PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 59

Physics

1. A hydrogen atom moving at speed v collides with another hydrogen atom kept at rest .Find the minimum value of v for which one of the

atoms may get ionized, the mass of a hydrogen atom $= 1.67 \times 10^{-27} kg$

A. $7.2 \times 10^{4} ms^{-1}$

B. $2.3 \times 10^{4} ms^{-1}$

C. $2.3 \times 10^{5} ms^{-1}$

D. $7.2 \times 10^{5} ms^{-1}$

Answer: A

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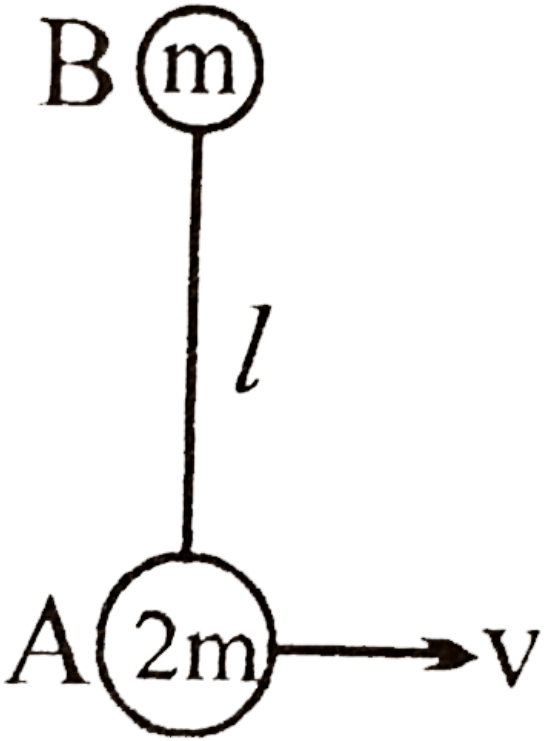
2. Two masses A and B connected with an inextensible string of length l lie on a smooth horizontal plane. A is given a velocity of vm/s along the ground perpendicular to line AB as shown in figure. Find the tension in string

during their subsequent motion



A. $\frac{2mv^2}{3l}$

B. $\frac{3mv^2}{2l}$

C. $\frac{mv^2}{2l}$

D. $\frac{4mv^2}{3l}$

Answer: A

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3. A particle is moving in a circle of radius R in such a way that at any instant the tangential retardation of the particle and the normal acceleration of the particle are equal. If its speed at $t = 0$ is v_0, the time taken to complete the first revolution is

A. $\frac{R}{v_0}$

B. $\frac{R}{v_0}\left(1-e^{-2\pi}\right)$

C. $\frac{R}{v_0}e^{-2\pi}$

D. $\frac{2\pi R}{v_0}$

Answer: B

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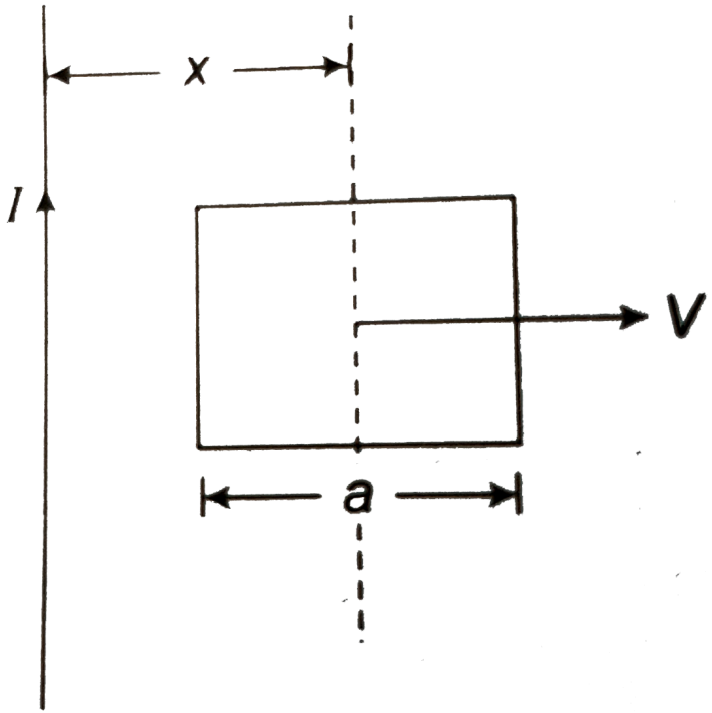
4. A conducting square frame of side $'a'$ and a long straight wire carrying current I are located in the same plane as shown in the

figure. The frame moves to the right with a constant velocity $'V'$. The emf induced in the frame will be proportional to



A. $\frac{1}{x^2}$

B. $\frac{1}{(2x-a)^2}$

C. $\frac{1}{(2x+a)^2}$

D. $\frac{1}{(2x-a)(2x+a)}$

Answer: D

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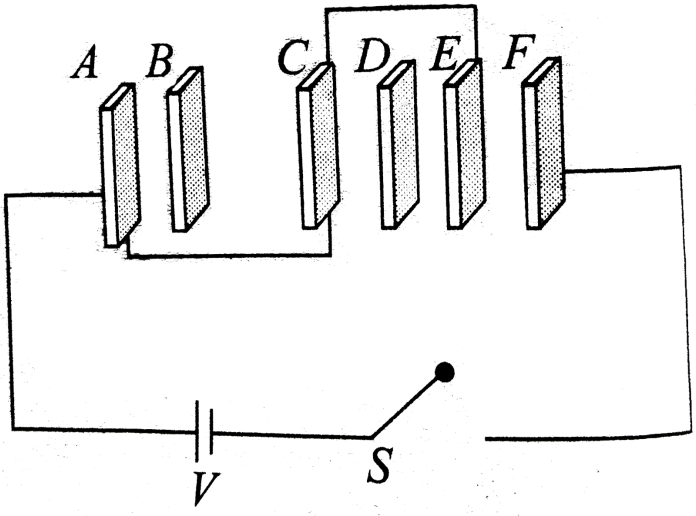
5. $A, B, C, D, E,$ and F are conducting plates each of area A, and any two consecutive plates are separated by a distance d, The energy in system after the switch S is

closed is`



A. $\frac{3\varepsilon_0 A}{2d}V^2$

B. $\frac{5\varepsilon_0 A}{12d}V^2$

C. $\frac{\varepsilon_0 A}{2d}V^2$

D. $\frac{\varepsilon_0 A}{d}V^2$

Answer: C

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6. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio C_P / C_V for the gas is

A. $4/3$

B. 2

C. $5/3$

D. $3/2$

Answer: D

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7. Two point masses, m each carrying charges $-q$ and $+q$ are attached to the ends of a massless rigid non - conducting wire of length L. When this arrangement is placed in a uniform electric field, then it deflects through

an angle θ. The minimum time needed by the rod to align itself along the field is

A. $2\pi\sqrt{\frac{mL}{qE}}$

B. $\frac{\pi}{2}\sqrt{\frac{mL}{2qE}}$

C. $\pi\sqrt{\frac{2mL}{qE}}$

D. $2\pi\sqrt{\frac{3mL}{qE}}$

Answer: B

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8. With what minimum speed must a particle be projected from origin so that it is able to pass through a given point $(30m, 40m)$? Take $g = 10m / s^2$

A. $60ms^{-1}$

B. $30ms^{-1}$

C. $50ms^{-1}$

D. $40ms^{-1}$

Answer: B

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9. A conveyor belt is moving at a constant speed of $2m/s$. A box is gently dropped on it. The coefficient of friction between them is $\mu = 0.5$. The distance that the box will move relative to belt before coming to rest on it taking $g = 10ms^{-2}$ is:

A. $1.2m$

B. $0.6m$

C. zero

D. $0.4m$

Answer: D

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10. The equation of the resultant motion of the number of simple harmonic motions is $E_c = (1 + K\sin\omega_2 t)\sin\omega_1 t$. The number of simple harmonic components is/are.

A. 1

B. 2

C. 3

D. 4

Answer: C

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11. When light of wavelength λ is incident on photosensitive surface, the stopping potential is V. When light of wavelength 3λ is incident

on same surface, the stopping potential is $\frac{V}{6}$

Threshold wavelength for the surface is

A. 2λ

B. 3λ

C. 4λ

D. 5λ

Answer: D

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12. A wire of cross section A is stretched horizontally between two clamps located $2lm$ apart. A weight Wkg is suspended from the mid-point of the wire. If the mid-point sags vertically through a distance $x < l$, the strain produced is

A. $\frac{x^2}{l^2}$

B. $\frac{2x^2}{l^2}$

C. $\frac{x^2}{2l^2}$

D. $\frac{x}{2l}$

Answer: C

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13. A ray of light is incident normally on one of the faces of a prism of apex angle 30 degree and refractive index $\sqrt{2}$. The angle of deviation of the ray is...degrees.

A. 30°

B. 45°

C. 15°

D. none of these

Answer: C

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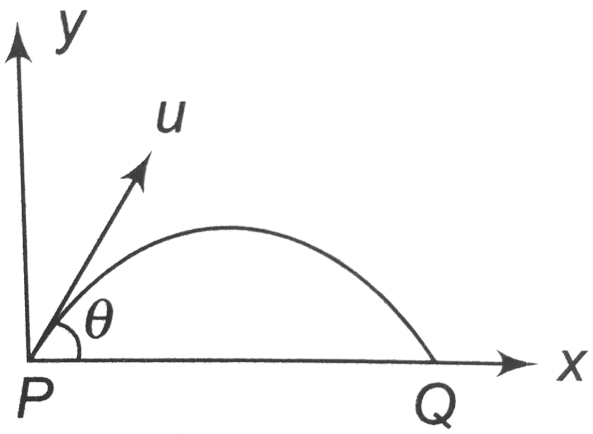
14. Average torque on a projectile of mass m (initial speed u and angle of projection θ) between initial and final positions P and Q as shown in figure, about the point of projection

is :



A. $\frac{mu^2 \sin(2\theta)}{2}$

B. $mu^2 \cos(\theta)$

C. $mu^2 \sin(\theta)$

D. $\frac{mu^2 \sin(\theta)}{2}$

Answer: A

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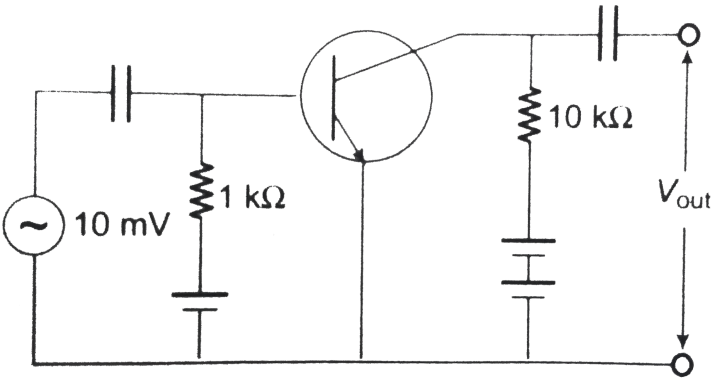
15. In the following common emitter configuration an NPN transistor with current gain $\beta = 100$ is used. The output voltage of the amlifier will be



A. 10 mV

B. 0.1 V

C. 1.0 V

D. 10 V

Answer: C

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16. A metal ball of surface area $200cm^2$ and temperature $527^\circ C$ is surrounded by a vessel at $27^\circ C$. If the emissivity of the metal is 0.4,

then the rate of loss of heat from the ball is

$\left(\sigma = 5.67 \times 10^{-8} J/m^2 - s - k^4\right)$

A. 108 W

B. 168 W

C. 182 W

D. 192 W

Answer: C

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17. The physical quantity which has the dimensional formula $\left[M^1T^{-3}\right]$ is

A. Surface tension

B. Density

C. Solar constant

D. Compressibility

Answer: C

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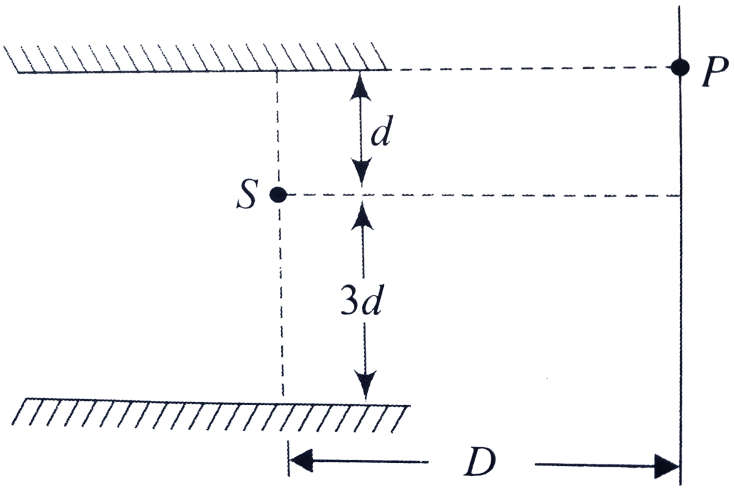
18. Consider the optical system shown in figure. The point source of ligth S is having wavelength equal to λ. The light is reaching screen only after reflection. For point P to be socond maxima, the value of λ would be ($D > > d$ and $d > > \lambda$)



A. 6

B. 2

C. 3

D. 4

Answer: A

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19. An iron load of 2Kg is suspended in the air from the free end of a sonometer wire of length 1m.A tuning fork of frequency 256 Hz, is in resonace with $\frac{1}{\sqrt{7}}$ times the length of the

sonometer wire. If the loaad is immersed in water, the length of the wire in metre that will be in resonance with the same tuning fork is (specific gravity of iron=8)

A. $\sqrt{8}$

B. $\sqrt{6}$

C. $\frac{1}{\sqrt{6}}$

D. $\frac{1}{\sqrt{8}}$

Answer: D

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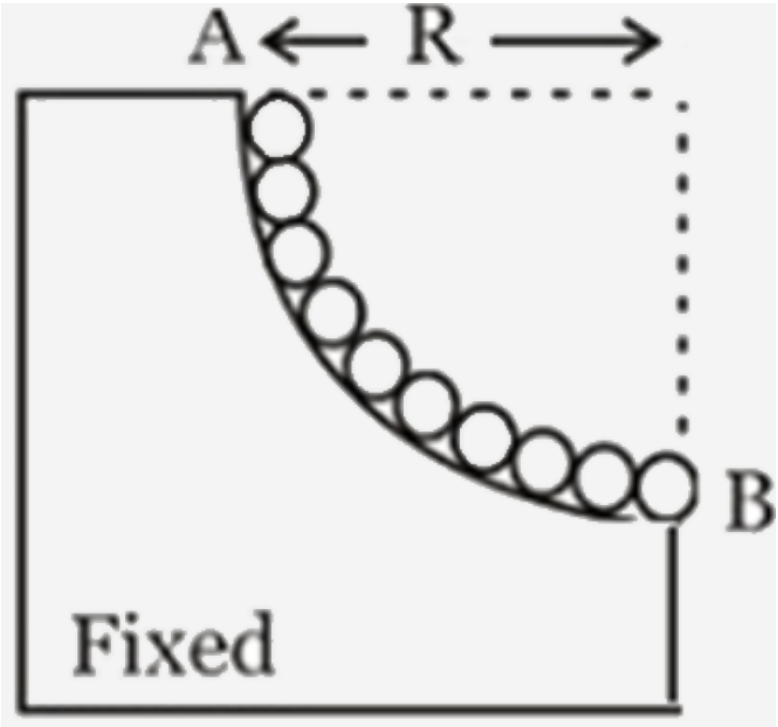
20. As shown in the figure, a chain of mass m is placed on a smooth quarter circular portion of radius R. End A is tied with a wedge while the remaining chain is free, then the minimum work required to be done by the external agent to make the chain horizontal keeping

point A fixed, is



A. mgR

B. $\mathrm{mg}\ \dfrac{2R}{\pi}$

C. $mg\sqrt{2}\dfrac{2R}{\pi}$

D. None

Answer: B

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21. A standerd cell emf $1.08V$ is balance by the potential difference across $91cm$ of a meter long wire applied by a cell of emf $2V$ through a series resistor of resistance 2Ω. The internal resistance of the cell is zero. Find the resistance per unit length of the potentiometer wire.

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22. All the edges of a block with parallel faces are unequal. Its longest edge is twice its shortest edge. The ratio of the maximum to minimum resistance between parallel faces is.

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23. A projectile of mass m is fired from the surface of the earth at an angle $\alpha = 60^\circ$ from the vertical. The initial speed v_0 is equal to

$\sqrt{\frac{GM_e}{R_e}}$. How high does the projectile rise ? Neglect air resistance and the earth's rotation.

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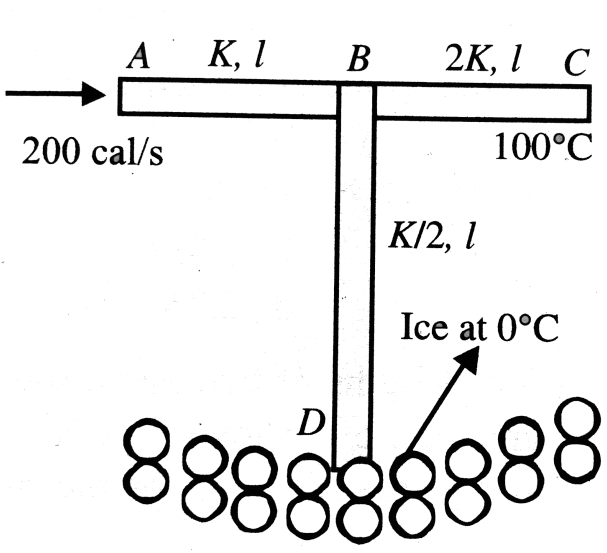

24.

Three rods AB, BC and BD of same length l and

cross section A are arranged as shown. The end D is immersed in ice whose mass is 440 g and is at $0^\circ C$. The end C is maintained at $100^\circ C$. Heat is supplied at constant rate of 200 cal/s. Thermal conductivities of AB, BC and BD are K, 2K and $K/2$, respectively Time after which whole ice will melt is ($K = 100 cal/m - s^\circ C A = 10 cm^2, l = 1 cm$)

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25. The binding energy per nucleon of O^{16} is $7.97MeV$ and that of O^{17} is $7.75MeV$. The energy (in MeV) required to remove a neutron from O^{17} is.

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