equation

not change

43. Diffusion of uncharged particles through the membrane obeys the equation:

Fick

Nernst-Planck equation.

Goldman-Hodgkin-Katz;

Nernst

44. As accumulated facilitate diffusion is the transfer of ions:

special molecules - vector

with the participation of integral proteins;

through the lipid bilayer

involving potassium-sodium pump.

45. Diffusion of a substance through the membrane provided by the harder than:

The thicker the membrane

More permeability coefficient

46. Active transport of substances through the membrane is carried out:

without energy

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with the participation of integral proteins

with the participation of potassium-sodium pump

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56. Proteins provide transport of hydrophilic substances through the membrane as a result of:

motion

the formation of channels in the membrane

lipophilic

conformational ties

57. The movement of lipids in the plane of the membrane is called:

drift

fluctuation

lateral diffusion

flip-flop transition

58. In cell membrane proteins are presented:

lungs

heavy

peripheral

transferred

59. Resting potential is:

potential difference in the first ECG at rest

negative potential of the cell cytoplasm unexcited

the potential of the outer cell membrane surface

the potential difference between the inner and outer surfaces of the membrane

60. The resting potential of a variety of cells is:

from -30 to -1000 mV

from 1 to 2 mV

from -3 to -10V

from -60 to -100 mV

61. *Active transport of substances across the cell membrane occurs:*
due to side diffusion of substances of smaller electrochemical capacity
due to side diffusion of substances greater electrochemical potential due to ATP hydrolysis
due to diffusion of substances into the direction of their lesser concentration
osmotic pressure

62. *Upon excitation of the cells opening of sodium channels and the transport of ions into the cell to cause:*

to membrane depolarization

to polarization

to repolarization

hyperpolarization

63. *When excited by the discovery of cell chloride channels and transport of ions into the cell to cause:*

to membrane depolarization

to polarization

to repolarization

hyperpolarization

64. *The highest permeability of the cell membrane at rest is typical for ions:*

potassium ions

sodium ions

chlorine ions

calcium ions

65. *What cell membrane ion channels open and close in the generation of an action potential:*

potassium

potassium, sodium, chlorine

chlorine

proton

66. *In the cell cytoplasm compared to the external solution ion concentration below:*

potassium

sodium, calcium, chlorine,

magnesium

hydrogen

67. *During repolarization membrane permeability for ions increases:*

potassium

sodium

chlorine

calcium

68. *Transport of substances in the facilitated diffusion is compared with a simple diffusion:*
in the opposite direction

fast

slower

at the same rate

69. *The basic structure of biological membranes are:*

layer protein;

carbohydrates;
double layer of phospholipids;
amino;
the DNA double helix.

70. Active ion transport is carried out at the expense of:

of the hydrolysis energy bonds ATP;

processes the ion diffusion through membranes

ion transport through the membrane with molecular - vectors

the lateral diffusion of molecules in the membrane

71. Flip-flop diffusion of molecules in membranes called:

rotational motion of molecules

jump molecules across the membrane

the movement of molecules along the plane of the membrane

active transport of molecules through the membrane

a passive transport of molecules through the membrane

72. Diffusion of a substance through a membrane is carried out more easily than:

is greater than the value of the permeability coefficient;

the larger the thickness of the membrane;

73. Diffusion of charged particles through the membrane obeys the equation:

Pick

the Nernst-Planck

Goldman-Hodgkin-Katz

the Nernst

74. Passive transport of substances through the membrane is carried out:

without energy loss, the concentration gradient

special molecules - vector

in cooperation with the integral proteins

with the participation of potassium-sodium pump

75. To penetrate charged and uncharged substances through the lipid bilayer of the cell interior are:

the protein channels and pumps

gaps in the lipid layer,

special education

water tube

76. In the sodium-potassium pump, the ions potassium

penetrate into a cell concentration gradient

are pumped into the cell against a concentration gradient

out of cells by the density gradient

are pumped out of the cell against a concentration gradient

Electrical phenomena in membranes

1. At rest, the membrane permeability:

$P_K \gg P_{Na}$

$$P_K = P_{Na}$$

$$P_K \ll P_{Na}$$

$$P_K < P_{Na}$$

2. Assuming that the membrane is only permeable for potassium ions, the equation Goldman-Hodgkin-Katz equation is transformed into:

Nernst-Planck

Nernst

Fick

3. For the occurrence of transmembrane potential difference necessary to:

ion concentration on both sides of the membrane were identical

surface membrane proteins contained

had the same permeability of ions through the membrane

ion concentration on both sides of the membrane have different

4. Change in the resting membrane potential during the action of the stimulus from 20 mV to -70mV called:

hyperpolarization

repolarization

overpolarization

depolarization

5. In the cytoplasm of excitable cells, as compared with the above external solution ion concentration:

potassium

sodium

calcium

chlorine

6. The inner surface of the cell membrane relative to the outer in the charged state of physiological dormancy:

positively

negatively

Neutrally

7. Change in the resting membrane potential during the action of the stimulus from -70mV to +20 mV is called:

hyperpolarization

repolarization

overpolarization

depolarization

8. Change in the resting membrane potential during the action of the stimulus from -70mV to -80mV called:

overpolarization

repolarization

slow depolarization

depolarization

9. During depolarization increases membrane permeability for ions:

potassium

sodium

chlorine

calcium

10. For the occurrence of transmembrane potential difference is necessary and sufficient:

availability of selective permeability of the membrane

ion concentration difference on both sides of the membrane

Availability of selective permeability and ion concentration difference on both sides of the membrane

increased permeability for ions

11. Equation Goldman -Hodgkin-Katz describes the occurrence:

Only the resting potential, but not the action potential

Only the action potential, but not resting potential

a transmembrane potential difference across the membrane as in the case of generating rest potential and action potential

12. The magnitude of the resting potential is subject to equation:

Fick

Goldman -Hodgkin-Katz

Nernst-Plank

Nernst

13. During depolarization increases membrane permeability for ions:

potassium

sodium

chlorine

calcium

Тема 3. Sound. Biophysics of hearing.

Формы контроля успеваемости

Письменный контроль, тестирование, контроль выполнения практических заданий.

Оценочные материалы текущего контроля успеваемости

1. Вопросы письменного контроля по теме

Вариант 1

1. Give definition of sound. Types of sound.
2. Give the definition of a pure tone, its sources.
3. Give the definition of a complex tone, its sources.
4. Physical and physiological characteristics of auditory sensation.
5. The Law Weber-Fechner.

Вариант 2

1. Give the definition of the threshold of audibility, it's numerical value.
2. Give the definition of a threshold of pain, it's numerical value.
3. Units of measurement of volume levels: b, db, Phon.
4. Definition of audiometry.
5. Principle of operation of the audiometer.

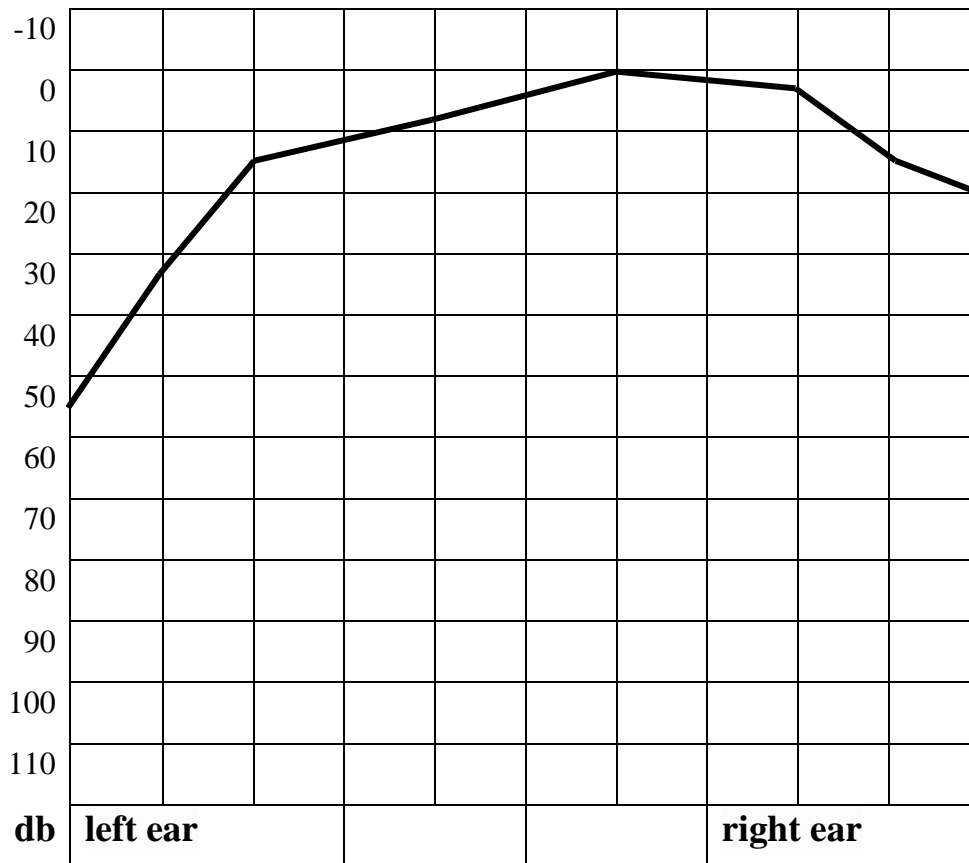
2. Практические задания для аудиторной работы

2.1 Worked task. To build a curve to the hearing threshold.

The received results of research represented in a table and build the curves hearing threshold for the left and right ear.

Frequency (Hz)		125	250	500	750	1000	1500	2000	3000	4000	6000	8000
Thresholds (dB)	B											
	L											
	R											

125 250 500 750 1000 1500 2000 3000 4000 6000 8000



2.2. Curves are obtained compared with the benchmark for a healthy ear and make conclusions.

Conclusion:

2.3. Definition Levels of Noise in Rooms of Different Types with the Help of a Device CENTER 320.

Measure the noise level during the lessons (silence).

2. Measure the noise level changes (noise).

3. To measure the level of noise in the street are noisy highway).

4. Compare the obtained values with maximum-permissible.

5. Data represented in a table:

№	Noise level in dB		
		Measured value	Maximum allowable value
1	during class		
2	during recess		
3	on the hall		
4			

2.4. *Worked tests on: « Registration Curve Threshold of Audibility »*

1. What value is characteristic of hearing?
 1. volume
 2. intensity
 3. frequency
 4. hearing threshold
2. Acoustic spectrum is a set with an indication of their relative intensity:
 1. frequency
 2. amplitude
 3. sound
3. The law Weber-Fechner establishes the correspondence between:
 1. physical and physiological parameters of sound
 2. the volume and the amplitude of the sound
 3. the intensity of sound and the threshold of audibility
 4. the intensity of sound and the threshold of pain
4. The basis of the apparatus for audiometry is:
 1. sound level meter
 2. sound generator
 3. kamerton
5. The volume of the sound depends on...
 1. the intensity of a sound wave
 2. properties of the medium, which is distributed sound
 3. acoustic spectrum
 4. the frequency of sound
6. For the ear of the average person at a frequency of 1 kHz threshold of hearing correspond to the value of sound intensity:
 1. $I = 10 \text{ W/m}^2$
 2. $I = 10^{-12} \text{ W/m}^2$
 3. $I = 10^{12} \text{ W/m}^2$
 4. $I = 100 \text{ W/m}^2$
7. Audiometry-method definition:
 1. the severity of hearing
 2. hearing threshold
 3. volume level
8. The highest sensitivity of the ear of man lies in the range of:
 1. 20-20000 Hz
 2. 1000-5000 Hz
 3. 5000-20000hz
9. Law Weber-Fechner described by the equation:
 1. $\Delta E = k \cdot Lg \frac{I}{I_0}$

$$2. \Delta E = 20 \cdot Lg \frac{I}{I_0}$$

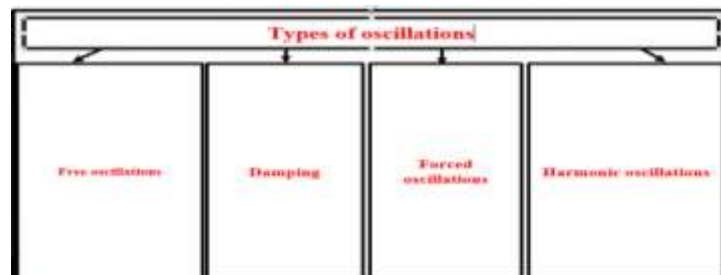
$$3. \Delta E = 10 \cdot Lg \frac{I}{I_0}$$

10. That is called the threshold of audibility ?

1. the minimum volume of the sound perceived by the ear
2. the maximum volume of the sound perceived by the ear
3. the minimum frequency of the sound perceived by the ear
4. minimum intensity sound sensing ear

3. Практические задания для внеаудиторной работы

Worked example. Break the types of oscillations down into components in a diagram.



4. Тестовые задания по теме

Acoustics

1. What value is characteristic of hearing?

- volume
- intensity
- frequency
- hearing threshold

2. Acoustic spectrum is a set with an indication of their relative intensity:

- frequency
- amplitude
- sound

3. The law Weber-Fechner establishes the correspondence between:

- physical and physiological parameters of sound
- the volume and the amplitude of the sound
- the intensity of sound and the threshold of audibility
- the intensity of sound and the threshold of pain

4. The basis of the apparatus for audiometry is:

- sound level meter
- sound generator
- kamerton

5. Sounds representing the combination of multiple tones, frequency, form, intensity and duration of which randomly change is called:

infrasound

noise

acoustic spectrum

6. A method for the analysis of sounds, arising when tapped on the surface of the body is called:

recognized through auscultation

percussion

7. Harmonic oscillation is called, what is happening according to the law:

tangent

sine and cosine

cotangent

8. The volume of the sound depends on:

the intensity of a sound wave

properties of the medium, which is distributed sound

acoustic spectrum

the frequency of sound

9. What characterizes the intensity of the sound wave?

mass of the substance carried wave

the spectral energy distribution of the wave

volume sound

the speed of propagation of waves

10. Unit of measurement of the level of intensity is:

Bel

phon

Watt

11. Timbre is characteristic sound sensations, which is determined by:

the frequency of the fundamental tone

amplitude

pitch

harmonic spectrum

12. The speed of sound in water (soft tissues of the body) is:

340 m/s

1500 m/s

5700 m/s

13. Audiometry is the method definition:

the severity of hearing

hearing threshold

volume level

14. The highest sensitivity of the ear of man lies in the range of:

20-20000 Hz

1000-5000 Hz

5000-20000hz

15. Elastic waves propagating in a medium in the form of longitudinal waves at a frequency below 16 Hz is called:

sound

ultrasound

infrasound

16. The timbre of the sound is characterized by:

frequency

harmonic spectrum

overtones

17. The sound is distributed in the environments:

in solids and liquids, gases and vacuum

in the solid, liquid, gaseous

in the air and in vacuum

only in solids and in gases

18. What part of the cochlea to perceive high-frequency tones?

the middle part

the top

basis

all region

19. What part of the snails perceive low-frequency tones?

the middle part

top snails

the basis

all areas of snails

20. The sound wave stimulates a receptor cell of Corti body, acting on:

the whole of the organ of Corti

several areas of Corti body

plots of Corti body, where there are "cutting" wave

21. Change the volume of the tone frequency 1000 Hz, with a change in the intensity of sound 10 times called:

phon

Bel

decibel

22. The main physical characteristic of a pure tone is:

amplitude

intensity

frequency

acoustic range

23. Acoustic spectrum is an important feature:

pure tone

complex tones

hum

24. The law Weber-Fechner establishes the correspondence between:

the volume and the amplitude of the sound

the volume and intensity of sound

the intensity of sound and the threshold of audibility

25. *Normally permissible noise level is considered:*

50-90 dB

30-100 dB

40-50 dB

130 dB

26. *The energy transferred by wave per unit time per unit surface perpendicular to the direction of propagation is called:*

the intensity of sound

the power of sound

energy flow

27. *What factors determine the volume of the sound?*

intensity, frequency

the threshold of audibility

threshold of pain

spectrum of sound

28. *What determines the value of hearing threshold?*

from the physiological characteristics of man and sound intensity

from the frequency and intensity of sound

the amplitude of the sound wave

from the harmonic spectrum of fluctuations

29. *That is called the threshold of audibility?*

the minimum volume of the sound perceived by the ear

the maximum volume of the sound perceived by the ear

the minimum frequency of the sound perceived by the ear

minimum intensity sound sensing ear

30. *Pitch due to:*

the frequency of the fundamental tone

amplitude

acoustic spectrum

timbre

31. *Speed of sound in air is:*

1500 m/s

5700 m /s

340m/s

32. *The speed of sound in solids is:*

340m/s

1500 m/s

5700M/s

33. *1 DB equals:*

100 Bel

0.1 Bel

1 Bel

10

34. *For objective measurement of the volume of noise used a device called:*

phonendoscope
audiometer
sound level meter

35. *Listening to sounds that occur inside the body is called:*

percussion
auscultation
phonocardiograph

36. *Ultrasound-this is the sound of a frequency above:*

15kHz
20000Hz
1MHz
16Hz

37. *What areas snails perceive midrange tones?*

the middle part of the cochlea
top snails
the base of the cochlea

38. *The main physical characteristic of a pure tone is:*

amplitude
intensity
frequency
acoustic spectrum

39. *Acoustic spectrum is an important feature:*

pure tone
complex tones
noise

40. *The maximum permissible level of noise is a limit beyond which there is likelihood of the defeat of receptors hearing is:*

85 dB
130 dB
55 dB
45 dB

41. *Normally permissible noise level is considered:*

50-90 dB
30-100 dB
40-50 dB
130 dB

42. *The energy transferred by wave per unit of time per unit surface perpendicular to the direction of propagation is called:*

the intensity of sound
the power of sound
energy flow

43. *What factors determine the volume of the sound?*

intensity, frequency
the threshold of audibility

threshold of pain
spectrum of sound

44. What determines the value of hearing threshold?

from the physiological characteristics of man and sound intensity

from the frequency and intensity of sound

from the amplitude of the sound wave

from the harmonic spectrum of fluctuations

45. That is called the threshold of audibility?

the minimum volume of the sound perceived by the ear

the maximum volume of the sound perceived by the ear

the minimum frequency of the sound perceived by the ear

minimum intensity sound perceived by the ear

46. The height of the tone is due to:

the frequency of the fundamental tone

amplitude

acoustic spectrum

timbre

47. Maximum permissible levels of mid-frequency noise at workplaces:

90-100 dB

85-90 dB

75-80 dB

48. Maximum permissible levels of high-frequency noise at the workplace:

90-100 dB

85-90 dB

75-80 dB

49. The noise has:

continuous spectrum

linear spectrum

constant frequency

50. Irreversible damage to the hearing can occur when sound intensity is:

30dB

85dB

100dB

130dB

51. Low frequency noise lie in the range:

16-350 Hz

0-800 Hz

more than 800 Hz

52. High frequency noise lie in the range:

16-350 Hz

0-800 Hz

more than 800 Hz

53. Maximum permissible levels of low frequency noise at the workplace:

90-100 dB

85-90 dB

75-80 dB

54. What characterizes the intensity of the sound wave?

mass of the substance carried wave

the spectral energy distribution of the wave

volume of sound

the speed of propagation of waves

55. Sound is the mechanical vibrations of the particles of the environment propagating in the form of:

transverse wave

longitudinal wave

plane wave

spherical wave

56. The highest sensitivity of the ear of man lies in the range of:

20-20000 Hz

1000-5000 Hz

5000-20000Hz

57. Rupture of eardrums is possible when sound levels:

more than 13 dB

less than 130 dB

more than 85 dB

more than 160 dB

Модуль №2. Electrocardiography. Physiotherapy. Ionizing radiation. Optical eye.

Тема 4. Physical Basics of Electrocardiography.

Формы контроля успеваемости

Письменный контроль, устный опрос, тестирование, контроль выполнения практических заданий.

Оценочные материалы текущего контроля успеваемости

1. Вопросы письменного контроля по теме

Вариант 1

1. Membrane theory for the origin of biopotentials.
2. The main function of the heart: automaticity, conductivity and contractility.
3. Electric dipole. Electric dipole as a source of the electric field.
4. Genesis of the electrocardiogram in the framework of the dipole equivalent of the electric generator heart.
5. Block - diagram of the ECG. Types of ECG. Блок - схема ЭКГ. Виды ЭКГ.

Вариант 2

1. Give the definition of electrocardiography.
2. Explain the scheme of the emergence and spread of biopotentials heart.
3. Describe the basic components of the conduction system of the heart (sketch). The main provisions Einthoven theory.
4. Call diversion by Einthoven.
5. Sketched electrocardiogram healthy heart, to explain the origin of teeth intervals, segments.

2. Вопросы для устного опроса

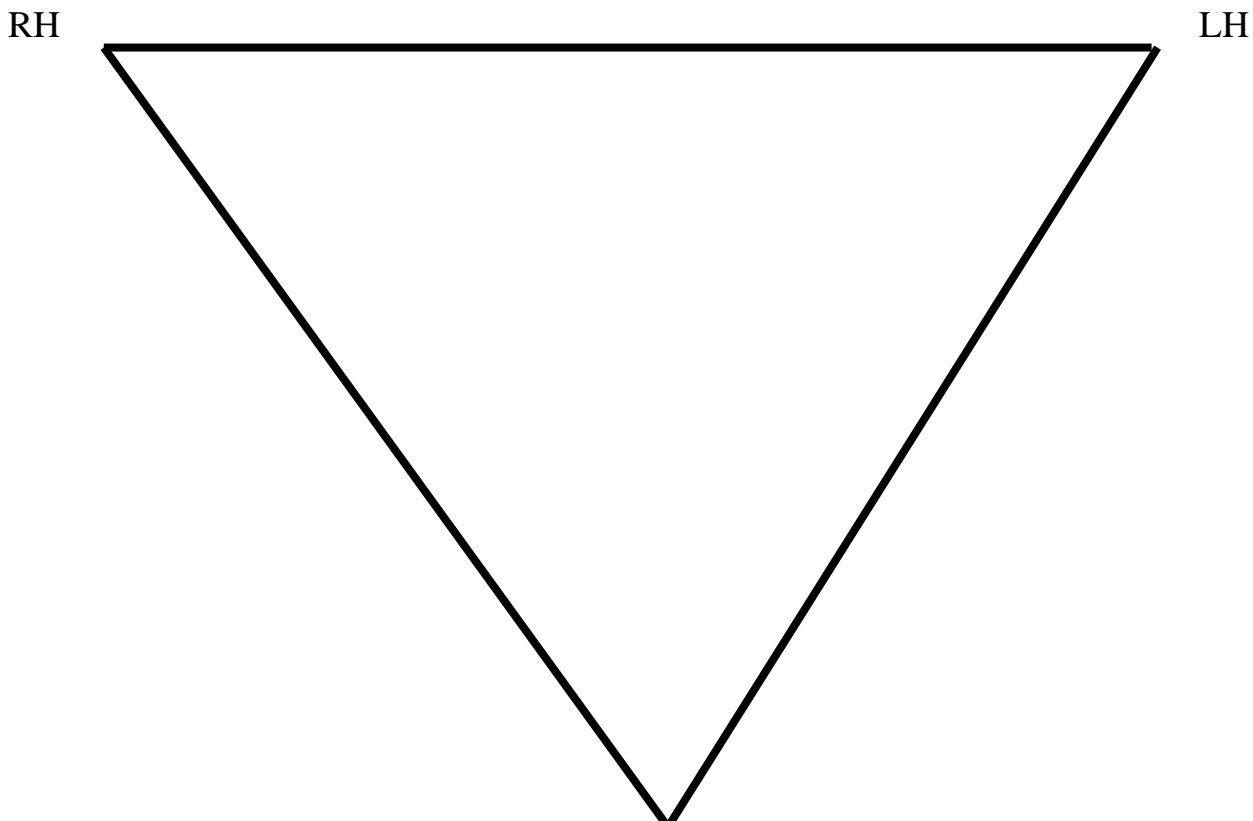
1. Einthoven theory, its main provisions.
2. Einthoven triangle. Standard leads.
3. ECG heart healthy. Nature waves, intervals, segments.
4. Explain block diagram of the electrocardiograph. Purpose blocks.
5. Explain procedure ECG.
6. Explain construction EMF vector hearts.

7. Explain the methodology for determining the voltage of the teeth, and calculating the time of ECG intervals.
8. Explain the role of electrocardiography in clinical and experimental medicine.

3. Практические задания для аудиторной работы

3.1. The construction of the vector EMF heart

1. To build a vector EMF heart draw an equilateral triangle (the party of about 7 sm) Einthoven top downward.
2. The parties and the vertices of the triangle mark in accordance with the theory of Einthoven numbers corresponding leads and letters adjacent to the extremities.
3. Spend the height and find the center of the triangle point O (the intersection point of heights).
4. Glue prong R cardiogram in each of the leads on the sides of the triangle as shown in Fig.6 i.e. on the side RH-LH of the from the middle of the right hand amplitude of the R wave in the first abduction, on the side of a RH-LF - down amplitude of the R wave in the second abduction and, finally, on the side of the LH-LF down - R-wave amplitude in the III abduction.
5. Restore the perpendiculars from the ends of the teeth R pending on the sides of the triangle. If built properly, the ends of the perpendiculars intersect at one point O'.
6. Connecting the dots O and O' get EMF vector heart.
7. Through the center of the triangle spend a horizontal line.
8. Determine the angle of the electrical axis of heart with respect to the horizontal line with a protractor.



LF

3.2. Calculation of voltage teeth (this is a translation of the amplitude of the wave of mm in mV).

1. Glue calibration pulse.



2. To calculate the voltage spike R measure the amplitude in mm.

Using the parameters of the calibration signal (amplitude and the voltage of **1 mV**), make proportion: **$A_k - 1 \text{ mV}$**

$$A_{R1} - x \text{ mV},$$

where **A_k** - amplitude calibration signal

A_{R1} - amplitude of the signal.

Then the amplitude of the signal will be equal to $X(\text{mV}) = \frac{A_{R1} \cdot 1\text{mV}}{A_k}$

3. Calculate the voltage teeth R in all three leads.

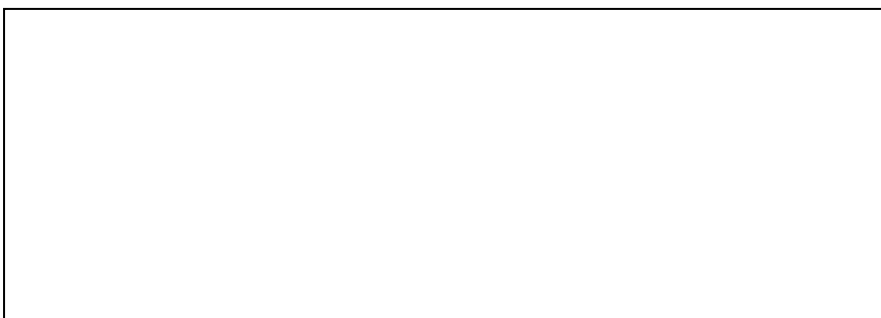
4. Enter data in the table:

Allotment	The amplitude of the signal in mm	The gauge amplitude of the signal in mV	The amplitude of the wave in mm	The amplitude of the wave in mV	The angle of the electrical axis of heart
1					
2					
3					

Conclusion:

3.3. Calculation of time intervals (this is a translation of the duration of the wave, the segment interval of mm in seconds).

1. Glue ECG fragment containing the two periods.



2. For the calculation of temporal characteristics specify the speed of the recording of the ECG.

3. Measure **mm** distance between interesting points on the **t** axis.

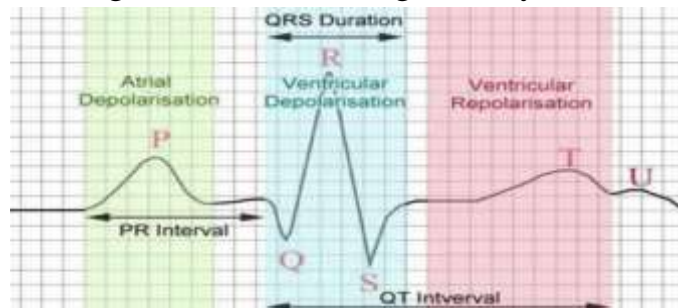
4. The data obtained substitute formula $t = \frac{S}{V}$.

4. Enter data in the table:

№	View teeth segment, interval	Speed ECG recording	The duration of teeth in mm	The duration of teeth in seconds
1	R-R			
2	P			
3	T			
Conclusion:				

4. Практические задания для внеаудиторной работы

Worked example. Draw a diagram Electrocardiogram in your notebook.



5. Тестовые задания по теме

Physical basis of electrocardiography

1. The second leads in electrocardiogram recorded between:

- Left hand-left foot
- Right hand-left foot
- Right hand-left hand

2. Lines of force and equipotential lines:

- mutually perpendicular
- in one direction
- in opposite directions
- directed at an angle to one another

3. The main provisions of the Einthoven theory include:

- the human body is an equilateral triangle

body has the same conductivity in all directions
heart is electric dipole placed in the center of the triangle
all the answers are correct

4. Electrocardiogram is reflected the electrical activity of:

heart
muscle
retinal
brain

5. Electroretinogram is reflected the electrical activity of:

heart
muscle
retinal
Brain

6. R wave on electrocardiogram is means:

atrial excitation
initiation of the interventricular septum
the full excitement of both ventricles
the almost complete excitation of both ventricles
the processes of repolarization

7. P wave on electrocardiogram is means:

atrial excitation
initiation of the interventricular septum
the full excitement of both ventricles
the almost complete excitation of both ventricles
the processes of repolarization

8. Electrocardiography is to register:

the electrical activity of the brain
potential difference, changing over time due to the electrical activity of the heart
potential difference arising in the functioning of an organ
potential difference, changing over time due to the electrical activity of the brain.

9. When registration of the electrocardiogram take place the total number of leads:

three
six
twelve
ten

10. Electrocardiograph by action principle is:

generator of electrical oscillations
AC rectifier
amplifier of the oscillations
rectangular pulse generator standard

11. The maximum amplitude of the R wave in the ECG is:

5 mV
5B
5 kV

1B

12. Low-pass amplifier suitable for:

receiving standard rectangular pulses

interference suppression

interference suppression and amplification of the desired signal

amplification of pulses coming from the heart

13. Calibration block is a generator:

low harmonic

high-frequency harmonic vibrations

rectangular pulses of the standard voltage of 1mV

rectangular pulses standard voltage 1V

14. Sources of interference are:

signals from the human heart

varying electric and magnetic fields generated in the lighting circuit current and high-frequency

electromagnetic waves coming from " ether "

15. When removed the ECG must be grounded:

right-hand of a man

right leg

right leg and left leg

left leg

16. Electric dipoles in a uniform electric field is located:

along the equipotential lines of the electric field

along the electric field lines

perpendicular to the lines of force of the electric field

angle to the lines of the electric field

17. Electric dipole can exist indefinitely in:

dielectric

conducting medium

semiconductor

18. Interference in the first and second leads in ECG registration due to poor contact of the electrode with skin of the patient on:

left hand

the right leg

right hand

the left leg

19. Interference in the first, second and third leads when recording ECG caused by poor contact of the electrode with skin of the patient on:

the left leg

right hand

left hand

the right leg

20. Equipotential lines is:

lines that extend from the positive charge
lines of equal potential
lines that come out of the negative charge
the line along which the potential decreases

21. Automatism is:

occurrence of an action potential
ability of the heart without any external influences perform rhythmic, following one after another
reduction
ability to conduct excitation arising in any part of heart, to other departments of the heart muscle

22. EMG reflects the electrical activity:

heart
muscle
retinal
brain

23. EEG reflects the electrical activity:

heart
muscle
retinal
brain

24. T wave on electrocardiogram is means:

atrial excitation
initiation of the interventricular septum
the full excitement of both ventricles
the almost complete excitation of both ventricles
the processes of repolarization

25. Q wave on electrocardiogram is means:

atrial excitation
initiation of the interventricular septum
the full excitement of both ventricles
the almost complete excitation of both ventricles
the processes of repolarization

26. S wave on electrocardiogram is means:

atrial excitation
initiation of the interventricular septum
the full excitement of both ventricles
the almost complete excitation of both ventricles
the processes of repolarization

27. The first lead are when gathering electrocardiogram recorded between:

Left hand-left foot
Right hand-left foot
Right hand-left hand

28. The third lead are when gathering electrocardiogram recorded between:

Left hand-left foot

Right hand-left foot
Right hand-left hand

29. *Distribution of equipotential lines on the surface of the human body:*
unchanged over time
changes over time

30. *The calibration unit is designed to:*
calculating timeslots ECG
determining voltage Teeth
amplification of pulses coming from the heart

31. *The differential amplifier is designed for:*
amplification of the useful signal
interference suppression
interference suppression and amplification of the desired signal
receiving standard rectangular pulses

32. *Amplifier oscillations is a device for:*
receiving standard rectangular pulses
increasing the voltage, current or power due to an external source of energy
interference suppression and amplification of the desired signal
interference suppression

33. *Grounding is:*
device for electrical connection of the machines , devices with the earth.
electrical contact with the human body using the unit
electrical contact of two bodies

34. *Electric dipole is a system consisting of two things:*
charges of opposite sign, located at a great distance from each other point charges of equal magnitude ,
the same sign located at a distance l from each other
point charges of equal magnitude, opposite in sign, located at a distance l from each other
point charges which differ in size, the same sign located at a distance l from each other

35. *Electric dipole moment:*
vector equal to the product charge on the shoulder dipole
scalar value, equal to the charge on the shoulder of the dipole

36. *The range of frequencies in the spectrum of the ECG is:*
(1-300)Hz
(0,01-10 Hz)
(1-1000) Hz
(0.5 to 120 Hz)

37. *Interference in the second and third leads when recording ECG caused by poor contact of the electrode with skin of the patient on:*
left hand
right hand
the right leg
the left leg

38. *Interference in the first and third leads when recording ECG caused by poor contact of the electrode with skin of the patient on:*

the left leg
the left hand
the right leg
right hand

39. *lead is mean:*

the potential difference detected between two points of the body
the potential difference, changing over time due to the electrical activity of the heart
the potential difference, changing over time due to the electrical activity of the brain
wires from the patient to the ECG

40. *The main provisions of the Einthoven theory include:*

the human body is an equilateral triangle
body has the same conductivity in all directions
heart is electric dipole placed in the center of the triangle
all the answers are correct

41. *"Phase 0 is depolarization" action potential of myocardial cells corresponds to the flow of ions:*

chlorine into the cell
sodium into the cell
potassium out of the cell
calcium and sodium into the cells and potassium out of the cell

42. *"Phase 2 is slow repolarization" action potential of myocardial cells corresponds to the flow of ions:*

chlorine into the cell
sodium into the cell
potassium out of the cell
calcium and sodium into the cells and potassium out of the cell

43. *"Phase 4 is of the action potential of myocardial cells is equal to:*

chlorine into the cell
sodium into the cell
potassium out of the cell
calcium and sodium into the cells and potassium out of the cell
diastole

44. *"Phase 1 is Initial rapid repolarization" action potential of myocardial cells corresponds to the flow of ions:*

chlorine into the cell
sodium into the cell
potassium out of the cell
calcium and sodium into the cells and potassium out of the cell

45. *"Phase 3 is repolarization ultimate fast" action potential of myocardial cells corresponds to the flow of ions:*

chlorine into the cell
sodium into the cell
potassium out of the cell
calcium and sodium into the cells and potassium out of the cell

Тема 5. Physiotherapy.

Формы контроля успеваемости

Письменный контроль, тестирование, контроль выполнения практических заданий.

Оценочные материалы текущего контроля успеваемости

1. Вопросы письменного контроля по теме

Вариант 1

1. Galvanization
2. Electrophoresis
3. Electrostimulation
4. Darsonvalisation
5. UHF-therapy

Вариант 2

1. Block Diagram Apparatus for Galvanization
2. Medicinal electrophoresis
3. Types of pulses
4. Schematic representation of the pulses used in darsonvalization
5. The block diagram of the apparatus UHF-therapy

2. Практические задания для аудиторной работы

2.1. The research part of the work A Study of Medical Apparatus for Galvanization.

2.1.1 Acquaintance with the device, the principle of action and electrical circuit apparatus.

1. Before you turn the device into the network, the switch to position «off», the potentiometer is in the extreme left position, the switch bypass milliammeter - in position 5 mA.

2. Put the power switch in the " on " position. To give the machine to warm up for 2 minutes.
3. Turning the potentiometer to the right, you need to follow the movement of the arrow milliammeter. Smooth slider potentiometer arrow milliammeter should move clockwise smoothly and without jumps.
4. If it has, the phone is in good order and ready for use.
5. When returning the slider potentiometer in the leftmost position, you can begin treatment.

2.1.2 Determination of the threshold of pain.

1. To find the area of the electrodes.
2. Connecting to the output terminals lead electrodes covered with gauze soaked in physiological solution, to strengthen the electrodes at opposite sides of the hand.
3. At slow rotation of the handle of a potentiometer to determine the lowest current which causes a slight tingling. To repeat the experience of three times, to calculate the average current.

4. To determine the threshold of pain by the formula: $J = \frac{I_n}{S}$

where j - is the threshold of pain;

I_n - power current (mA);

S - size of the electrode (cm²).

5. The experiment data is recorded in the table:

№	The length of the electrode (sm)	Width electrode (sm)	The area of the electrode S(sm²)	Current strength I(mA)	The current density J(A/sm²)	Average value current density J(A/sm²)
1.						
2.						
3.						

Conclusion:

2.2 Study Device for Local Darsonvalization "DE-212 CARAT"

2.2.1 The main part of the device:

The device is a generator of electrical oscillations of medium frequency, high voltage and low intensity, providing a quiet appearance and spark discharges in a gas-filled electrode. The device provides the ability to control the voltage applied to the electrode.

The main part of the apparatus for darsonvalization:

- Transformer;
- High voltage generator;
- A set of gas-filled electrodes.

2.2.2 Working with the device "DE-212 CARAT"

1. Install the electrode holder, not putting considerable effort to the cylinder electrode. Little effort Clockwise screw the chuck electrode cap. Make sure that the electrode is sufficiently firmly attached and set the regulator output voltage amplitude to the leftmost position.
2. Connect the device to the AC mains.
3. Regulator to set the necessary amplitude intensity spark on individual feeling, ie should feel a slight tingling sensation, does not cause discomfort. Electrode continuously and smoothly move on painful areas, not taking away from the body surface.
4. After the procedure, the regulator output voltage amplitude set to the extreme left and only then remove the electrode from the body and remove the device from the network.
5. Remove the electrode from the holder by unscrewing the screw chuck.

2.3. The Study of Apparatus for Electric Stimulation

In the lab, we study the electronic massager to stimulate nerve endings OMRON. This electronic nerve stimulator is designed for use as a massager to relieve muscle pain, numbness and fatigue. Massaging effect is achieved by stimulation of the nerve fibers of the electronic means of the electrode plates attached to the skin.

Capabilities of the device

1. Three modes of massage: Shoulder sector, waist and feet.
2. Ability to select the intensity of five levels of intensity.
3. Electrode plates of large size. The size of the electrode plates is increased to a large area has been involved, and thus improved the efficiency of the massage.

Operation of the device

1. Connect the power cord to the electrode plates.
2. Insert the appliance plug into the socket of the electronic unit.
3. Attach the plate to these areas in accordance with these illustrations.



Recommendations for massage

Duration: 10-15 minutes per zone

Frequency: 1-2 times a day

Intensity: at the level of comfortable feeling

2.4. Study Device UHF-Treatment

2.4.1 Working with the UHF-66

1. Connect.
2. Put control knobs apparatus to the starting position: switch "Power" to 0, the switch "Voltage" to "Off."
3. Press "Control" and increasing the voltage with the switch "Voltage", set the arrow apparatus within the red sector.
4. Allow the unit to warm up 1.5 - 2 min. and only then set the knob "Power" in position 70.
5. Hold the setting indication between the electrodes and by turning the "Settings", achieve maximum glow of neon bulb.
6. Turn off the apparatus, turn the knob switch "Power" to 0, and the selector knob "Voltage" - in the "Off" position. Disconnect the Power from the wall outlet.

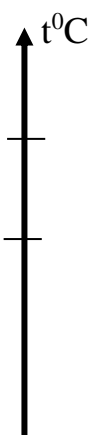
Safety instructions

For security purposes, patient and service personnel when the network apparatus is prohibited: to avoid burns by high frequency, you must never touch electrodes and wires by metal objects.

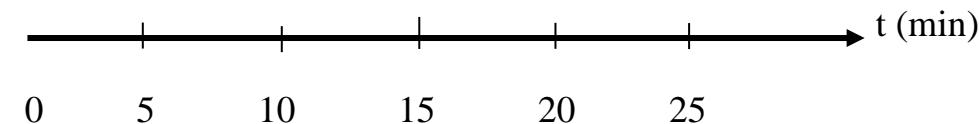
2.4.2 The research part of the work

1. Put the between the electrodes apparatus UHF two vessels, one with a salt solution (electrolyte), the other - with vaseline oil (dielectric).
2. Pull down into vessels thermometers measure start temperature of the solutions.
3. Measure the temperature every 5 minutes (for 25 minutes), the data tabulated.
4. Construct graphics of temperature versus time for the electrolytes and dielectrics.

№	Time (min)	Temperature °C	
		vaseline oil	Solution NaCl
1	0		
2	5		
3	10		
4	15		
5	20		
6	25		



$t^{\circ}\text{C}$



Conclusion:

3. Практические задания для внеаудиторной работы

Worked example. Break the types Physiotherapy down into components in a diagram.

4. Тестовые задания по теме

Physical basis of Physiotherapy

1. *Galvanization is a method, which used with the medical purpose for impact on patient:*

electromagnetic field

the electrical component of the electromagnetic field

DC in continuous mode low voltage (40-80V), low force (up to 50mA)

DC to pulse mode

2. *Electrophoresis is a method combining the effects on the body for therapeutic purposes:*

electromagnetic fields and electromagnetic waves

continuous current and input from its help of medicinal substances

constant current in pulse mode and input from its use of medicinal substances

3. *Pain threshold is:*

the lowest current, which causes a slight tingling

maximum current which causes a slight tingling

the lowest current, which causes the expressed tingling

4. *The basis of apparatus for galvanization and electrophoresis is:*

multivibrator

the blocking generator

generator sustained oscillations

rectifier AC

5. *The injected substance during electrophoresis with anode:*

metal ions

acid radicals

6. When galvanization, first of all, is irritation:

muscles

skin receptors

internal organs

nerve cells

7. Anions is....moving on towards the anode (positive electrode):

positively charged ions (H^+ , K^+ , Na^+ , Ca^{+} etc.)

Negatively charged ions (OH^- , Cl^- , SO_3^- etc.)

8. All effects that occur in the tissues of the body under the influence of apparatus for galvanization:

the thermal effect

resonant absorption of the energy of the water molecules

excitation fabrics

electrolysis, polarization, ion asymmetry, electrodiffusive, electroosmosis

9. When galvanization positively charged ions (H^+ , K^+ , Na^+ , Ca^{+} etc.) towards the cathode and interacting with water produced products of electrolysis:

acid (HCl),

alkali (KOH , $NaOH$).

10. The accumulation near membranes oppositely-charged ions with the formation of the electromotive force, which has a direction opposite to the applied voltage is called:

electric polarization

ion asymmetry

electrodiffusive

electroosmosis

11. Electroosmosis is the transfer of water, ions in hydrated membranes under the action:

ultraviolet radiation

direct current

x-ray radiation

magnetic field

12. When galvanization is increased excitability of nerve endings at:

cathode

anode

13. Rectifier is a device which converts:

alternating current in a magnetic field

the direct current into alternating current

a constant current in pulse current

alternating current into direct current

14. In the primary action of a direct current in the tissues of the body lie mainly:

polarization phenomena

the thermal effect

resonant absorption of the energy of the water molecules

15. The injected substance during electrophoresis with cathode:

metal ions

acid radicals

16. Physiotherapeutic method, which uses the effects with a medical purpose, a continuous electric low voltage (40-80) and small power (up to 50 mA), conducted by the patient's body through contact imposed electrodes is called:

UHF-therapy

galvanization

electrophoresis

the local darsonvalization

17. A method combining the effects on the body continuous current low voltage, low force, and entered with his use of drugs called:

electrostimulation

the local darsonvalization

UHF-therapy

galvanization

electrophoresis

18. The apparatus for galvanization is used:

the step-up transformer

step-down transformer

19. When galvanic current flows in the human body:

through the intact skin

through the skin cells

mainly on the excretory ducts sweat glands

through the ducts of the sebaceous glands

20. When the galvanization of the body the current is spreads:

the path of least ohmic resistance,

on the shortest path between electrodes

21. When galvanization negatively charged ions (OH⁻, Cl⁻, SO₃⁻ - etc.) towards the anode and interacting with water produced products of electrolysis:

acid (HCl),

alkali (KOH, NaOH).

22. Electrolysis is the collapse of the molecules in the tissue on electrically charged ions under the influence:

ultraviolet radiation

x-ray radiation

magnetic field

a constant electric field

23. Electrodifusive is a change in the permeability of fabrics and increase the passive transport of large protein molecules and other substances under action:

ultraviolet radiation

x-ray radiation

magnetic field

direct current

24. The most typical manifestation of ion asymmetry is the prevalence at the cathode:

monovalent cations

divalent ions

25. The most typical manifestation of ion asymmetry is the prevalence in the anode:

monovalent cations

divalent ions

26. UHF-therapy is a method of physical therapy which use the effect on the human body for therapeutic purposes:

the magnetic component of the electromagnetic field of ultrahigh frequency

a constant electric field

electric component of the electromagnetic field, ultra-high frequency (40.68 MHz)

a constant magnetic field

27. The most important characteristic magnitude of the electric field is:

the intensity of an electric field (symbol E).

magnetic induction

capacity

inductance

28. The most important characteristic of a magnetic field is:

capacity

inductance

magnetic induction

the intensity of an electric field (symbol E)

29. Conductors (electrolytes) is a material :

not conducting electrical current
poorly electrically conductive
good electrically conductive

30. Dielectrics is material:

not conducting electrical current
poorly electrically conductive
good electrically conductive

31. Heating of electrolytes in the UHF is due to:

uniform motion of the ions
oscillatory motion of ions (conduction current)
reorientation of dipolar molecules
uniform motion of dipolar molecules

32. When the frequency of oscillations of the electric field, equal 40,68 MHz intense heat up:

dielectrics

electrolytes

blood, lymph, bile

cerebrospinal fluid, urine, muscle tissue

33. Oscillatory system consists of:

power source

valve

inductor and capacitor

therapeutic contour

34. The variable capacitor of therapeutic contour is necessary for:

settings in resonance with the basic oscillatory contour

changes in the power

voltage regulation

35. The electromagnetic field is a composite of two:

invariable, mutually excitation by each other electric and magnetic fields

variables, mutually excitation by each other electric and magnetic fields

constant electric and magnetic fields

36. The conductors of electric current are:

bone, fat, nervous

coarse-fibered connective tissue of the tooth enamel

blood, lymph, bile, cerebrospinal fluid, urine, muscle tissue

37. Bad-conductive fabric:

bone, fat, nervous, coarse-fibered connecting fabric, tooth enamel

blood, lymph, bile, cerebrospinal fluid,

urine, muscle tissue

38. In dielectric under the action of high-frequency electric field occurs:

uniform motion of ions

oscillatory motion of ions

re-orientation of the dipole molecules

uniform motion of the dipole molecules

39. Generator sustained oscillations consists of:

the oscillatory circuit, power source, valve, feedback

therapeutic contour

inductor and capacitor

40. Oscillating circuit is:

source of the electric field

power source

the source of the magnetic field

the source of electromagnetic oscillations

41. When the impact on the knee of the UHF field occurred then more intense will be heated:
intra-articular fluid
leather
subcutaneous fat

Тема 6. Ionizing radiation.

Формы контроля успеваемости

Письменный контроль, тестирование, контроль выполнения практических заданий.

Оценочные материалы текущего контроля успеваемости

1. Вопросы письменного контроля по теме

Вариант 1

1. Ionizing radiation, types, sources.
2. Absorbed dose. Units of measurement.
3. Exposure dose. Units of measurement.
4. Equivalent dose, the unit of measurement.
5. Effective equivalent dose. Units of measurement. The dose rate. Units of measurement.

Вариант 2

1. Protection from ionizing radiation.
2. Two types of ionizing radiation.
3. Dosimetry.
4. Protection against ionizing radiation.
5. Chemical protection.

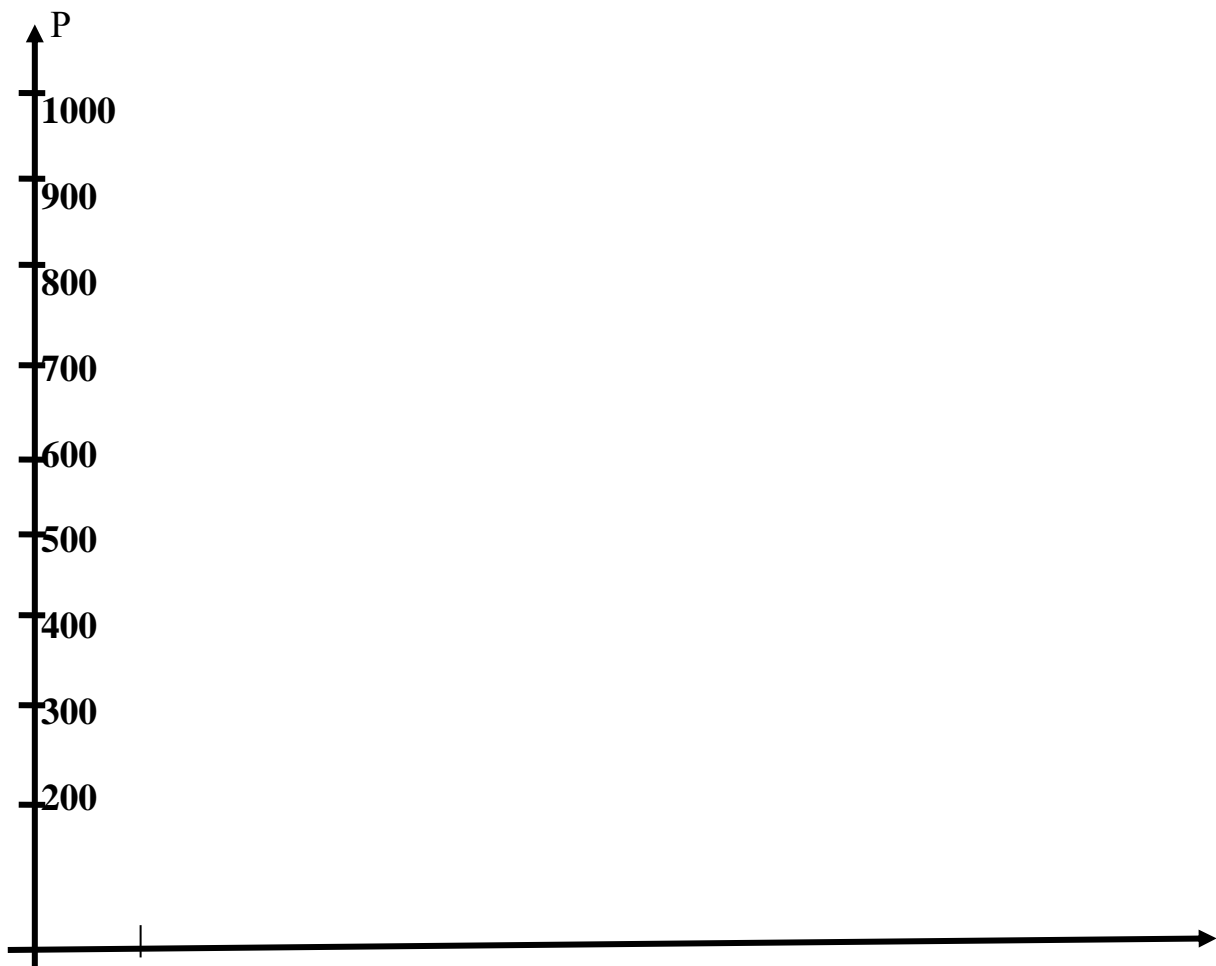
2. Практические задания для аудиторной работы

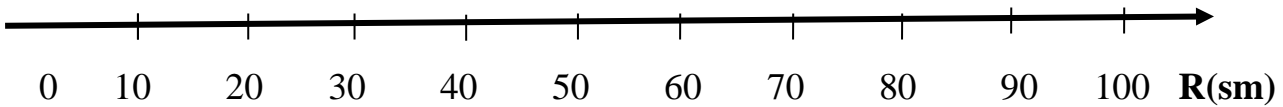
1. Determination of the air layer of half and full absorption β radiation source

1. Measure the dose rate at a distance from 0 to 100 sm every 5 sm from the source of radiation.
2. Data recorded in the table and plotted dose of air layer thickness.

The thickness of the air layer (sm)	The dose rate (mR / hr)	The thickness of the air layer (sm)	The dose rate (mR / hr)

0		55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			





1. According to the schedule to determine the thickness of the air layer of half and full absorption of beta radiation.
2. Data recorded in the table below:

Air layer thickness half-absorption of beta radiation sm	The thickness of the layer of air of complete absorption of beta radiation sm
Conclusion:	

II. Determination of the maximum permissible safe residence time in the field of human beta and gamma - radiation.

We are interested in a safe duration of time during which a person may be about isotope. To perform the calculations we use the formula:

$$P = D_{pr}/t$$

However, note that the maximum safe dose per working day for those working directly with radioactive sources is 0.017 R.

We express this dose mR:

$$D_{np} = 0.017 \text{ R} = 17 \cdot 10^{-3} \text{ R} = 17 \cdot 10^{-3} \cdot 10^6 \text{ mR} = 17 \cdot 10^3 \text{ mR}$$

To measure the location near the source of radiation in hours necessary to measure the dose produced by the source (Ri), and then calculate the time safe location near the source of radiation directly to the clock by the formula: $P = D_{pr}/t$ $t = D_{pr}/P$.

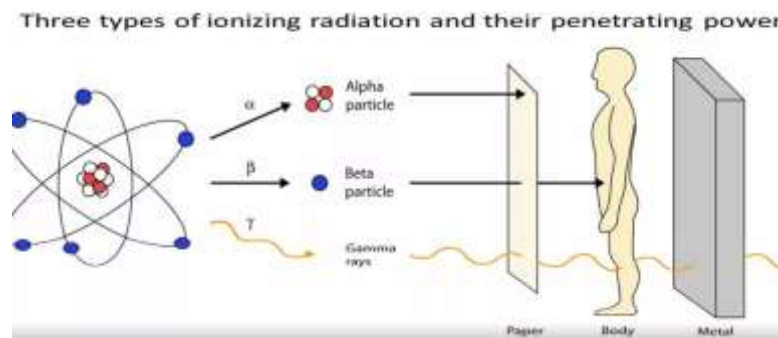
The measurement results tabulated:

№	Distance between the dosimeter and source of gamma – radiation sm	Meaning dose rate (mkR/hr)	Maximum permissible exposure time hour
1.			

2.			
Conclusion:			

3. Практические задания для внеаудиторной работы

Worked example. Break the types of ionizing radiation down into components in a diagram.



4. Тестовые задания по теме

Dosimetry of ionizing radiation

1. Radiation interaction with matter which leads to ionization of atoms and molecules, called:

- ionizing
- cosmic
- thermal

2. Number energy absorbed by a unit mass during irradiation, is called:

- absorbed dose
- exposure dose
- equivalent dose

3. The dosage which takes into account the biological effect of various types of radiation is called:

- exposure dose
- equivalent dose
- absorbed dose

4. Dose characterizing damaging effect on the population as a whole, is called:

exposure dose
equivalent dose
effective dose equivalent
collective effective dose equivalent

5. The power of the exposure dose measured by the SI:

Gray
Ampere per kilogram

Sievert
man-sievert

6. The absorbed dose in the SI system is measured in:

Gray
Coulomb on a kg
Sievert
man-sievert

7. Off-system unit exposure dose:

rad
ber
Rentgen

8. Off-system unit of absorbed dose:

rad
ber
X-ray

9. The radiation dose at which the substance is irradiated 1 kg transmitted ionizing radiation energy of 1 J, is:

1 X-ray
1 Gray
1 Sievert
1 rad

10. Equivalent dose is measured in SI:

Coulomb on a kg
Gray
Sievert

11. Exposure dose is measured in SI:

Gray per second
Ampere per kilogram
Coulomb on a kg

12. Dose X-ray or gamma radiation, under which influence in 1 cm³ of dry air formed 2 billion ion pairs (both signs) under normal conditions, is:

1 Gray
1 Sievert
1 Rentgen
1 rad

13. Quality factor alpha radiation is:

20

10

1

3

14. The energy of ionizing radiation of any kind, which by their biological effect is equivalent to one rad X-ray or gamma radiation is:

ber

rad

Rentgen

Sievert

15. Coefficient of radiation risk of bone marrow is:

0.15

0.25

0.12

0.03

16. Coefficient equal to the radiation risk of ovarian:

0.15

0.25

0.12

0.03

17. Minimum lethal doses gamma radiation is about:

100 ber

600 ber

1000 ber

100 mber

18. The maximum permissible equivalent dose exposure of the personnel during the year is:

5 ber

0.5 ber

50 mber

100 mber

600 ber

19. Radiation capable of ionizing the atoms and molecules (tear electrons) is called:

alfa radiation

betta radiation

ionizing radiation

gamma radiation

20. Section, which provides a quantitative assessment of the effects of ionizing radiation on matter, or living cells, called:

rentgenologiey

dozimetriy

onkologiey

21. The dose was evaluated by ionization of dry air at normal atmospheric pressure, called:

exposure dose

equivalent dose

absorbed dose

22. Doza characterizing the cumulative effect of which has ionizing radiation on the human body as a whole, given the sensitivity of different organs, called:

absorbed dose

exposure dose

equivalent dose

effective dose equivalent

23. Equivalent dose in the SI system is measured in:

Gray

Coulomb on a kg

Sievert

man-sievert

24. Effective equivalent dose in the SI system is measured in:

Gray

Coulomb on a kg

Sievert

man-sievert

25. Off-system unit of equivalent dose:

rad

ber

Rentgen

26. Off-system unit effective dose equivalent:

Rad

ber

Rentgen

27. Gray is equivalent:

10 rad

100 rad

0.1 rad

28. The dose absorbed by the object per unit time is called:

exposure dose

power absorbed dose

29. Power absorbed dose is measured in SI:

Gray per second

A per kg

30. Dose, under the influence of which upon full ionization 1 kg of dry air under normal conditions, a charge equal to 1 C, is called:

1 Gray per kg

1 the Coulomb per kg

1 Sievert per kg

31. Coefficient indicating how many times the efficiency of the biological action of this type of radiation is greater than X-ray or gamma radiation at the same absorbed dose of 1 g of tissue, called:

coefficient of radiation risk

the quality factor

32. *Natural Radioactive sources (cosmic rays, radioactive mineral resources, water, etc.)*

create a pattern corresponding to approximately:

500 mber

0.5 mber

100 mber

500 ber

33. *Maximum permissible dose equivalent for the population per year be considered:*

5 ber

0.5 ber

50 mber

100 mber

600 ber

34. *Activity of nuclide in which the occur disintegration of one nucleus in 1 second is called:*

Rezerford

Kyuri

Bekkerel

Ionizing radiation biophysics

1. *To protect from beta-radiation necessary:*

thick layer of lead

thick layer of concrete

layer of any material (wood, glass, light metal) with a thickness of 1-2cm

paper

2. *The number of protons in the nucleus is equal to:*

mass number

the atomic number of the element

the number of neutrons

3. *Spontaneous transformation of the nucleus of one element into another nucleus with mass number less than 4 units and charge less 2 units called:*

betta decay

alpha-decay

gamma decay

radioactive disintegration

4. *Alpha decay is accompanied by:*

gamma radiation

neutrino radiation

radiation antineutrino

5. *Alpha particles are formed in the kernel:*

turning a proton into a neutron

conversion of a neutron into a proton

the interaction of two protons and two neutrons

6. *The highest density of ionization alpha particles have:*

beginning of the journey
end of the road
during the entire movement

7. Alpha radiation has:

more penetrating
small penetrating

8. Most penetrating has:

Beta radiation
Gamma radiation
Alpha radiation

9. Speed of beta radiation:

much less than the speed of light
close to the speed of light
the speed of light

10. The path length of beta radiation is greatest in:

biological tissues
aluminum
air

11. The number of decays occurring per unit time is called:

decay constant
activity of the radioactive element
half-life

12. Activity of the radioactive element, which occurs decay one nucleus in per one second is called the:

1 Ru
1 Bq
Rd 1

13. For the same periods breaks up the same share of radioactive nuclei is:

half-life
activity of the radioactive element
radioactive decay law

14. Most dangerous when ingested are:

alpha particles
beta-particles
gamma rays
neutrons
protons

15. For protection from alpha rays sufficiently application:

lead
thin layer of any substance

16. Property nuclei of certain elements spontaneously turn into a kernel other elements with the emission of alpha, beta and gamma radiation is called:

artificial radioactivity
radioactivity
alpha decay

17. The kernel consists of atoms:

protonov

neytronov

protonov and electrons

protonov and neutrons

protonov and alpha particles

18. Nuclear forces:

short- and strong

low potency

depend the amount of protons

increase with increasing size of the nucleus

19. Probability of Interaction alpha particle with the medium, the greater:

more speed alpha particles

more energy alpha particles

less speed alpha particles

20. Beta particle is formed in the kernel:

conversion proton into a neutron or conversion neutron into a proton

interaction two protons and two neutrons

21. The highest ionizing ability has:

beta radiation

gamma radiation

alfa radiation

22. The average distance between the beginning and end of the path of a charged ionizing particle in a given substance is called:

linear ionization density

linear stopping power

average linear mileage

23. The time during which splits half cash of the nuclei is called

the decay constant

half-life

24. Unit activity of the radioactive element in the SI system:

Becquerel

Kyuri

Rezerford

25. With time the activity of the radioactive element:

increases

decreases

Do not changed

26. The main danger of alpha particles are hit:

In the surface of human skin

In the mucous membranes of the respiratory or digestive tract

On the person's clothing

X-ray radiation

1. Electromagnetic radiation with a wavelength of 80 nm up to 10^{-4} nm is called:

gamma radiation

x-ray radiation

2. Radiation produced by deceleration of electrons, departing from the cathode in the field of atomic nuclei anode is called:

characteristic

brake

3. Efficiency of x-ray tube:

high

very high

very low

average

4. X-ray radiation longer wavelengths with low penetrating power is called:

hard

soft

5. Characteristic X-rays has:

continuous spectrum

linear spectrum

striped range

6. Changing direction X-ray backgrounds in their interaction with the electrons of the inner shells is called:

coherent scattering

photoeffect

compton effect

7. Detachment of an electron from the outer shell of the atom, accompanied by an increase wavelength of the photon of X-rays, called:

coherent scattering

photoeffect

compton effect

8. The interaction of X-rays with matter occurs:

Increase in X-ray flux

weakening of X-rays

X-ray flux does not change

9. Shadow picture formed on the film as a result of overlapping shadows all parts of the object located along the beam of radiation, called:

tomogram

roentgenogram

10. On a scale of Hounsfield value tissue densities are in the range:

-100 to 100

-1000 to 3000

0 to 1000

-1000 to 0

11. On a scale of Hounsfield bone density is:

-1000

0

3000

12. Image quality at the X-ray tomography is increased by:

increasing the number of detectors

decreasing the number of recorded

projections while reducing research time

13. X-ray source is:

accelerator

x-ray tube

lamp triode

lamp diode

14. The thickness of a substance after passing which the intensity of radiation is reduced by half is called:

layer half of weakening

layer tenfold weakening

15. More effective ослабителем x-ray radiation is:

luminium

lead

copper

16. Fixing the shadow image tissues of the body on a film called:

radiography

fluoroscopy

17. Application of x-ray radiation with the purpose of treatment is called: radiodiagnosis

x-ray radiation treatment

computed tomography

18. Layer-by-layer x-ray examination, which consists in obtaining of a shadow image of the individual layers of the investigated object is called:

1 roentgenogram

x-ray tomography

19. On a scale of Hounsfield air density (light) is:

-1000

0

1000

20. On a scale of Hounsfield density of water is equal to:

-1000

0

1000

Тема 7. Optical eye.

Формы контроля успеваемости

Письменный контроль, тестирование, контроль выполнения практических заданий.

Оценочные материалы текущего контроля успеваемости

1. Вопросы письменного контроля по теме

Вариант 1

1. The lens. Construction of the image in the lens.
2. Focus of lens and its optical power.
3. The optical system of the eye.
4. Types and characteristics of biological lenses.
5. Reduced eye. Angle of view. Resolution. Visual acuity.

Вариант 2

1. The accommodation.
2. Disadvantages of the optical system of the eye and physical basis of their correction.
3. Morpho-functional layers of the retina.
4. Primary mechanisms of light and colour perception.
5. The concept of a «primary visual images».

2. Практические задания для аудиторной работы

I. Determination of the Concentration of Substances in Solutions Using the Photoelectric Colorimeter of Concentration KFK-2

The order of execution of work

1.1. Preparation for work

1. Kolorimetr enable network 15 min before beginning measurements. During warm-up sample compartment must be opened.
2. Insert for measurements required by need of a deal colored filter.
3. Set the minimum sensitivity of the colorimeter.

To do this: a) handle "sensitivity" to position "1"

b) Handle "set roughly 100"-to the extreme left.

Before measurements and switching photodetectors verify the installation arrows colorimeter to "0" on the scale transmittance τ with an open sample compartment. By moving the pointer from its zero position sum to zero by the potentiometer "zero", derived under the slot.

1.2. The work with the device

1. In the light beam to put a cell with a control solution.
2. Do close the sample compartment cover.
3. By buttons (knobs) do select "sensitivity" and "setting 100 coarse and fine" set countdown 100 colorimeter scale (handle "sensitivity" can be in one of three positions: "1", "2", "3").
4. Later on by turning the cuvette cell holder with a solvent to replace the cell with the test solution.
5. Do scale reading of the test solution τ bandwidth percentage and absorbance of the solution.

1.3. Determination of the concentration of substances in solution

To determine the concentration of a substance in the solution should be observed in the following sequence.

1. Construction of the calibration curve for the substance
 - a) Measure the optical density and the light transmission of all solutions, the concentrations of which are known to you, at the selected wavelength.
 - b) Measure the absorbance and light transmission of the solution of unknown concentration.

wavelength λ	solution strength C%	optical density of the solution D	light transmission τ
	1 %		
	3 %		
	5 %		
	7 %		
	9 %		
	$C_x\%$		

- b) Construct a calibration curve by plotting known concentrations of the horizontal axis and the vertical - the corresponding values of absorbance.

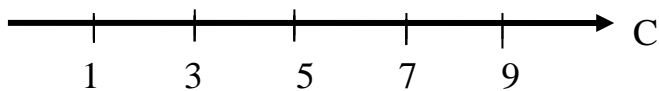


D_

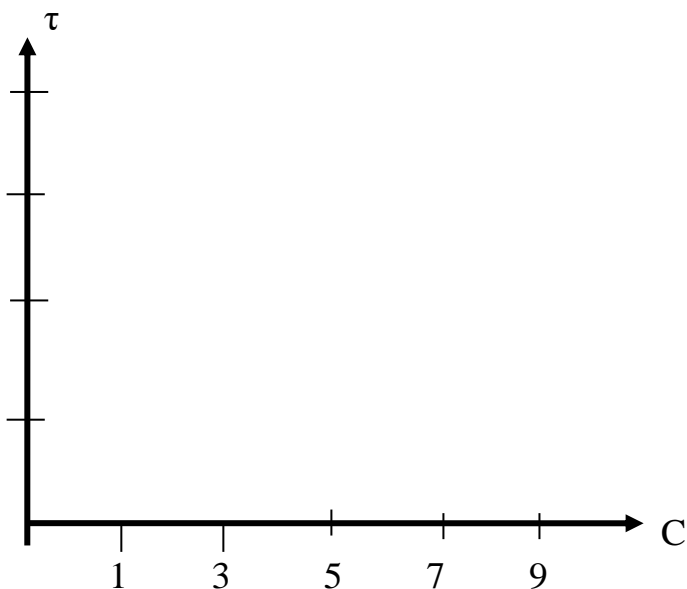
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d) Construct a calibration curve by plotting known concentrations of the horizontal axis and the vertical - the corresponding light transmission value of the coefficient.



2) Determination of the concentration of a substance in solution

- Pour the solution of unknown concentration in the cell, to determine the optical density of the solution.
- By graduative curve do find the concentration corresponding to the measured value of the optical density.

Conclusion:

II. Hygienic Assessment of a Natural and an Artificial Lighting. Rules of work with the device for measuring light (ATT-1508)

2.1 The practical part

1. Install the device in a horizontal position.

2. Connect the solar cells to measure.
3. Measurements should avoid prolonged exposure to light, exceeding the lux meter limit of light.
4. To avoid overload search meter limit of measurement should always be started with the limit 19990 lux, consistently moving on to more sensitive measurement limits until the pointer is in the working part of the scale.

2.2 Determination of illumination

1. Determine the illumination of workplaces in the laboratory, created mixed lighting (natural and artificial).
2. Determine the natural illumination of working places (when the lamps switched off the lamps).
3. Determine the illumination of workplaces created by the artificial lighting (the difference between native and natural light).
4. The results of the work summarized in a table:

Mixed light, both (natural and artificial) lux	Natural illumination lux	Artificial illumination lux	Norm light lux
Conclusion:			

2.3 Calculation of necessary quantity of luminaires

1. Calculate the required number of lamps to generate a given level of artificial light in the room.

Determination of necessary quantity of lamps to generate a given level of artificial light in the room you can spend calculated using the tables of specific power (power density-the ratio of the total power of the lamps for the area of the floor (W/m²)). Do find power density find on the tables at the intersection of the horizontal line, the corresponding area of the premises and suspension heights of lamps and a vertical line corresponding to a given level of illumination.

1. To determine the required number of lamps to obtained a value of the specific power to multiply the size of the premises and to share the power of a single bulb. (40 W).

$$N = \frac{J \cdot S}{P}$$

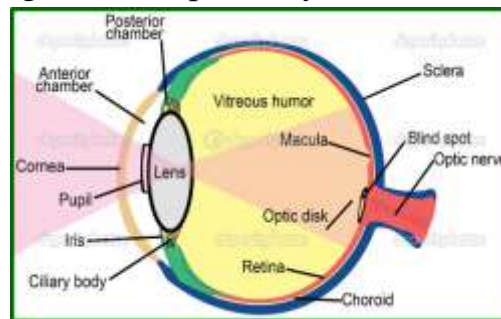
2. The results of the work summarized in a table:

H	S	Illumination	Power	the power of one	Number of
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(M)	(M ²)	E	density J	lamp P	lamps N
Conclusion:					

3. Практические задания для внеаудиторной работы

Worked example. Draw a diagram the Optical System of the Eye.



4. Тестовые задания по теме

Optics

1. Most refractivity in the eye possesses:

- lens
- cornea
- liquid front camera
- the vitreous body

2. Speed of light in vacuum..... speed of light in any environment:

- less then
- more then
- equal

3. Unit of measurement of optical power of the lens:

- lumen
- +dioptre
- meter
- candela

4. The ray of light falling on collecting lens parallel to its main optical axis, after refraction goes:

- parallel to the main optical axis
- through the lens focus

through the optical center of the lens
perpendicular to the main optical axis

5. For the correction of presbyopia apply:

concave lenses

a complex system of lenses

converging lenses

cylindrical lenses

6. Accommodation is:

the adaptation of the eye to vision in the dark

the adaptation of the eye to the clear vision of objects is on different distances

the adaptation of the eye to perceive different shades of one color

the value inverse threshold brightness

7. Visual acuity of 0.5 corresponds to the smallest angle of view:

2'

5'

1'

0,5'

8. Light perceive of the structure eye:

lens

the cornea, lens and retina

retina

9. Rods are located:

in the central part of the retina (macula)

uniformly over the entire surface

over the entire surface of the retina and the periphery concentration above than the central portion

over the entire surface of the retina, and on the periphery of their concentration is less than the central portion

10. The eye adaptation to accurate vision of variously remote subjects call:

accommodation

visual acuity

adaptation

myopia

11. distance of the best of view an adult is:

70 microns

25cm

12,5cm

12. The closest distance of the subject from the eyes, which is still possible to clear image on the retina, called:

the distance of the best of view

the near-point eyes

limit of the resolution

resolution

13. The acuity of vision is:

the value inverse of the smallest angle of view

value, defined as the smallest angle of view

the ratio of geometric dimensions of image on retina to actual size of body

the ratio of size body image on retina to distance of best of view

14. The dimensions of the image on the retina of the subject, at a distance of the best of view, provided that the angle at which the subject is visible is equal 1 ':

1000 micron

1 cm

5mkm

73 microns

16. The destination of the retina:

image formation

conversion of light exposure to thermal

the perception of light

reflection of light energy

17. Colour vision is the result of the existence of three types of cones, which have absorption spectra of visible light with maxima:

400, 500 and 700 nm

220, 350 and 555 nm

45 and 535 and 570 nm

425, 555 and 760 nm

18. Cause nearsightedness (myopia)?

the shortened form of the eyeball

the elongated shape of the eyeball

the ability of the lens to the accommodation

changing the size of the pupil

19. Blind spot is a place where:

many rods

no rods, no cones

many of the cones

little of rods

20. The value of the smallest angle of view for normal eyes:

10'

5'

3'

1'

21. Spectral range of sensitivity of the eye:

400-800 nm

200-400 nm

800-1000 nm

40-200 nm

22. The main light refraction occurs on:

border lens with vitreous body

the border of the cornea with air

iris

retina

23. *Total optical power refracting medium of the eye is:*

80 dioptre

18-20 dioptre

63-65 dioptre

40 dioptre

24. *The optical power of a collecting lens:*

less than zero

zero

greater than zero

25. *A ray of light that falls on the collecting lens, passing through her front focus after refraction leave the lens:*

through her back focus

perpendicular to the main optical axis

through the optical center of the lens

parallel to the main optical axis

26. *A ray of light that falls on center of the collecting lens:*

after refraction passes through the lens focus

after refraction is parallel to the main optical axis

passes through the lens, not refracted

experiences full reflection from the lens surface

27. *The closest distance of the subject from the eyes, when is still possible to have the clear image on the retina without severe tensions accomodation, called:*

the distance of the best of view

maximum accommodation

visual acuity

the nearest point of the eyes

front focus reduced eyes

28. *In medicine the resolution of the eye evaluate:*

the smallest angle of view

angle of view

visual acuity

the distance between two neighboring visual cells in the retina

29. *Light conduct structures of the eye:*

the cornea, anterior chamber, lens, vitreous humor

sclera, lens, vitreous body, retina

the pupil, lens, liquid front of the camera, cones

optic cells-rods and cones

30. *Cones are distributed:*

in the central part of the retina (macula)

evenly across the surface

on the whole surface of the retina

on the periphery of the

31. In a normal eye the image of the object is...if it is infinity

before the retina

behind the retina

on the retina

32. When the subject approaching to the eye up to a distance of the best of view:

accommodation is performed without tension

angle view decreases

the accommodation is done with a voltage

accommodation increases

33. Accommodation (focusing) is the change:

form of the eyeball

the curvature of the lens

optical density of the vitreous body

the refractive index of watery moisture

34. The retina consists of:

light-sensitive molecules

rods and cones

phospholipid membranes

blood vessels and nerve

35. The most critical areas of the retina are:

yellow spot and especially central hole

blind spot

the occurrence of the optic nerve of the eye

optic nerve

36. Select a physical phenomenon that is observed in the interaction of light with matter:

resonance

cavitation

absorption

deformation

37. The concentration colorimetric is method of definition of concentration:

painting solutions by measuring the intensity of the light streams passed through a solution of

solutions through a Desks study of heat

painting solutions on the angle of rotation of the polarization plane

solution by measuring the reflection coefficient

38. The coefficient of absorption of light colored solutions depends on:

the magnetic properties of atoms of the substance in the solution

the thermal properties of the atoms of the substance in the solution

the concentration of the substance in the solution

the refractive index of a substance in a solution

39. The ratio of the intensity of the transmitted through a solution to the intensity of light falling on a solution of the light is called the coefficient of:

absorption

reflection

scattering

Transparency

40. Transmittance:

the ratio of the intensity of reflected light to the intensity of the incident light body
the reciprocal of the distance where the light intensity due to absorption in the
environment is attenuated in e times

ratio of absolute refractive index of the second Wednesday to the index of the first
environment

the ratio of the flow of radiation transmitted through the body to the flow of radiation
falling on the body

Критерии оценивания, применяемые при текущем контроле успеваемости, в том числе при контроле самостоятельной работы обучающихся.

Форма контроля	Критерии оценивания
<p align="center">устный опрос</p>	<p>Оценкой "ОТЛИЧНО" оценивается ответ, который показывает прочные знания основных вопросов изучаемого материала, отличается глубиной и полнотой раскрытия темы; владение терминологическим аппаратом; умение объяснять сущность явлений, процессов, событий, делать выводы и обобщения, давать аргументированные ответы, приводить примеры; свободное владение монологической речью, логичность и последовательность ответа.</p>
	<p>Оценкой "ХОРОШО" оценивается ответ, обнаруживающий прочные знания основных вопросов изучаемого материала, отличается глубиной и полнотой раскрытия темы; владение терминологическим аппаратом; умение объяснять сущность явлений, процессов, событий, делать выводы и обобщения, давать аргументированные ответы, приводить примеры; свободное владение монологической речью, логичность и последовательность ответа. Однако допускается одна - две неточности в ответе.</p>
	<p>Оценкой "УДОВЛЕТВОРИТЕЛЬНО" оценивается ответ, свидетельствующий в основном о знании изучаемого материала, отличающийся недостаточной глубиной и полнотой раскрытия темы; знанием основных вопросов теории; слабо сформированными навыками анализа явлений, процессов, недостаточным умением давать аргументированные ответы и приводить примеры; недостаточно свободным владением монологической речью, логичностью и последовательностью ответа. Допускается несколько ошибок в содержании ответа.</p>
	<p>Оценкой "НЕУДОВЛЕТВОРИТЕЛЬНО" оценивается ответ, обнаруживающий незнание изучаемого материала, отличающийся неглубоким раскрытием темы; незнанием основных вопросов теории, несформированными навыками анализа явлений, процессов; неумением давать</p>

	<p>аргументированные ответы, слабым владением монологической речью, отсутствием логичности и последовательности. Допускаются серьезные ошибки в содержании ответа.</p>
<p>письменный опрос</p>	<p>Оценкой "ОТЛИЧНО" оцениваются письменные работы, которые свидетельствуют о прочных знаниях основных вопросов изучаемого материала, отличаются подробностью и глубиной раскрытия темы; владение терминологическим аппаратом; умение объяснять сущность явлений, процессов, событий, делать выводы и обобщения, давать аргументированные ответы, приводить примеры; свободное владение письменной речью, орфографическая грамотность, логичность и последовательность ответа.</p>
	<p>Оценкой "ХОРОШО" оцениваются письменные работы, которые выявляют прочные знания основных вопросов изучаемого материала, отличающиеся полнотой и корректностью раскрытия темы; владение терминологическим аппаратом; умение объяснять сущность явлений, процессов, событий, делать выводы и обобщения, давать аргументированные ответы, приводить примеры; свободное владение письменной речью, логичность и последовательность ответа. Однако допускается одна - две неточности в ответе.</p>
	<p>Оценкой "УДОВЛЕТВОРИТЕЛЬНО" оцениваются письменные работы, которые отражают знание основного содержания изучаемого материала, при этом отличаются недостаточной глубиной и полнотой раскрытия темы; в малой степени сформированными навыками анализа явлений, процессов, ограниченным умением давать аргументированные ответы и приводить примеры; недостаточно свободным владением письменной речью, логичностью и последовательностью ответа. Допускается несколько ошибок в содержании ответа.</p>
	<p>Оценкой "НЕУДОВЛЕТВОРИТЕЛЬНО" оцениваются письменные работы, которые обнаруживают незнание изучаемого материала, характеризуются неглубоким раскрытием темы; ограниченной осведомленностью в области основных вопросов теории, несформированными</p>

	<p>навыками анализа явлений, процессов; неумением давать аргументированные ответы, слабым владением письменной речью, отсутствием логичности и последовательности. Допускаются серьезные ошибки в содержании ответа.</p>
тестирование	<p>Оценка «ОТЛИЧНО» выставляется при условии 90-100% правильных ответов</p>
	<p>Оценка «ХОРОШО» выставляется при условии 75-89% правильных ответов</p>
	<p>Оценка «УДОВЛЕТВОРИТЕЛЬНО» выставляется при условии 60-74% правильных ответов</p>
	<p>Оценка «НЕУДОВЛЕТВОРИТЕЛЬНО» выставляется при условии 59% и меньше правильных ответов.</p>
выполнение практического задания	<p>Оценка «ОТЛИЧНО» выставляется если обучающимся практическое задание выполнено, верно, рационально, и в полном объеме согласно предъявляемым требованиям. Обоснованно, последовательно и грамотно объясняется ход и логика выполнения задания, проведен правильный анализ рассматриваемого вопроса, сделаны аргументированные выводы. Точно используется терминология науки и соответствующий теоретический и прикладной материал. На дополнительные вопросы дается корректный, верный и точный ответ.</p>
	<p>Оценка «ХОРОШО» выставляется если обучающимся практическое задание выполнено верно и в полном объеме. Объяснение хода ее выполнения задания подробное, но недостаточно логичное, с единичными ошибками в деталях, некоторыми затруднениями в теоретическом обосновании. Проведен недостаточно развернутый анализ содержания и процесса реализации задания, выводы ограничены и в малой степени обоснованы.</p>
	<p>Оценка «УДОВЛЕТВОРИТЕЛЬНО» выставляется если обучающимся выбран верный путь решения и теоретические сведения для выполнения задания. Задание не доведено до завершения, анализ вопросов недостаточно аргументирован, Объяснение хода работы над заданием недостаточно полное, с нарушением</p>

	логики и последовательности осмысления материала. Ответы на дополнительные вопросы недостаточно точные, с ошибками в деталях.
	Оценка «НЕУДОВЛЕТВОРИТЕЛЬНО» выставляется если обучающимся задание выполнено частично, не доведено до завершения, нет убедительного обоснования решения или не сформулированы доказательные выводы дан правильный ответ на вопрос задачи. Нарушена последовательность и логика выполнения задания. Процесс работы над заданием раскрывается не полностью, с существенными ошибками. Ответы на дополнительные вопросы некорректные, недостоверные или отсутствуют.

3. Оценочные материалы промежуточной аттестации обучающихся.

Формой проведения промежуточной аттестации по дисциплине является зачет. Зачет проводится письменно в форме тестирования.

Процедура проведения промежуточной аттестации и механизм формирования зачетного рейтинга регулируются следующими нормативными документами:

- Положение П 076.02-2019 «О формах, периодичности и порядке текущего контроля успеваемости и промежуточной аттестации обучающихся по образовательным программам высшего образования – программам бакалавриата, программам специалитета, программам магистратуры»;

- Положение П004.03-2020 «О балльно-рейтинговой системе оценивания учебных достижений обучающихся» (приказ №479 от 03.03.2020г.)

Зачетный рейтинг обучающегося формируется при проведении промежуточной аттестации и выражается в баллах по шкале от 0 до 30.

Перевод процентов правильных ответов при прохождении тестирования определяется по таблице 3.1

Таблица 3.1

Формирование зачетного рейтинга с учетом % правильных ответов за тесты

Результат тестирования (%)	Количество баллов	Результат тестирования (%)	Количество баллов
≤50	14	72-74	22
51-53	15	75-77	23
54-56	16	78-80	24
57-59	17	81-83	25
60-62	18	84-86	26
63-65	19	87-89	27
66-68	20	90-92	28

69-71	21	93-96	29
		97-100	30

Промежуточная аттестация по дисциплине считается успешно пройденной обучающимся при условии получения им экзаменационного/зачетного рейтинга не менее 15 баллов и (или) текущего стандартизированного рейтинга не менее 35 баллов.

В случае получения обучающимся экзаменационного/зачетного рейтинга менее 15 баллов и (или) текущего стандартизированного рейтинга менее 35 баллов результаты промежуточной аттестации по дисциплине (модулю) признаются неудовлетворительными и у обучающегося образуется академическая задолженность. Дисциплинарный рейтинг обучающегося в этом случае не рассчитывается.

Итоговая оценка по дисциплине определяется на основании дисциплинарного рейтинга (максимально 100 баллов) по таблице перевода

Таблица 3.2

Перевод дисциплинарного рейтинга в пятибалльную оценку по дисциплине

дисциплинарный рейтинг по БРС	оценка по дисциплине (модулю)	
	экзамен	зачет
86 – 105 баллов	5 (отлично)	зачтено
70 – 85 баллов	4 (хорошо)	зачтено
50–69 баллов	3 (удовлетворительно)	зачтено
49 и менее баллов	2 (неудовлетворительно)	не зачтено

Таблица 3.3

Таблица перевода зачетного/экзаменационного рейтинга в дисциплинарный рейтинг при повторной промежуточной аттестации по дисциплине (модулю)

Рэ/з	Рд	Оценка	Рэ/з	Рд	Оценка	Рэ/з	Рд	Оценка
15	50	удовлетворительно	20	70	хорошо	25	86	отлично
16	54	удовлетворительно	21	74	хорошо	26	89	отлично
17	59	удовлетворительно	22	78	хорошо	27	92	отлично
18	64	удовлетворительно	23	82	хорошо	28	95	отлично
19	69	удовлетворительно	24	85	хорошо	29	98	отлично
						30	100	отлично

Тестовые задания для проведения промежуточной аттестации формируются на основании представленных теоретических вопросов и практических заданий. Тестирование обучающихся проводится письменно.

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
«ОРЕНБУРГСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ
УНИВЕРСИТЕТ» МИНИСТЕРСТВА ЗДРАВООХРАНЕНИЯ РОССИЙСКОЙ
ФЕДЕРАЦИИ

кафедра биофизики и математики
специальность 31.05.01 Лечебное дело (факультет иностранных студентов)
дисциплина Биофизика

ВАРИАНТ НАБОРА ТЕСТОВЫХ ЗАДАНИЙ

1.The second leads in electrocardiogram recorded between:

- Left hand-left foot
- Right hand-left foot
- Right hand-left hand

2.Lines of force and equipotential lines:

- mutually perpendicular
- in one direction
- in opposite directions
- directed at an angle to one another

3.The main provisions of the Einthoven theory include:

- the human body is an equilateral triangle
- body has the same conductivity in all directions
- heart is electric dipole placed in the center of the triangle
- all the answers are correct

4.Electrocardiogram is reflected the electrical activity of:

- heart
- muscle
- retinal
- brain

5.Electroretinogram is reflected the electrical activity of:

- heart
- muscle
- retinal
- Brain

6.R wave on electrocardiogram is means:

- atrial excitation
- initiation of the interventricular septum

the full excitement of both ventricles
the almost complete excitation of both ventricles
the processes of repolarization

7.P wave on electrocardiogram is means:
atrial excitation
initiation of the interventricular septum
the full excitement of both ventricles
the almost complete excitation of both ventricles
the processes of repolarization

8.Electrocardiography is to register:
the electrical activity of the brain
potential difference, changing over time due to the electrical activity of the heart
potential difference arising in the functioning of an organ
potential difference, changing over time due to the electrical activity of the brain.

9.When registration of the electrocardiogram take place the total number of leads:
three
six
twelve
Ten

10.Electrocardiograph by action principle is:
generator of electrical oscillations
AC rectifier
amplifier of the oscillations
rectangular pulse generator standard

11.The maximum amplitude of the R wave in the ECG is:
5 mV
5B
5 kV
1B

12.Low-pass amplifier suitable for:
receiving standard rectangular pulses
interference suppression
interference suppression and amplification of the desired signal
amplification of pulses coming from the heart

13.Calibration block is a generator:
low harmonic
high-frequency harmonic vibrations

rectangular pulses of the standard voltage of 1mV
rectangular pulses standard voltage 1V

14.Sources of interference are:

signals from the human heart

varying electric and magnetic fields generated in the lighting circuit current and high-frequency electromagnetic waves coming from " ether "

15.When removed the ECG mast be graunded:

right-hand of a man

right leg

right leg and left leg

left leg

16.Electric dipoles in a uniform electric field is located:

along the equipotential lines of the electric field

along the electric field lines

perpendicular to the lines of force of the electric field

angle to the lines of the electric field

17.Electric dipole can exist indefinitely in:

dielectric

conducting medium

semiconductor

18.Interference in the first and second leads in ECG registration due to poor contact of the electrode with skin of the patient on:

left hand

the right leg

right hand

the left leg

19.Interference in the first, second and third leads when recording ECG caused by poor contact of the electrode with skin of the patient on:

the left leg

right hand

left hand

the right leg

20.Equipotential lines is:

lines that extend from the positive charge

lines of equal potential

lines that come out of the negative charge

the line along which the potential decreases

21. Automatism is:

occurrence of an action potential

ability of the heart without any external influences perform rhythmic, following one after another reduction

ability to conduct excitation arising in any part of heart, to other departments of the heart muscle

22. EMG reflects the electrical activity:

heart

muscle

retinal

brain

23. EEG reflects the electrical activity:

heart

muscle

retinal

brain

24. T wave on electrocardiogram is means:

atrial excitation

initiation of the interventricular septum

the full excitement of both ventricles

the almost complete excitation of both ventricles

the processes of repolarization

25. Q wave on electrocardiogram is means:

atrial excitation

initiation of the interventricular septum

the full excitement of both ventricles

the almost complete excitation of both ventricles

the processes of repolarization

26. S wave on electrocardiogram is means:

atrial excitation

initiation of the interventricular septum

the full excitement of both ventricles

the almost complete excitation of both ventricles

the processes of repolarization

27. The first lead are when gathering electrocardiogram recorded between:

Left hand-left foot

Right hand-left foot

Right hand-left hand

28. The third lead are when gathering electrocardiogram recorded between:

Left hand-left foot
Right hand-left foot
Right hand-left hand

29. Distribution of equipotential lines on the surface of the human body:
unchanged over time
changes over time

30. The calibration unit is designed to:
calculating timeslots ECG
determining voltage Teeth
amplification of pulses coming from the heart

31. The differential amplifier is designed for:
amplification of the useful signal
interference suppression
interference suppression and amplification of the desired signal
receiving standard rectangular pulses

32. Amplifier oscillations is a device for:
receiving standard rectangular pulses
increasing the voltage, current or power due to an external source of energy
interference suppression and amplification of the desired signal
interference suppression

33. Grounding is:
device for electrical connection of the machines, devices with the earth.
electrical contact with the human body using the unit
electrical contact of two bodies

34. Electric dipole is a system consisting of two things:
charges of opposite sign, located at a great distance from each other
point charges of equal magnitude, the same sign located at a distance l from each other
point charges of equal magnitude, opposite in sign, located at a distance l from each other
point charges which differ in size, the same sign located at a distance l from each other

35. Electric dipole moment:
vector equal to the product charge on the shoulder dipole
scalar value, equal to the charge on the shoulder of the dipole

36. The range of frequencies in the spectrum of the ECG is:
(1-300)Hz
(0,01-10 Hz)
(1-1000) Hz
(0.5 to 120 Hz)

37. Interference in the second and third leads when recording ECG caused by poor contact of the electrode with skin of the patient on:

- left hand
- right hand
- the right leg
- the left leg

38. Interference in the first and third leads when recording ECG caused by poor contact of the electrode with skin of the patient on:

- the left leg
- the left hand
- the right leg
- right hand

39. lead is mean:

- the potential difference detected between two points of the body
- the potential difference, changing over time due to the electrical activity of the heart
- the potential difference, changing over time due to the electrical activity of the brain
- wires from the patient to the ECG

40. The main provisions of the Einthoven theory include:

- the human body is an equilateral triangle
- body has the same conductivity in all directions
- heart is electric dipole placed in the center of the triangle
- all the answers are correct

41. "Phase 0 is depolarization" action potential of myocardial cells corresponds to the flow of ions:

- chlorine into the cell
- sodium into the cell
- potassium out of the cell
- calcium and sodium into the cells and potassium out of the cell

42. "Phase 2 is slow repolarization" action potential of myocardial cells corresponds to the flow of ions:

- chlorine into the cell
- sodium into the cell
- potassium out of the cell
- calcium and sodium into the cells and potassium out of the cell

43. "Phase 4 is of the action potential of myocardial cells is equal to:

- chlorine into the cell
- sodium into the cell
- potassium out of the cell

calcium and sodium into the cells and potassium out of the cell
diastole

44. "Phase 1 is Initial rapid repolarization" action potential of myocardial cells corresponds to the flow of ions:

chlorine into the cell

sodium into the cell

potassium out of the cell

calcium and sodium into the cells and potassium out of the cell

45. "Phase 3 is repolarization ultimate fast" action potential of myocardial cells corresponds to the flow of ions:

chlorine into the cell

sodium into the cell

potassium out of the cell

calcium and sodium into the cells and potassium out of the cell

46. Mechanical oscillations are:

1. alternations of the vector of electric field intensity

2. the movements having in a varying degree repeatability in time

3. regular changes of the vector of induction of magnetic field

4. movements happening to variable speed

47. The distance over which the sound wave's shape repeats:

1. phase of the sound wave

2. acoustic wavelength

3. amplitude of the sound wave

4. frequency of the sound wave

48. Weber-Fechner law establishes compliance between:

1. physical and physiological properties of the sound

2. loudness and amplitude of the sound

3. sound-energy flux density and hearing threshold

4. sound-energy flux density and threshold of pain

49. Hearing threshold is:

1. the minimum frequency of the perceived sounds

2. the maximum frequency of the perceived sounds

3. the minimum perceived intensity of sounds

4. the maximum perceived intensity of sounds

50. Passive transport of substance through membrane is carried out:

1. without energy expense

2. with expense of energy of chemical bonds of molecules of substance

3. with the participation of surface proteins
4. with the participation of ionic pumps

51. Ability of myocardium of heart to be reduced, thereby realizing pumping function, it is:

1. automatism
2. conductivity
3. excitability
4. contractility

52. Potential of electric field is:

1. power characteristic of the field, scalar
2. power characteristic of the field, vector
3. power characteristic of the field, scalar
4. power characteristic of the field, vector

53. The equipotential lines are:

1. lines leaving a positive charge
2. lines of equal potential
3. lines leaving a negative charge
4. lines having potential which decreasing along them

54. Is called accommodation of eye:

1. eye adaptation to vision in the dark
2. eye adaptation to accurate vision of variously remote objects
3. capability of eye to perception of different shades of one color
4. capability of eye of the person to distinguish the objects having different brightness

55. Eye represents:

1. simple optical system
2. the optical system consisting of three identical thin lenses
3. the centered optical system
4. the optical system consisting of two identical thin lenses

56. Light represents:

1. elastic longitudinal waves
2. elastic transverse waves
3. electromagnetic transverse waves
4. electromagnetic longitudinal waves

57. The greatest value of the relative luminosity corresponds:

1. to red light
2. to green light
3. to orange light
4. to blue light

58. Current intensity represents:

1. force operating on the charge from electric field
2. quantity of an electric charge transferred through the surface over a time
3. the total quantity of free charge carriers in a conductor
4. mean energy of an ordered movement of charges in a conductor

59. Electric current which does not change in value and direction is called:

1. alternating current
2. pulsing current
3. direct current
4. randomly changing current

60. Conductivity of biological tissues:

1. is caused with ions and charged molecules
2. it is caused with free electrons
3. is protonic
4. is electronic and protonic

61. The atomic nucleus consists to:

1. electrons and positrons
2. neutrons and electrons
3. protons and electrons
4. protons and neutrons

62. The radioactive radiation which representing by helium nuclei is:

1. alpha radiation
2. beta radiation
3. gamma radiation
4. x-ray radiation

63. Liquids which coefficient of viscosity does not depend on the mode of their current are called:

1. the Newtonian
2. non-Newtonian
3. ideal
4. solutions

64. Hydraulic resistance when radius of a vessel increase:

1. does not change
2. significantly increase
3. decrease
4. increase in beginning, and then decrease

65. By the physical nature, x-ray radiation represents:

1. ionizing electro-magnetic radiation
2. flow of electrons
3. radioactive radiation in the form of multicharged ions
4. radioactive radiation in the form of fast neutrons

66. Are harmonious:

1. any oscillations
2. decaying oscillations
3. oscillations which describes with sinusoidal or sinusoidal function
4. oscillations with variable frequency and amplitude

67. Physical quantity inversed to period of oscillations, is called:

1. oscillation phase
2. amplitude
3. frequency
4. logarithmic decrement

68. The main physical characteristic of pure tone is:

1. loudness
2. frequency
3. intensity
4. acoustic spectre

69. Method of determination of auditory acuity is:

1. audiometry
2. cardiophonography
3. auscultation
4. percussion

70. Movement of molecular components of cell membrane within the layer is called:

1. drift
2. fluctuation
3. lateral diffusion
4. flip-flop transition

71. In cytoplasm of excitable cells concentration is above then outside for ions:

1. potassium
2. sodium
3. calcium
4. chlorine

72. The electrocardiogram represents electric activity of:

1. heart
2. muscle
3. retina

4. brain

73. The electrocardiography represents registration of:

1. intensity of electric field of heart
2. tiny electrical changes on the skin that arise from the heart muscle's electrical activity
3. potential difference arising when functioning any body
4. tiny electrical changes on the skin that arise from the brain activity

74. The property of liquid to show resistance to movement of its layers concerning each other is called:

1. capillary phenomenon
2. flowability
3. turbulence
4. viscosity

75. The stroke volume of blood is:

1. total amount of blood in heart ventricles
2. blood volume in atriums
3. is the volume of blood pumped from the left ventricle per beat
4. is the volume of blood pumped from the left ventricle per minute

76. The sharp image of subject in healthy eye turns out:

1. between crystalline lens and back focus of eye
2. before retina
3. on retina
4. behind retina

77. Spectral range of sensitivity of eye is:

1. 380-780 nanometers
2. 200-400 nanometers
3. 800-1000 nanometers
4. 50-200 nanometers

78. Measure of spectral sensitivity of the eye is:

1. reflectivity
2. absorption coefficient
3. relative luminosity
4. scattering factor

79. Optical phenomenon which is the physical basis as a method of photolorimetry:

1. light reflection
2. light absorption
3. light refraction
4. light dispersion

80. Electric current which periodically reverses direction and quantity is call:

1. alternating
2. pulse
3. direct
4. randomly changing

81.The electromagnetic wave is:

1. the change of the condition of the electromagnetic field extending eventually in space
2. the type of matter which is characterized by set of the electric and magnetic fields interconnected and mutually causing each other
3. ordered movement of carriers of electricity
4. one of fundamental interactions existing between the particles possessing electric charge

82.The half-life is the time required for a quantity to reduce to:

1. half of molecular complexes of substance
2. half of initial quantity of nucleons
3. half of available radioactive nuclei
4. half of complex organic molecules on simpler

83.A measure of the ionization of air due to ionizing radiation from photons, that is, gamma rays and X-rays:

1. dose equivalent
2. radiation exposure
3. absorbed dose
4. collective effective equivalent dose

84. Radiography is:

1. an imaging technique using X-rays or similar radiation to view the internal form of an object
2. an research technique of ranges of the luminescence of the number of substances at x-ray radiation
3. a method of treatment of different diseases using x-ray radiation
4. an invasion to organism of radionuclides which distribution in different bodies is determined with the medical radiometer

85.A computer-processed combinations of many X-ray measurements taken from different angles to produce cross-sectional (tomographic) images (virtual "slices") of specific areas of a scanned object, allowing the user to see inside the object without cutting is:

1. radiography
2. CT-scan
3. photofluorography
4. fluoroscopy

86. Normally, acceptable noise level is considered:

1. 70-90 dB
2. 90-100 dB
3. 45-55 dB
4. 130 dB

87. A sound representing a combination of a set of tones with frequency, form, intensity and duration which randomly changing is:

1. infrasound
2. noise
3. simple tone
4. complex tone

88. The threshold of pain in hearing is:

1. the frequency at which sound still don't becomes painful for a listener
2. the pressure at which sound becomes painful for a listener
3. the wavelength at which sound becomes painful for a listener
4. the pitch at which sound still don't becomes painful for a listener

89. From the tympanic membrane to the oval window acoustical stones are located in the following order:

1. anvil, hammer, stirrup
2. stirrup, hammer, anvil,
3. anvil, stirrup, hammer
4. hammer, anvil, stirrup

90. Treat set of subjective characteristics of the sound:

1. loudness, pitch, timbre
2. intensity, frequency, acoustic spectrum
3. acoustic spectrum, loudness
4. acoustic pressure, pitch

91. Concentration of ions of sodium:

1. is above, than at potassium in cytoplasm of cell
2. is same, as at potassium ions in cytoplasm of cell
3. is below, than at potassium ions in the intercellular environment
4. is above, than at potassium ions in the intercellular environment

92. Selectivity is ability of ion channels to allow passing through only ions:

1. of different types
2. of several types
3. of one type
4. of any type

93. Determine the correct sequence of spread of activation by the carrying-out system of heart:

1. His bundle, sinus node, Purkinje fibers, atrioventricular node, His bundle legs
2. Purkinje fibers, atrioventricular node, His bundle legs, ventriculonector, sinus node
3. atrioventricular node, Purkinje fibers, sinus node, His bundle, His bundle legs
4. sinus node, atrioventricular node, His bundle, His bundle legs, Purkinje fiber

94. Establish the right sequence of formation of teeth on an ECG at spread of activation on the carrying-out system of heart:

1. R, S, Q, T, P
2. S, Q, R, T, P
3. P, Q, R, S, T
4. T, S, Q, P, R

95. The small circle of blood circulation begins in:

1. left ventricle
2. right ventricle
3. left atrium
4. right atrium

96. The big circle of blood circulation begins in:

1. left ventricle
2. right ventricle
3. left atrium
4. right atrium

97. The space between iris and cornea is called:

1. conjunctiva
2. vascular cover
3. vitreous body
4. front camera of eye

98. Treat photoreceptor cells of retina:

1. rods and cones
2. horizontal and amacrine cells
3. ganglion cells
4. bipolar cells

99. The optical power of the lens is measured in:

1. radians
2. steradians
3. meters
4. dioptries

100. At UHF-therapy:

1. dielectric fabrics heat up more intensively than carrying out
2. the carrying-out fabrics heat up more intensively than dielectric
3. the carrying-out and dielectric fabrics heat up equally
4. only the carrying-out fabrics get warm

Из предоставленного варианта набора тестовых заданий для обучающегося формируется зачётный тест из 50 тестовых заданий, рассчитанный на выполнение в течение 100 минут (1ч 40мин).

Заведующий кафедрой биофизики и математики, д.м.н., доцент

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А.О. МIRONЧЕВ

« _____ » _____ 20__

Таблица соответствия результатов обучения по дисциплине и оценочных материалов, используемых на промежуточной аттестации.

№	Проверяемая компетенция	Дескриптор	Контрольно-оценочное средство (номер вопроса/практического задания)
1	ОПК-4.1	Знать physical principles of operation of devices, conditions of use for medical purposes, safety rules when working with devices that are used in medical diagnostics	вопросы тестовых заданий №: 16, 17, 21, 25, 37, 39, 46, 56, 59, 61, 81,86,87,88,89,90,93,94,95,97,99,100.
		Уметь rationally, correctly, in compliance with safety requirements, use physical medical equipment to achieve diagnostic and therapeutic goals	вопросы тестовых заданий №: 1-49, 50, 53, 64, 73, 76,80-100.
		Владеть a set of basic information about the content of the physical concepts of physiological states, an algorithm of actions to determine the physiological states and processes in the body using medical equipment	вопросы тестовых заданий: №: 1,2,3,5,6,17,46,33,44,73,56, 31, 34, 54, 55, 57, 58, 60, 62, 67, 68, 69, 70, 75, 76, 77, 78, 79, 80, 82, 83, 84, 85, 87, 88, 89, 91, 92, 93, 94, 95, 96,100.
2	ОПК-5.2	Знать content, formulation, limits of applicability of physical laws, the essence of physical phenomena and patterns underlying the processes occurring in the human body	вопросы тестовых заданий №: 9, 16, 17, 21, 25, 37, 39, 46, 56, 59, 61, 81, 86, 93,95,99.
		Уметь apply a set of basic concepts and laws, theoretical knowledge	вопросы тестовых заданий №: 10, 13, 14, 15, 18, 19, 20, 27, 30, 32,

		and empirical data in physics to explain a variety of physical phenomena that underlie the assessment of the physiological state	35, 36, 38, 40, 41, 42, 43, 44, 45, 65, 90, 97, 98, 99, 100.
		Владеть physical terminology, physical laws to describe physiological states	вопросы тестовых заданий №: 12, 28, 29, 33,39,40,42,43,44,45,46,55,62,64,71,72,74,75,77, 80,81,83,94,97,98.
3	УК1.1.	Знать basic terms and concepts that make up the substantive basis of the science of physics, physical theories and physical laws that are used in solving problem situations in professional activities	вопросы тестовых заданий №: 30, 33, 34, 35, 36, 38, 40, 41, 42, 43, 44, 45, 50-75.
		Уметь explain the physical phenomenon that occurs in the body using biophysical laws, reveal the essence of physical processes and use them in solving problem situations in professional activities	вопросы тестовых заданий №: 10, 13, 14, 15, 18, 19, 20, 27, 30, 32, 35, 36, 38, 40, 41, 42, 43, 44, 45, 65, 90, 97, 98, 99, 100.
		Владеть techniques and methods for describing physical phenomena and processes in living organisms in solving professional problematic tasks	вопросы тестовых заданий №: 1-20, 27, 30, 32, 35, 36, 38, 40, 41, 42, 43, 44, 45, 65, 90, 97, 98, 99, 100.

4. Методические рекомендации по применению балльно-рейтинговой системы оценивания учебных достижений обучающихся в рамках изучения дисциплины «Биофизика»

В рамках реализации балльно-рейтинговой системы оценивания учебных достижений обучающихся по дисциплине в соответствии с Положением П004.03-2020 «О балльно-рейтинговой системе оценивания учебных достижений обучающихся» (приказ №479 от 03.03.2020г.) дисциплинарный рейтинг по дисциплине (модулю) обучающегося (Рд) рассчитывается как сумма текущего стандартизированного рейтинга (Ртс) и экзаменационного (зачетного) рейтинга (Рз) по формуле:

$$Рд = Ртс + Рз$$

Где:

Ртс – текущий стандартизированный рейтинг;

Рэ/Рз – экзаменационный (зачетный) рейтинг.

При наличии бонусных баллов у обучающегося дисциплинарный рейтинг по дисциплине (модулю) увеличивается на величину этих баллов.

Текущий стандартизированный рейтинг (Ртс) выражается в баллах по шкале от 0 до 70 и вычисляется по формуле:

$$Ртс = (Ртф * 70) / \text{макс} (Ртф)$$

где,

Ртс – текущий стандартизированный рейтинг;

Ртф – текущий фактический рейтинг;

макс (Ртф) – максимальное значение текущего фактического рейтинга из диапазона, установленного преподавателем по дисциплине.

4.1. Правила формирования текущего фактического рейтинга обучающегося.

Текущий фактический рейтинг (Ртф) по дисциплине (**максимально 5 баллов**) рассчитывается как среднее арифметическое значение результатов (баллов) всех контрольных точек, направленных на оценивание успешности освоения дисциплины в рамках аудиторной и внеаудиторной работы (КСР):

-текущего контроля успеваемости обучающихся на каждом практическом занятии по дисциплине (Тк).

По каждому практическому занятию предусмотрено от 1 до 6-ти контрольных точек (устный контроль входной/ письменный выходной контроль; практические задания для аудиторной работы; проблемно-ситуационные задачи; практические задания для внеаудиторной работы; тестирование), за которые обучающийся получает от 0 до 5 баллов включительно. Тестирование и проблемно-ситуационные задачи не являются

обязательной контрольной точкой на каждом занятии. Входной/выходной контроль, выполнение практических заданий – являются обязательными контрольными точками, если это предусмотрено структурой практического занятия. В модуле № 1. Physical Basics of Hemodynamics. Biophysics of membranes. Sound. предусмотрено 5 контрольных точек: 3 контрольных точек по темам модуля, 1 – КСР и 1 тестирование по модулю. В модуле № 2. Electrocardiography. Physiotherapy. Ionizing radiation. Optical eye. предусмотрено 6 контрольных точек: 4 контрольных точек по темам модуля, 1 – КСР и 1 тестирование по модулю. Критерии оценивания каждой формы контроля представлены в ФОС по дисциплине.

Среднее арифметическое значение результатов (баллов) рассчитывается как отношение суммы всех полученных студентом оценок (обязательных контрольных точек и более) к количеству этих оценок.

При пропуске практического занятия за обязательные контрольные точки выставляется «0» баллов. Обучающему предоставляется возможность повысить текущий рейтинг по учебной дисциплине в часы консультаций в соответствии с графиком консультаций кафедры.

4.2 Правила начисления бонусных баллов.

Формирование бонусных баллов по дисциплине (максимальное количество 5) определено п.8 и п.9 Положения П004.03-2020 (таблица 4.1)

Таблица 4.1.

Правила формирования бонусных баллов по дисциплине

Критерий	Количество баллов
Посещение обучающимися всех практических занятий	1
Посещение обучающимися всех лекций	1
Результаты участия обучающегося в предметной олимпиаде по изучаемой дисциплине	
1 место	3
2 место	2
3 место	1