PEOPLES´ FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA

RUDN UNIVERSITY

Tests for RUDN University Open Olympiad for Foreign Citizens

PHYSICS (B)

Variant 1

Choose one or more correct answers in the test tasks.

Transfer the answer numbers to the answer sheet:

question	answers
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

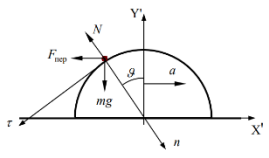
No.1 Two identical bodies M and N are moving: one slides down an inclined plane without friction, the other falls freely along the side of the inclined plane simultaneously with the first one. Determine: a) whether the bodies move relative to each other; c) whether they will finish moving at the same final speed?

a) they move, at the same speed
b) they do not move, at the same speed
c) they move, not at the same speed
d) they do not move, not at the same speed

No.2 Water with refractive index n=1.33 is poured into a concave mirror. The radius of the curvature of the mirror is R=40cm. Find the optical power of this system.
a) 8.7 diopt. b) 6.7 diopt. c) 1.3 diopt. c) 2.7 diopt.

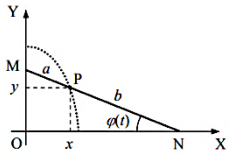
No.3 A magnetic field vector $\vec{B}$ is directed along 0z axis, an electric field vector $\vec{E}$ is directed along 0x axis, the initial velocity of the charged particle lies in the x0y plane. The trajectory of the charged particle is:
a) parabola b) circle c) spiral d) trochoid e) ellipse

No.4 A small body m =30 gr is placed on the top of a smooth half-cylinder with radius R=9.8m located on a horizontal surface (see figure). The semi-cylinder is given constant horizontal acceleration $\vec{a}$, as a result of which the body begins to slide off the surface of the semi-cylinder. Calculate the velocity modulus $|\overrightarrow{\upsilon_0}|$ of the body relative to the half-cylinder at the separation moment. (g=9,8 m/ s^2)



a) 8.0m/s b) 3.5m/s c) 9.8m/s d) 12.4m/s e) 1.7m/s

No.5 The ends of the solid rod MN can slide freely along the sides of right angle MON (see figure). Find the shape of the trajectory of point P of the rod, which divides it into parts of length a and b.



a) parabola b) circle c) spirals d) trochoids e) ellipse

No.6 A diffraction grating has lines n = 400 per 1 mm and is illuminated normally by monochromatic light (λ = 0.6 μm). Calculate the total number of diffraction peaks produced by this grating. Calculate diffraction angle $\boldsymbol{\varphi}$ to the last maximum.
a) N = 9; φ = 74˚ b) N = 5; φ = 35˚ c) N = 3; φ = 14˚ d) N = 7; φ = 45˚

No.7 A paraffin part in the form of a ball (without voids inside) with the density of 650 kg/m^3 floats in water on a lunar space base. How will the Archimedean force acting on the ball change if it floats in oil? The density of water is 1000 kg/m^3, density of oil is 900 kg/ m^3, acceleration of free fall on the Moon 1.6 m/s^2
a) it will decrease by 6 times *b)* it will decrease by 3 times *c)* it will decrease by 2 times *d)* it will not change

No.8 What determines the color of transparent and opaque bodies which are not independent sources of light?
Answer

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No.9 The glass is half filled with boiling water. In which case will the water cool to a greater extent?
a) if you wait for 5 minutes and then add cold water to the glass;
b) if you immediately add cold water and then wait for 5 minutes;
c) the water will cool down in the same amount of time.

No.10 The current source is closed once to a resistor with resistance R_1 = 4 ohm, the other - to a resistor with resistance R_2= 6 ohm. The same power is allocated to them in both cases. At what resistance R will the power be maximum?
a) 5 ohm *b) 4 ohm* *c) 6 ohm* *d) 10 ohm* *e) 2 ohm*