PHYSICS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 3

Physics

1. A ball is thrown with a speed u, at an angle θ with the horizontal. At the highest point of its motion, the strength of gravity is somehow

doubled. Taking this change into account, the total time of flight of the projectile is

A. $\frac{2u\sin\theta}{g}$

B. $\frac{3}{2}\frac{u\sin\theta}{g}$

C. $\frac{3}{4}\frac{u\sin\theta}{g}$

D. $\left(\frac{\sqrt{2}+1}{\sqrt{2}}\right)\frac{u\sin\theta}{g}$

Answer: D

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2. A screen is at distance $D = 80$ cm form a diaphragm having two narrow slits S_1 and S_2 which are $d = 2$ mm apart.

Slit S_1 is covered by a transparent sheet of thickness

$t_1 = 2.5\mu m$ slit S_2 is covered by another sheet of thickness

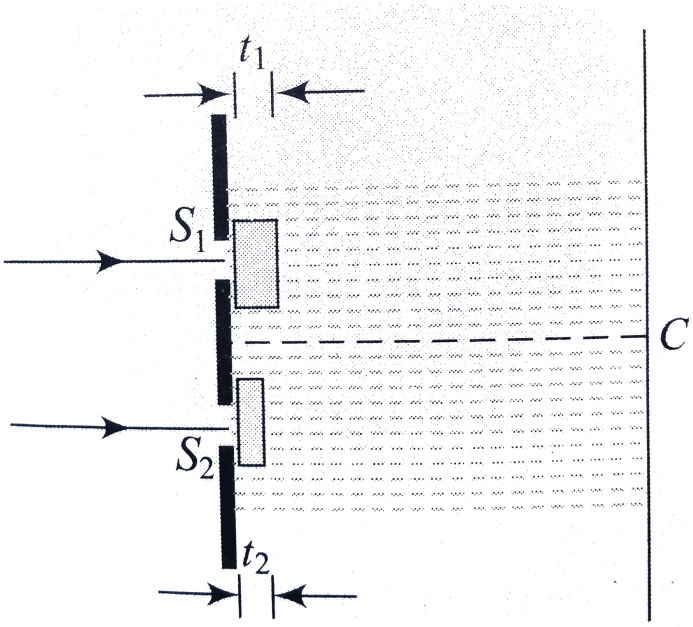
$t_2 = 1.25\mu m$ as shown if Fig. 2.52.

Both sheets are made of same material having refractive index $\mu = 1.40$

Water is filled in the space between diaphragm and screen. A mondichromatic

light beam of wavelength $\lambda = 5000\text{Å}$ is incident normally on the diaphragm.

Assuming intensity of beam to be uniform, calculate ratio of intensity of C to maximum intensity of interference pattern obtained on the screen $(\mu_w = 4/3)$



A. $\frac{3}{4}$

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

C. $\frac{1}{3}$

D. $\frac{3}{5}$

Answer: A

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3. A stream of water flowing horizontally with a speed of $15ms^{-1}$ pushes out of a tube of cross sectional area $10^{-2}m^2$ and hits a

vertical wall nearby. What is the force exerted on the wall by the impact of water assuming.that it does not rebound? (Density of water $= 1000 kgm^3$)

A. 2.25×10^3 N

B. 2.5×10^3 N

C. 3.0×10^3 N

D. 3.5×10^3 N

Answer: A

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4. A partition wall has two layers of different materials A and B in contact with each other. They have the same thickness but the thermal conductivity of layer A is twice that of layer B. At steady state the temperature difference across the layer B is 50 K, then the corresponding difference across the layer A is

A. 50 K

B. 12.5 K

C. 25 K

D. 60 K

Answer: C

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5. The mean lives of a radioactive substance are 1620 years and 405 years for α emission and β emission respectively. Find out the time during which three fourth of a sample will decay if it is decaying both by α-emission and β-emission simultaneously. $(\log_e 4 = 1.386)$.

A. 643 years

B. 449 years

C. 528 years

D. 279 years

Answer: B

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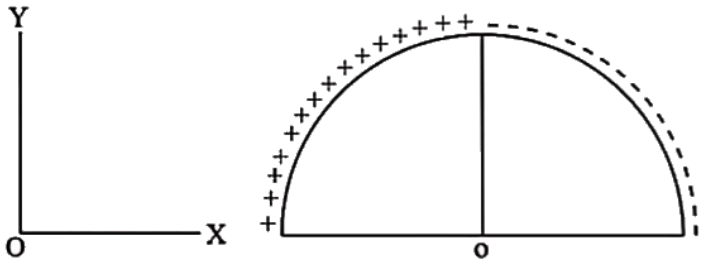
6. A wire of length L= 20 cm is bent into a semicircular arc and the two equal halves of the arc are uniformly charged with charges

$+Q$ and $-Q$ as shown in the figure. The magnitude of the charge on each half is $|Q| = 10^3\varepsilon_0$, where ε_0 is the permittivity of free the space. The net electric field at the center O is



A. $\left(25 \times 10^3\right)\hat{i}NC^{-1}$

B. $\left(50 \times 10^3\right)\hat{i}NC^{-1}$

C. $\left(25 \times 10^3\right)\hat{j}NC^{-1}$

D. $\left(50 \times 10^3\right) \hat{j} NC^{-1}$

Answer: A

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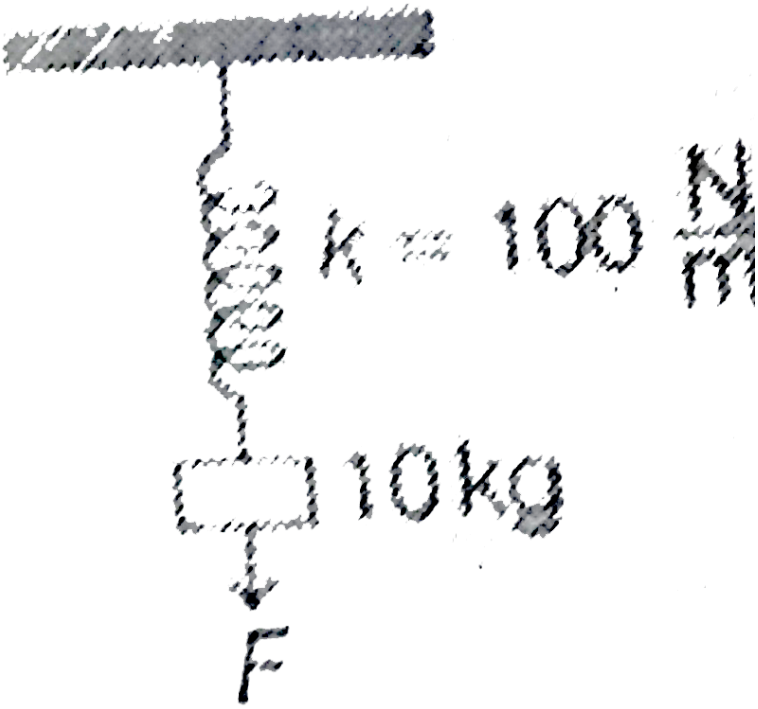
7. A vertical spring of force cosntant $100N/m$ is attached with a hanging mass of 10 kg. Now an external force is applied on the mass so that the spring is stretched by additional 2m. The work done by the force F is

$(g = 10m/s^2)$



A. 200 J

B. 400 J

C. 100 J

D. 600 J

Answer: A

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8. The radii of two planets are respectively R_1 and R_2 and their densities are respectively ρ_1 and ρ_2.The ratio of the accelerations due to gravity at their surface is

A. $\frac{\rho_1 R_2^2}{\rho_2 R_1^2}$

B. $\frac{\rho_1 R_1^2}{\rho_2 R_2^2}$

C. $\frac{\rho_2 R_1}{\rho_1 R_2}$

D. $\frac{\rho_1 R_1}{\rho_2 R_2}$

Answer: D

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9. The magnetic flux through a circuit of resistance R changes by an amount $\Delta\phi$ in a time Δt. Then the total quantity of electric

charge Q that passes any point in the circuit during the time Δt is represent by

A. $Q = \frac{1}{R}\frac{\Delta\phi}{\Delta t}$

B. $Q = \frac{\Delta\phi}{R}$

C. $Q = \frac{\Delta\phi}{\Delta t}$

D. $Q = R\frac{\Delta\phi}{\Delta t}$

Answer: B

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10. The shortest wavelength in Lyman series is 91.2 nm. The longest wavelength of the series is

A. 121.6 nm

B. 182.4 nm

C. 234.4 nm

D. 364.8 nm

Answer: A

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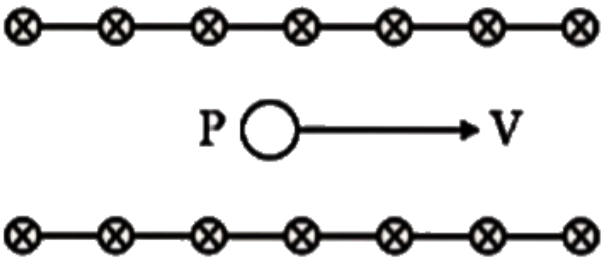
11. Two infinite sheets carrying current in same direction (of equal current per unit length K) are separated by a distance d. A proton is released from a point between the plates with a velocity parallel to the sheets but perpendicular to the direction of current in the sheets. Then the path of the proton is



A. circle

B. helix

C. straight line

D. straight line only if it is released from a point exactly midway between the two plates.

Answer: C

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12. A block of wood is floating in water at $0^\circ C$. The temperature of water is slowly raised from $0^\circ C$ to $10^\circ C$. How will the percentage of volume of block V above water level change with rise in temperature?

A. increase

B. decrease

C. first increase and then decrease

D. first decrease and then increase

Answer: A

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13. A bat moving at $10ms^{-1}$ towards a wall sends a sound signal of 8000 Hz towards it. On reflection it hears a sound of frequency f. The value of g in Hz is close to (speed to sound $= 320ms^{-1}$) :

A. 8258

B. 8424

C. 8000

D. 8516

Answer: D

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14. A particle of mass 2 kg moving with a speed of 6 m/s collides elastically with another particle of mass 4 kg travelling in same direction with a speed of 2m/s. The maximum possible deflection of the 2 kg particle is

A. 37°

B. 45°

C. 53°

D. 60°

Answer: C

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15. The displacement of a particle of mass $3g$ executing simple harmonic motion is given by $x = 3\sin(0.2t)$ in SI units. The kinetic energy of the particle at a point which is at a

displacement equal to $\frac{1}{3}$ of its amplitude from its mean position is

A. 12×10^{-3} J

B. 25×10^{-3} J

C. 0.48×10^{-3} J

D. 0.24×10^{-3} J

Answer: C

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16. A bullet is fired from a gun. The force on the bullet is given by $F = 600 - 2 \times 10^5$ t, where F is in newtons and t in seconds. The force on the bullet becomes zero as soon as it leaves the barrel. What is the average impulse imparted to the bullet?

A. 9 Ns

B. 1.8 Ns

C. 0.9 Ns

D. 0.3 Ns

Answer: C

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17. The moment of inertia of a rigid body in terms of its angular momentum L and kinetic energy K is

A. $\frac{L^2}{K}$

B. $\frac{L^2}{2K}$

C. $\frac{L}{2K^2}$

D. $\frac{L}{2K}$

Answer: B

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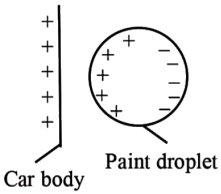
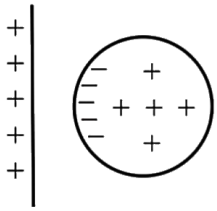
18. In a system used for spraying cars, a car body is positively charged. Neutral droplets of paint are then attracted to the car because the positive car body induces a charge on the droplets of paint. Which diagram best shows the charge pattern?

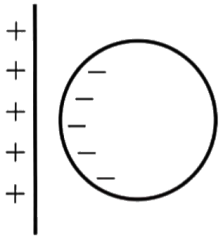
A.



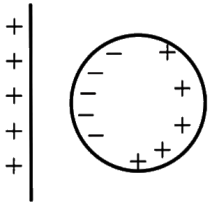
B.



C.



D.



Answer: D

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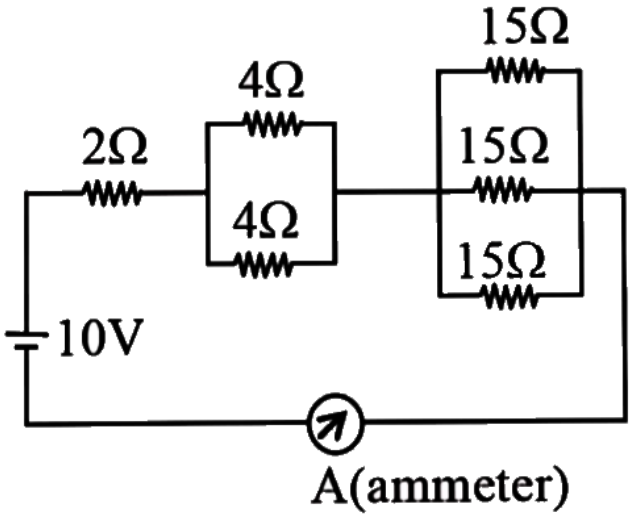
19. In the given circuit, Reading of ammeter is 1 A. If each of the 4Ω resistor is replaced by 2Ω resistor, the reading of ammeter will become nearly-



A. $1.11A$

B. $1.25A$

C. 1.34 A

D. 1.68 A

Answer: A

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20. The temperature of n moles of an ideal gas is increased from T to 4T through a process for which pressure $P = aT^{-1}$ where a is a constant . Then the work done by the gas is

A. nRT

B. 4nRT

C. 2nRT

D. 6nRT

Answer: D

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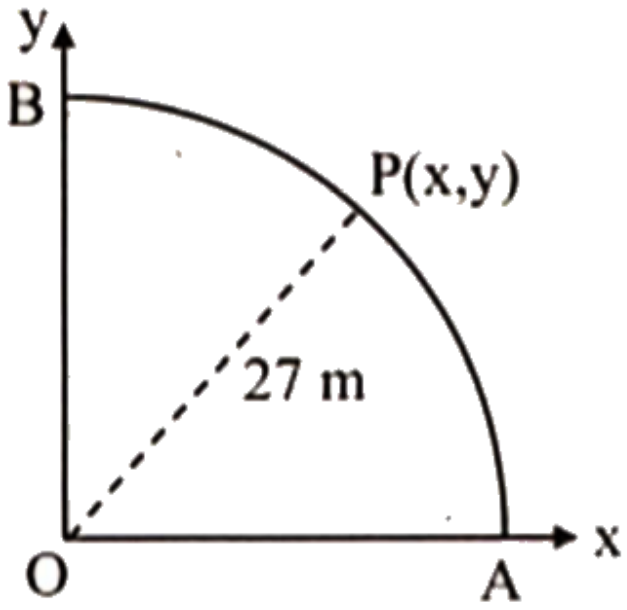
21. A point P moves in a counter-clockwise direction on a circular path as shown in the figure. The movement of P is such that it

sweeps out a length $s = t^3 + 5$ where s is in the metre and t is in seconds. The radius of the path is 27 m. The acceleration of P when t= 3 s is _____ m/s^2. (Take $\sqrt{13} = 3.6$)



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22. Coefficient of thermal conductivity is the product of heat, distance and reciprocal of (area x difference in temperature x time). The new value of a unit of coefficient of thermal conductivity, if fundamental units are 21.6 kg, 1 decimetre, 4 K and 1 minute will be _____ $\times 10^{-6}$ new units.

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23. Two trains A and B of length 400 m each are moving on two parallel tracks with a

uniform speed of $72kmh^{-1}$ in the same direction, with A ahead of B. The driver of B decides to overtake A and accelerates by $1ms^{-2}$. If after $50s$, the guard of B just brushes past the driver of A, what was the original distance between them?

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24. Two forces whose magnitudes are in the ratio $3:5$ give a resultant of 28N. If the angle

of their inclination is 60°, find the magnitude of each force.

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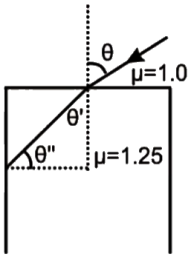
25. Consider the situation shown in figure. Find the maximum angle θ for which the light suffers total internal reflection at the vertical surface.



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