

## Essay

\$\$\$001

Ways to develop the professional competence of a future physics teacher

\$\$\$002

Features of teaching physics in the conditions of the updated program

\$\$\$003

The troubles of a young physics teacher

\$\$\$004

Creative activity of a physics teacher

\$\$\$005

Personal style of a physics teacher

\$\$\$006

Ways to develop the professional skills of a physics teacher

\$\$\$007

Problems of distance learning physics

\$\$\$008

My profession is a teacher of physics

\$\$\$009

Modern physics classroom at school

\$\$\$010

The place of STEM technology in teaching physics

\$\$\$11

Approach to the problem of teaching the topic "Electric current in semiconductors" in high school physics

\$\$\$12

Current trends in the development of science

\$\$\$13

The essence of Fundamental Physical Education for the development of the intellectual potential of the country

\$\$\$14

Modern development of Interdisciplinary Sciences

\$\$\$15

Problems of teaching astrophysics and cosmology in accordance with the school curriculum

\$\$\$16

What should a modern physics teacher be like?

\$\$\$17

Express your thoughts in the words of Y. Altynsarin: «A good teacher is dearer to me than anything else, because the teacher is the heart of the school»

\$\$\$18

Physics teacher-is it a profession or a life position?

\$\$\$19

Methods of teaching physics to students with special educational needs.

\$\$\$20

Ways to develop students ' research skills in the process of studying physics.

## Questions

###001

Clapeyron-Clausius equation.

###002

Electric charge and the law of its conservation. The interaction effects of charges.

###003

Doppler effect. Sound waves. Ultrasound and its application.

###004

Electric field and its voltage. Superposition principle. The electric field of the dipole. Vector flow.

###005

The second law of thermodynamics and its physical meaning. Useful effect coefficient of the Carnot cycle. Carnot's theorem.

###006

Ostrogradsky-Gauss theorem and its application to calculate the electric field strength.

###007

The work of the field force in charge transport. Electrostatic field circulation.

###008

Potential. Potential difference. Equipotential surfaces. The relationship of potential with electrostatic field strength.

###009

Conductors in an electrostatic field. Electric field in the conductor and near the conductive surface. Boundary conditions at the conductor-vacuum boundary.

###010

Electrical capacity. Capacitors. Capacitance of capacitors of different geometric shapes.

###011

Charged capacitors and the energy of the system of conductors. Volumetric density of electric field energy.

###012

Movement of charges in an electric field. Conditions for the occurrence of electric current and its general characteristics.

###013

Classical electronic theory of electrical conductivity of metals.

###014

Differential type of Ohm and Joule-Lenz laws. Alien forces. Electromotive force.

###015

Branched chains. Kirchhoff rules.

### 16

Show the way to generalize the basic equation of the kinetic theory of gas.

### 17

Calorific equation of state. Methods for determining calorific and thermal coefficients.

### 18

Rutherford experience

### 19

Generalize the relationship between adiabatic, elastic modules and the speed of sound.

### 20

A method of applying the Ostrograd-Gauss theorem in order to describe physical processes.

### 21

The difference between Maxwell and Gibbs phase spaces from other spaces.

### 22

Our galaxy. Fundamentals of Extragalactic Astronomy. Red shift in the spectrum of galaxies.

### 23

The concept of the Hot Universe and radiative radiation.

### 24

Thermonuclear reactions. Energy of the sun and stars.

### 25

Formation of planets. The hypotheses of Kant, Laplace and jeans.

### 26

Friedman's cosmological solutions.

### 27

The structure of the atom. D. D. Thomson and E. Rutherford Model

### 28

Types of spectrum. Description of the absorption and excretion Spectra

### 29

Spectral series of hydrogen atom

### 30

Bohr postulates. The structure of the hydrogen atom according to Bohr's theory

### 31

Frank-Hertz experiments

### 32

Elliptical orbit of a hydrogen atom

### 33

Louis-de-Broglie equation

### 34

Heisenberg's principle of indeterminacy.

### 35

Linear harmonic oscillator and the quantization of its energy

### 36

The Pauli principle. Electronic layers

### 37

Elements of the zonal theory of solids. Fermi surface

### 38

Optical quantum generators. The use of laser light in science and technology.

### 39

Analyze the differences between the third initiation of thermodynamics and the first and second initiations.

### 40

Structure of the atomic nucleus

### 41

Core size. Nuclear power. Contact Energy

### 42

Atomic nucleus model

### 43

$\alpha$ -decay. spectrum of  $\alpha$ -particles

### 44

Law of radioactive decay

### 45

Application of the Clausius-Clapeyron equation to the description of homogeneous phase transitions

### 46

Meeting of phase transitions of second Origin in practice

### 47

Description of phase transitions of second Origin using the Ehrenfest equation

### 48

Calculation of changes in characteristic functions using phase diagrams

### 49

Radioactive series

### 50

Nuclear reactions performed under the influence of an alpha particle

###001

Find the frequency of rotation of an electron moving in a circular orbit in a magnetic field with induction of 0.2 Tl

###002

Determine the force of interaction of charges with values located at a distance of 1 m from each other 1Cl,  $q_1 = q_2$

###003

Find the electric field strength generated by a 10 nCl charge at a distance of 10 cm.

###004

An ideal gas creates a Carnot cycle. The temperature of the heater is three times the temperature of the cooler. What work did it do if the heater supplied 42 kJ of heat to the gas?

###005

Water with a mass of 5 kg and a temperature of 280 K is mixed with water with a mass of 8 kg and a temperature of 350 K. Find the temperature of the mixture.

###006

Find the average value of the free path of molecules with a mass of 1g of hydrogen inside a container with a volume of 10 liters.

###007

The density at a temperature of 309 K and a pressure of 0.7 MPa is  $12 \text{ kg/m}^3$ . Find the molar mass of the gas.

###008

A container with a capacity of 25 L contains hydrogen with a temperature of 290 K. After some of the hydrogen in the container is used, its pressure decreases by 0.4 MPa. Find the mass of the hydrogen used.

###009

How many molecules are in a container with a capacity of 30 l, a temperature of 300 k, a pressure of 5 MPa?

###010

Find the amount and concentration of a substance in a container with a capacity of  $240 \text{ cm}^3$ , a temperature of 290 K, a pressure of 50 KPa.

###011

The average square velocity of the gas is 450 M/s, the pressure is equal to  $5 \cdot 10^4 \text{ n/m}^2$ . Find the gas density

###012

A material point with a mass of 20 g oscillates with the pattern  $x = 0.1 \cos (4\pi t + \pi/4)$ . Find the full energy of the point.

###013

The distance between the first and fourth nodes of the residential wave is 30 cm. Determine the length of the chase wave.

###014

Write the equation of harmonic oscillations with an initial phase of  $10^0$ , a maximum speed of 30 cm/sec, and an amplitude of 15 cm.

###015

The point creates harmonic oscillations with an amplitude of 10 cm and a period of 5 sec. Find the maximum speed and acceleration.

### 16

When the average square velocity of a hydrogen molecule is equal to the first cosmic velocity on Earth, the gas temperature ( $M = 2 * 10^{-3} \text{ kg/Mol}$ ,  $v_{space} = 8 \text{ km / s}$ )

### 17

The diameter of the bicycle wheel is  $d = 70 \text{ cm}$ , the number of teeth of the drive wheel is  $z_1 = 48$ , and the number of teeth of the drive wheel is  $z_2 = 18$ .

### 18

Under water at a depth of 5 m, the lower mouth of the glass pipe was opened, on which two sides were fixed. At this point, 1.95 g of water entered the pipe. If the volume of the pipe is  $2 \text{ cm}^3$ , the atmospheric pressure is 105 Pa, the pressure of the sealing glass pipe ( $g = 10 \text{ m/sec}^2$ ;  $\rho_{\text{water}} = 103 \text{ kg/m}^3$ )

### 19

The air temperature is  $16^\circ\text{C}$ , the dew point is  $6^\circ\text{C}$ . The absolute and relative humidity of the Air ( $t = 16^\circ\text{C}$ ;  $\rho = 13.6 \text{ g/m}^3$ ;  $t = 6^\circ\text{C}$ ;  $\rho = 7.3 \text{ g/m}^3$ )

### 20

The concentration of molecules in some liquid is  $n = 2 * 10^{27} \text{ m}^{-3}$ . Estimate how long this liquid will evaporate, poured into a cylindrical container with a diameter of  $d=10 \text{ cm}$  and a height of  $H=3 \text{ cm}$ . The evaporation rate of the liquid from the vessel is constant and  $\frac{\Delta N}{t} = 5 * 10^{20} \frac{1}{\text{c}}$ .

### 21

A cylinder with a capacity of  $V=20 \text{ L}$  is filled with nitrogen at a temperature of  $T=400 \text{ K}$ . When some of the gas was used, the pressure in the cylinder decreased by  $\Delta P = 200 \text{ kPa}$ . Determine the mass  $m$  of the exhaust gas. The process is considered isothermal.

### 22

Volume  $V_1 = 4 * 10^{-3} \text{ m}^3$  containers contain  $m=2 \text{ g}$  of hydrogen ( $\mu = 0.002 \text{ kg/Mol}$ ) at a pressure of  $P_1 = 1 \text{ atm}$ . The gas was compressed, in this case the gas pressure was equal to  $P_2=4 \text{ atm}$ , and the volume decreased  $\Delta V = 2 * 10^{-3} \text{ m}^3$ . How much has the gas temperature changed?

### 23

A flask with a capacity of  $V=4 \text{ L}$  contains gas weighing  $m=0.6 \text{ g}$  at a pressure of  $P=200 \text{ kPa}$ . Determine the average square velocity of gas molecules .

### 24

Density  $\rho = 3 \frac{\text{kg}}{\text{m}^3}$  and mean square velocity of its molecules  $v^2=100 \text{ m}^2 / \text{sec}^2$ , what will be the pressure of an ideal gas?

### 25

Determine the speed of argon molecules, in which the value of the distribution function of the velocity Modulus  $F(v)$  will be the same as for temperature  $T_0=300 \text{ K}$ ,  $n=5$  times greater temperature. Molar mass of argon  $\mu = 40 * 10^{-3} \text{ kg/mol}$ .

### 26

A glass flask with air at atmospheric pressure is measured at  $P_0=105 \text{ Pa}$   $t_1=80^\circ\text{C}$ . The air in the flask is heated to  $T_2=185^\circ\text{C}$ . In subsequent measurements, the flask was lighter  $\Delta m=0.25 \text{ g}$ . What is the volume of lamp  $V$ ? Molar mass of air  $\mu=0.029 \text{ kg/Mol}$ .

### 27

Dark matter and dark energy.

### 28

Actual problems of elementary particles. Main properties: characteristics of elementary particles. Quark and gluons, their interaction.

### 29

Superconductivity. Tunnel effect.

### 30

Nuclear fission reaction. Transuranic element

### 31

Nuclear reactions performed under the influence of deuterons

### 32

Nuclear reactions performed under the influence of neutrons

### 33

Nuclear reaction performed under the influence of electrons and photons

### 34

Separation of heavy nuclei and synthesis reaction

### 35

Stress and deformation. Elastic deformation. Plastic deformation.

### 36

The principle of relativity. The transformations of Galileo and Lorenz. Equations of physics in the form of covariants.

### 37

The principle of symmetry, superposition, the principle of indeterminacy. The principle of conformity as a guide in the creation of new physical theories.

### 38

The law of conservation of energy and the uniformity of time.

###39

Laws of conservation of momentum and angular momentum as a consequence of Translational invariance and isotropy of space.

### 40

Quantum numbers and energy of the hydrogen atom. Quantum superposition. Classic superposition.

### 41

Energy-indeterminacy ratio for time. Relation of indeterminacy, the principle of indeterminacy.

### 42

Magnetic field and its characteristics.

### 43

Classification of materials, data on their shape, methods for studying thermal, electrical, magnetic and optical properties.

### 44

Amorphous materials and their characteristics.

### 45

Internal energy and enthalpy as a function of State.

### 46

Coriolis theorem on the addition of point accelerations. Vector expression, physical meaning, modulus and direction of Coriolis acceleration.

### 47

The Hartree-Fock equation. Mutually agreed field.

### 48

Wave functions and energy equations of atoms.

### 49

Lagrange equations of second Origin. Methodology for compiling these equations for a mechanical system.

### 50

Entropy. The physical meaning of entropy. GUI-Stodola equation.

###001

At 10 sec, the current in the conductor gradually increases from 0 A to 3 A. Find the amount of charge that has passed through the conductor.

###002

The current in a conductor with a resistance of 12 Ohms decreases from 5 A to 0 A in 10 seconds. Find the amount of heat generated in the conductor at the specified time.

###003

Determine the magnetic induction in the center of a thin ring with a radius of 5 cm. The current in the ring is 10 A.

###004

Determine the magnetic induction at a point located at a distance of 5 cm from an infinitely straight conductor with a current of 50 A?

###006

Two balls weighing 0.1 g are suspended at one point through a 20 cm long thread. The balls are equally charged and move away from each other until the angle between the threads is equal to  $60^\circ$ . Find the charge of each ball.

###007

In the elementary theory of the hydrogen atom, an electron rotates around the nucleus in a circle with a radius of 53 pm. Find the speed and frequency of rotation of the electron

###008

At what wavelength does a circuit consisting of an inductor with an inductance of 4  $\mu\text{H}$  and a capacitor with a capacity of 1.11 pF resonate?

###009

Find the total resistance of a circuit consisting of a 10  $\mu\text{F}$  capacitor and a 50 Ohm resistance connected in parallel to each other. The AC frequency is 50 Hz.

###010

If a person can read a book located at a distance of 12.5 cm without glasses, what kind of glasses with optical power do they need?

###011

Monochromatic light with a wavelength of 600 nm hits a diffraction grating with a period of 10 mm at an angle of  $30^\circ$ . Find the diffraction angle corresponding to the second maximum of the head

###012

1 kg of cargo is hung on a wire with a diameter of  $d = 2$  mm. Find the voltage that occurs in the wire  $\sigma$ .

###013



A disk weighing 1 kg, with a diameter of 60 cm rotates with an angular velocity of 20 revolution/seconds on an axis perpendicular to its plane. What kind of work needs to be done to stop the disk?

###014

A projectile weighing 10 kg has a speed of 200 m / s at the top of the trajectory. At what speed does the second part move, if the part with a mass of 3 kg moves in its first direction at a speed of 400 m/s?

###015

A metal ball falls from a height of 1 m to the surface of steel platinum and after a collision rises again to 0.81 m. Find the recovery coefficient of the ball's substance

### 16

Electrical properties: theory of conductivity; insulating conductors, superconductors

### 17

Optical properties: transparent and opaque materials. Colour. Luminescence. Optical fibers and modern optical devices. Lasers

### 18

Magnetic properties: magnetic materials. General information about ferromagnets. Magnetic and magnetic materials and their requirements. Diamagnets.

### 19

Open systems for the exchange of environment and matter, energy and information. Examples of open systems from living and non-living nature.

### 20

Kepler's laws.

### 21

When the distance between two balls of mass  $m_1=m_2=1$  kg is equal to  $R$ , the force of mutual gravitational influence between them is equal to  $F$ . What is the force of attraction of two balls with a mass of 3 kg and 2 kg located at such a distance from each other?

### 22

Mechanical stress. Young's modulus.

### 23

Properties of semiconductors

### 24

Heat capacity of crystals (according to Einstein, according to Debye). Anharmonicity and thermal expansion of solids.

### 25

The law of conservation of charge. The Lorentz force.

### 26

Maxwell's equations in integral and differential forms. Their physical meaning.

### 27

The Fourier method. Green's theorems.

### 28

Motion of charged particles in an electromagnetic field.

### 29

Flat monochromatic waves. Scale of electromagnetic waves.

### 30

The Lorentz principle.

### 31

Electric dipole field.

### 32

Galileo's principle of relativity. Galilean transformations.

### 33

Relativistic law of velocity addition.

### 34

Electrostatics. Electrostatics of conductors.

### 35

Electrostatics of dielectrics.

### 36

Forces acting on conductors and dielectrics.

### 37

Superconductors and their characteristics.

### 38

Using the uncertainty relation for coordinates and momentum to estimate the zero-point energy of a harmonic oscillator.

### 39

Spherical potential well, the zero-point energy of a harmonic oscillator.

### 40

Explanation of the stability of the atom and the inability to find an electron inside the nucleus based on the uncertainty relation. Tunnel effect and scattering outside the barrier.

### 41

Introduction to the concept of virtual particles in the microcosm using the uncertainty relation for energy and time. Estimation of the quantum mass. The concept of virtual particles in the microcosm.

### 42

Particle beam accelerators are synchrotrons and synchrophasotrons. Accelerators in opposite beams. Particle beam accelerators-synchrotrons and colliders. The Large Hadron Collider.

### 43

Classical theory of heat capacity of solids (crystals)

### 44

Relation of the spectral function to entropy. Evolution of entropy. Prigogine's theorem, minimum entropy production. Unbalanced and stationary state.

### 45

Electrical capacity of conductors. Electrical capacity of a flat capacitor and an insulated ball. Capacitors. Units of electrical capacity measurement .

### 46

Experimental proof of the wave and particle properties of light . Young's experiments. The Compton Effect

### 47

Hamilton's equations

### 48

Classical theory of electrical conductivity in a magnetic field. The Hall effect.  
Магнит өрісіндегі күйлердің Energy levels and density of states in a magnetic field.

### 49

Crystal structure of semiconductors. Energy zones of electrons.

### 50

X-ray diffraction. Electronic diffraction. Atomic and geometric structural factors.