PHYSICS

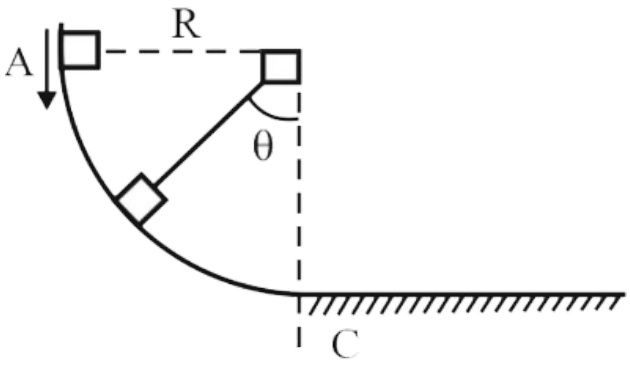
BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 46

Physics

1. A block of mass m is placed on a vertical fixed circular track and then it is given velocity v along the track at position A on track. The coefficient of friction between the block and the track varies with the angle θ . If the block

moves on track with constant speed then the coefficient of



friction is

A. $\mu = \dfrac{\sin\theta}{\cot\theta + \frac{v^2}{Rg}}$

B. $\mu = \dfrac{\sin\theta}{\cos\theta + \frac{v^2}{Rg}}$

C. $\mu = \dfrac{\tan\theta}{\cos\theta + \frac{v^2}{Rg}}$

D. $\mu = \dfrac{\cos\theta}{\tan\theta + \frac{v^2}{Rg}}$

Answer: B

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2. In a hydrogen-like species, the net force acting on a revolving electron in an orbit as given by the Bohr model is proportional to [n $\rightarrow$ principal quantum numbe, Z $\rightarrow$ atomic number]

A. $\frac{Z^3}{n^4}$

B. $\frac{n^3}{Z^2}$

C. $\frac{Z^2}{n^3}$

D. $\frac{n^4}{Z^3}$

Answer: A

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3. A voltmeter with a resistance $50 \times 10^3 \Omega$ is used to measure voltage in a circuit. To increase its range to 3 times, the additional resistance to be put in series is

A. $9 \times 10^6 \Omega$

B. $10^5 \Omega$

C. $1.5 \times 10^5 \Omega$

D. $9 \times 10^5 \Omega$

Answer: B

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4. A long solenoid of cross-sectional radius a has a thin insulates wiere ring tightly put on its winding, one half of the ring has the resistance η times that of the other half. The magneticv induction produced by the solenoid varies with the time as $B = bt$, where b is a constant. Find the magnitude of the electric field strength in the ring.

A. $\frac{9}{11}Rb$

B. $\frac{9}{22}Rb$

C. 9Rb

D. Rb

Answer: B

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5. The electric potential at a point (x, y) in the x-y plane is given by $V = -kxy$. The field intentisy at a distance r in this plane, from the origin is proportional to

A. r^2

B. r

C. 2r

D. $2r^2$

Answer: B

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6. A body weighs W newton at the surface of the earth. Its weight at a height equal to half the radius of the earth, will be

A. $\frac{W}{2}$

B. $\frac{2W}{3}$

C. $\frac{4W}{9}$

D. $\frac{8W}{27}$

Answer: C

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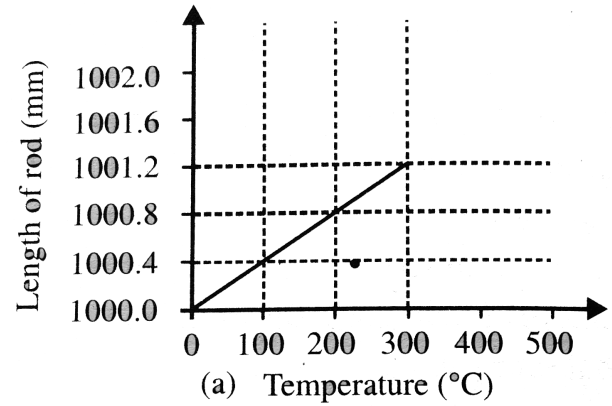

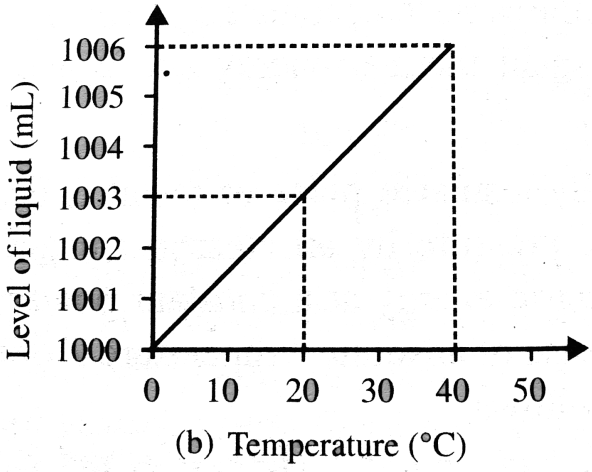

7.

The graph of elongation of rod of a substance A with temperature rise is shown if Fig. A liquid B contained in a cylindrical cessel made up of substance A, graduated in millilitres at $0^\circ C$ is heated gradually. The readings of the

liquid level in the vessel corresponding to different temperatures are shown in the figure. the real volume expansivity of liquid is

A. $2.7 \times 10^{-5}.^{\circ} C^{-1}$

B. $15.4 \times 10^{-5}.^{\circ} C^{-1}$

C. $16.2 \times 10^{-5}.^{\circ} C^{-1}$

D. $151.2 \times 10^{-5}.^{\circ} C^{-1}$

Answer: C

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8. Fig. shows the variation of internal energy (U) with the pressure (P) of 2.0 mole gas in cycle process $abcda$. The

temperatures of gas at c and d are 300 and $500K$, respectively. Calculate the heat absorbed by the gas during the process.

A. 440 R In 2

B. 400 R In 2

C. 430 R In 2

D. 414 R In 2

Answer: B

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9. The magnetic field at the point of intersection of diagonals of a square wire loop of side L, carrying a current I is

A. $\frac{\mu_0 I}{\pi L}$

B. $\frac{2\mu_0 I}{\pi L}$

C. $\frac{\sqrt{2}\mu_0 I}{\pi L}$

D. $\frac{2\sqrt{2}\mu_0 I}{\pi L}$

Answer: D

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10. An artillary piece which consistently shoots its shells with the same muzzle speed has a maximum range R. To hit a target which is $R/2$ from the gun and on the same level, the elevation angle of the gun should be

A. 15°

B. 45°

C. 30°

D. 60°

Answer: A

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11. If 200 MeV energy is released in the fission of a single nucleus of ${}_{92}U^{235}$, how many fissions must occur per sec to produce a power of 1 kW?

A. 3.125×10^{13}

B. 6.250×10^{13}

C. 1.525×10^{13}

D. None of these

Answer: A

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12. Infinite springs with force constant`k , 2k, 4k and 8 k .... respectively are connected in series. The effective force constant of the spring will b

A. 2k

B. k

C. $\frac{k}{2}$

D. $\frac{k}{4}$

Answer: C

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13. A charged dust particle of radius $5 \times 10^{-7} m$ is located in a horizontal electric field having an intensity of $6.28 \times 10^{5} V m^{-1}$. The surrounding medium in air with coefficient of viscosity $\eta = 1.6 \times 10^{-15} N s m^{-2}$. If this particle moves with a uniform horizontal speed of $0.01 m s^{-1}$, the number of electrons on it will be

A. 20

B. 15

C. 25

D. 30

Answer: B

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14. Energy needed in breaking a drop of radius R into n drops of radii r is given by

A. $4\pi T\left(nr^2 - R^2\right)$

B. $\frac{4}{3}\pi\left(r^3 n - R^2\right)$

C. $4\pi T\left(R^2 - nr^2\right)$

D. $4\pi T\left(nr^2 + R^2\right)$

Answer: A

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15. If a ray of light in a denser medium strikes a rarer medium at an angle of incidence i, the angles of reflection

and refraction are respectively, r and r' If the reflected and refraction rays are at right angles to each other, the critical angle for the given pair of media is

A. $\sin^{-1}(\tan r)$

B. $\tan^{-1}(\sin r)$

C. $\sin^{-1}(\tan r')$

D. $\tan^{-1}(\sin r')$

Answer: A

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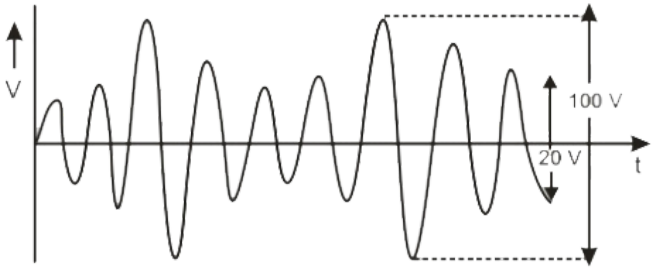
16. An amplitude modulated wave is as given in figure. Calculate the percentage modulation,



A. $66.67\ \%$

B. $33.33\ \%$

C. $85.67\ \%$

D. None of these

Answer: A

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17. A steel tape measures that length of a copper rod as 90.0 cm when both are at $10^{\circ}C$, the calibration temperature, for the tape. What would the tape read for the length of the rod when both are at $30^{\circ}C$. Given $\alpha_{\text{steel}} = 1.2 \times 10^{-5}$ per.$^{\circ}$ C and $\alpha_{Cu} = 1.7 \times 10^{-5} per.^{\circ} C$

A. 90.01 cm

B. 89.90 cm

C. 90. 22 cm

D. 89. 80 cm

Answer: A

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18. The velocity of water wave v may depend on their wavelength λ, the density of water ρ and the acceleration due to gravity g. The method of dimensions gives the relation between these quantities as

A. $v^2 \alpha \rho g$

B. $v^2 \alpha g \lambda \rho$

C. $v^2 \alpha g \lambda$

D. $v^2 \alpha g^{-1} \lambda^{-3}$

Answer: C

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19. First diffraction minima due to a single slit of width 10^{-4}cm is at $\theta = 30^{\circ}$. The wavelength of the light used is –

A. 4000Å

B. 5000Å

C. 6000Å

D. 6250Å

Answer: B

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20. A train moves towards a stationary observer with speed $34m/s$. The train sounds a whistle and its frequency registered by the observer is f_1. If the train's speed is reduced to $17m/s$, the frequency registered is f_2. If the speed of sound of $340m/s$, then the ratio $f_1/f_2$is

A. 2

B. $\frac{1}{2}$

C. $\frac{18}{19}$

D. $\frac{19}{18}$

Answer: D

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21. A smooth tunnel is dug along the radius of the earth that ends at the centre. A ball is released from the surface of earth along the tunnel. If the coefficient of restitution is 0.2 between the surface and ball, then the distance travelled by the ball before second collision at the centre is

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22. An electric current is passed through a circuit containing two wires of the same material connected in parallel. If the lengths and radii of the wire are in the ratio $\frac{4}{3}$ and $\frac{2}{3}$, then the ratio of the currents passing through the wires will be

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23. The potential energy of a particle of mass 5 kg moving in the $x - y$ plane is given by $U = (-7x + 24y)J$, where x and y are given in metre. If the particle starts from rest, from the origin, then the speed of the particle at $t = 2$s is

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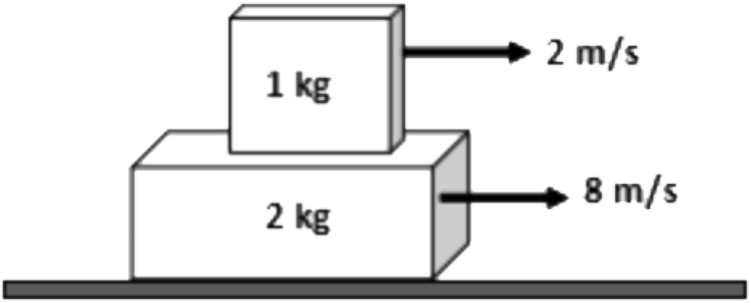
24. The coefficient of friction between the two blocks shown in the figure is $\mu = 0.4$ and between the lower block and the ground is zero. The blocks are given velocities of $2ms^{-1}$ and $8ms^{-1}$ respectively in the direction shown in the figure. In how much time (in

seconds) the slipping between the blocks will stops ?



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25. A bullet of mass $10g$ and speed $500m/s$ is fired into a door and gets embedded exactly at the centre of the door. The door is $1.0m$ wide and weight $12kg$. It is hinged at one end and rotates about a vertical axis practically without friction. Find the angular speed of the door just after the

bullet embeds into it.(Hint. The moment of inertia of the door about the vertical axis at one end is $ML^2/3$)

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