PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 93

Physics

1. A block having 12 g of an element is placed in a room. This element is a radioactive element with a half-life of 15 years. After how

many years will there be just 1.5 g of the element in the box ?

A. 40 year

B. 45 year

C. 20 year

D. 15 year

Answer: B

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2. A train of length L move with a constant speed V_t. A person at the back of the train fires a bullet at time t = 0 towards a target which is at a distance of D (at time t = 0) from the front of the train (on the same direction of motion). Another person at the front of the train fires another bullet at time t = T towards the same target. Both bullets reach the target at the same time. Assuming the speed of the bullets V_b are same, the length of the train is

A. $T(V_b \times 2V_t)$

B. $T(V_b + V_t)$

C. $2T(V_b + 2V_t)$

D. $2T(V_b - 2V_t)$

Answer: B

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3. In Young's doble-slit experiment, if the monochromatic source of light is replaced by white light, then one sees

A. Interference pattern disappears

B. Fringe separation remains fixed

C. Fringe closest to the central fringe is red.

D. Fringe separation increases

Answer: C

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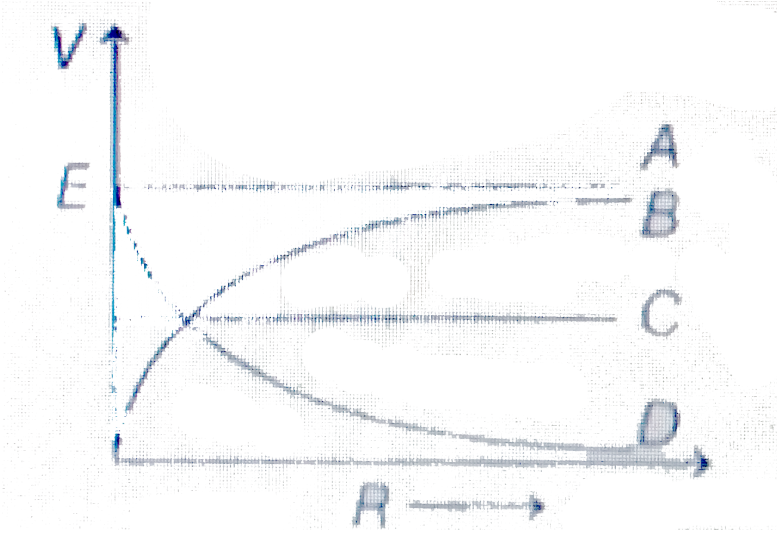
4. A cell of emf E having an internal resistance

R varies with R as shown in figure by the curve



A. A

B. B

C. C

D. D

Answer: B

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5. In amplitude modulation

A. Amplitude remains constant but frequency change

B. Both amplitude and frequency do not change

C. Both amplitude and frequency change

D. Amplitude of the carrier wave changes according to information signal

Answer: D

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6. Work done by an external agent to move slowly a charge Q from rim of a uniformly charged horizontal disc of radius R and charge per unit area σ, to center of this disc is

A. $\frac{\sigma RQ}{\varepsilon_0}\left(\frac{2}{\pi}-\frac{1}{2}\right)$

B. $\frac{\sigma RQ}{\varepsilon_0}\left(\frac{1}{2}-\frac{1}{\pi}\right)$

C. $\frac{\sigma aQ}{\varepsilon_0}\left(\frac{1}{\pi}-\frac{1}{2}\right)$

D. $\frac{\sigma aQ}{\varepsilon_0}\left(\frac{1}{2}-\frac{2}{\pi}\right)$

Answer: B

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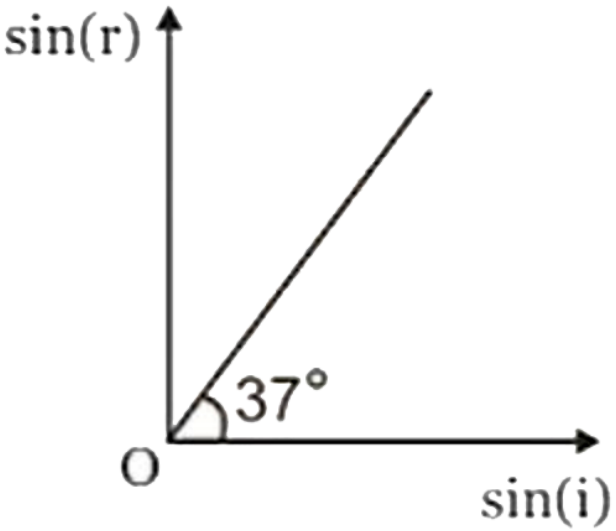
7. A ray of ligh, travelling in medium A, is incident on plane interface of two media A and B and gets refracted into medium B. The angle

of incidence is i and that of refraction is r. Graph between sin(i) and sin(r) is as shown in diagram. The correct statement among the following is



A. Speed of light in medium B is three fourth of that in medium A

B. Total internal reflection can take place

C. Refraction index of medium A is greater than that of medium B

D. None of these

Answer: A

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8. Find the difference of kinetic energies of photoelectrons emitted from a surface by

light of wavelength 2500Å and 5000Å. $h = 6.62 \times 10^{-34} Js.$

A. 1.61 eV

B. 2.47 eV

C. 3.96 eV

D. $3.96 \times 10^{-19} eV$

Answer: B

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9. A black body of mass 34.38 g and surface area $19.2cm^2$ is at an initial temperature of 400 K. It is allowed to cool inside an evacuated enclose kept at constant temperature 300 K. The rate of cooling is 0.04° C/s. The specific heat of body is (Stefan's constant $\sigma = 5.73 \times 10^{-8} jm^{-2}K^{-4}$)

A. $2800J/kg - K$

B. $2100J/kg - K$

C. $1400J/kg - K$

D. $1200 J / kg - K$

Answer: C

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10. Energy of the electron in nth orbit of hydrogen atom is given by $E_n = -\frac{13.6}{n^2} eV$. The amount of energy needed to transfer electron from first orbit to third orbit is

A. 10.2 J

B. 12.09 J

C. 12.09 eV

D. 13.6 eV

Answer: C

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11. If pressure P, velocity V and time T are taken as fundamental physical quantities, the dimensional formula of force if

A. PV^2T^2

B. $P^{-1}V^2T^{-2}$

C. PVT^2

D. $P^{-1}VT^2$

Answer: A

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12. A solid sphere of radius R made of a material of bulk modulus K is surrounded by a liquid in a cylindrical container. A massless

pistion of area A floats on the surface of the liquid. When a mass M is placed on the piston to compress the liquid the fractional change in the radius of the sphere, $\delta R / R$, is .....

A. $\frac{Mg}{AK}$

B. $\frac{Mg}{3AK}$

C. $\frac{3Mg}{AK}$

D. $\frac{Mg}{2AK}$

Answer: B

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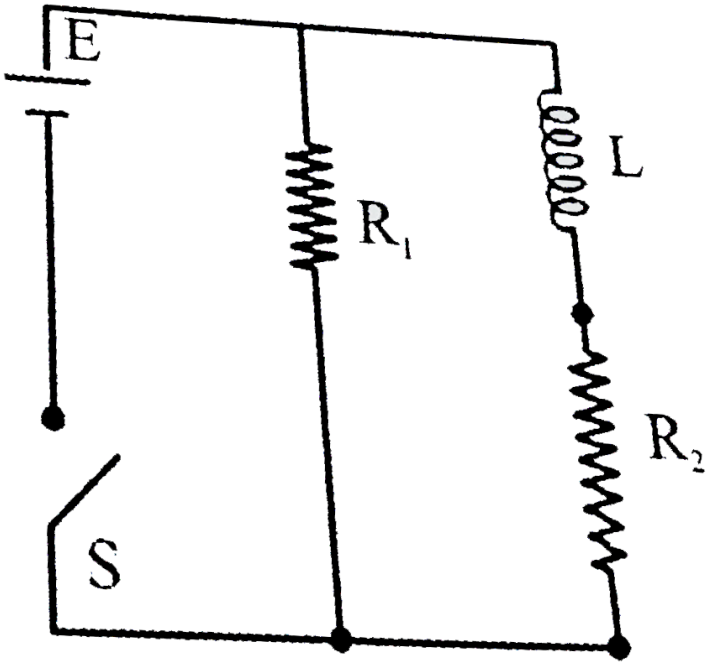
13. An inductor of inductance L = 400 mH and resistors of resistance $R_1 = 2\Omega$ and $R_2 = 2\Omega$ are connected to a battery of emf 12 V as shown in the figure. The internal resistance of the battery is negligible. The switch S is closed at $t = 0$. The potential drop across L as a

function of time is



A. $12e^{-5t}V$

B. $\frac{12}{t}e^{3t}V$

C. $6\left(1-e^{-\frac{t}{0.2}}\right)V$

D. $6e^{-5t}V$

Answer: A

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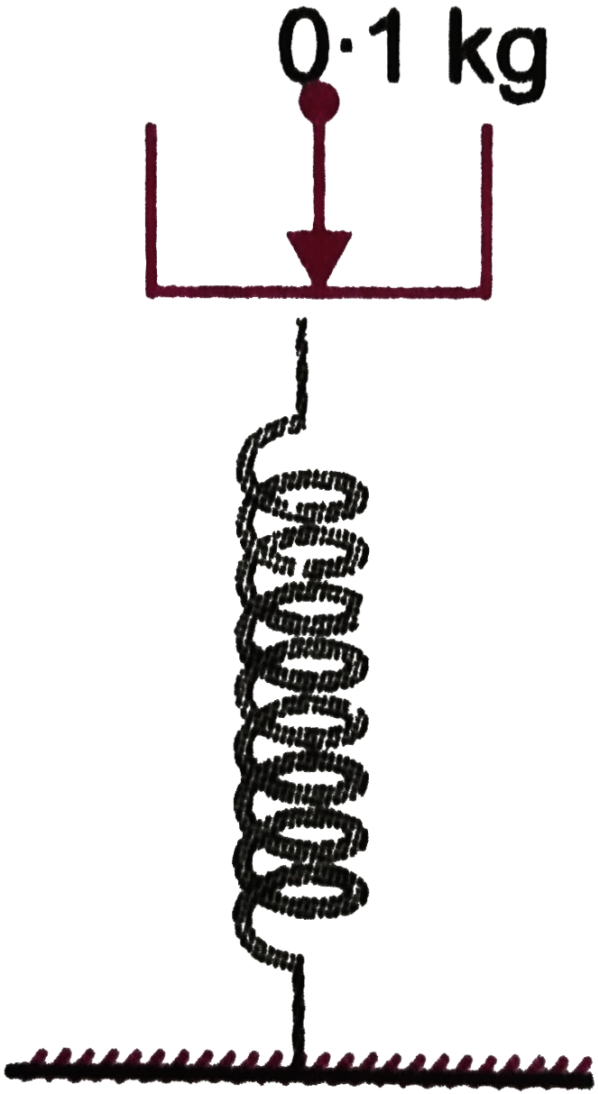
14. A massless platform is kept on a light elastic spring as shown in figure. When a small stone of mass 0.1 kg is dropped on the pan from a height of 0.24 m, the spring compresses by 0.01m. From what height should the stone be droppped to cause a

compression of 0.04m in the spring ?



A. 0.96 m

B. 2.96 m

C. 3.96 m

D. 0.48 m

Answer: A

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15. Three identical bar magnets each of magnetic moment M are arranged in the form of an equilateral triangle such that at two

vertices like poles are in contact. The resultant magnetic moment will be

A. Zero

B. 2M

C. $\sqrt{2}M$

D. $M\sqrt{3}$

Answer: B

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16. A wire of length 100 m is tightly wounded on a hollow tube of radius 5mm and length 1 m. A current of 1 A is flowing in the wire. Then magnetic field strength inside the tube will be :-

A. 4 T

B. 4 mT

C. 40 mT

D. 40 T

Answer: B

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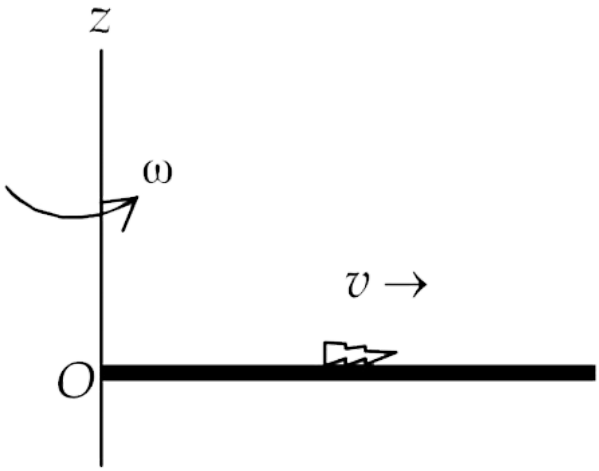
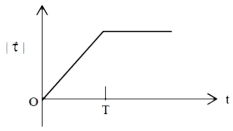
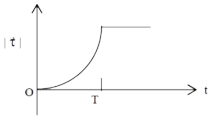
17. A thin uniform rod, pivoted at O, is rotating in the horizontal plane with constatn angular speed ω, as shown in the figure. At time t = 0, a small insect starts from O and moves with constant sped v, with respect to the rod towards the other end. It reaches the end of the rod at t =T and stops. The angular speed of the system remains ω throughout. The magnitude of the torque $\left(\left|\vec{\pi}\right|\right)$ about O, as a function of time is best represented by which

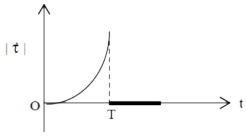
plot?



A. 

B. 

C. 

D. 

Answer: B

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18. Sound waves of frequency $660Hz$ fall normally on a perfectly reflecting wall. The shortest distance from the wall at which the air particles have maximum amplitude of vibration is ..... meters.

A. $\frac{7}{8}m$

B. $\frac{3}{8}m$

C. $\frac{1}{8}m$

D. $\frac{1}{4}m$

Answer: C

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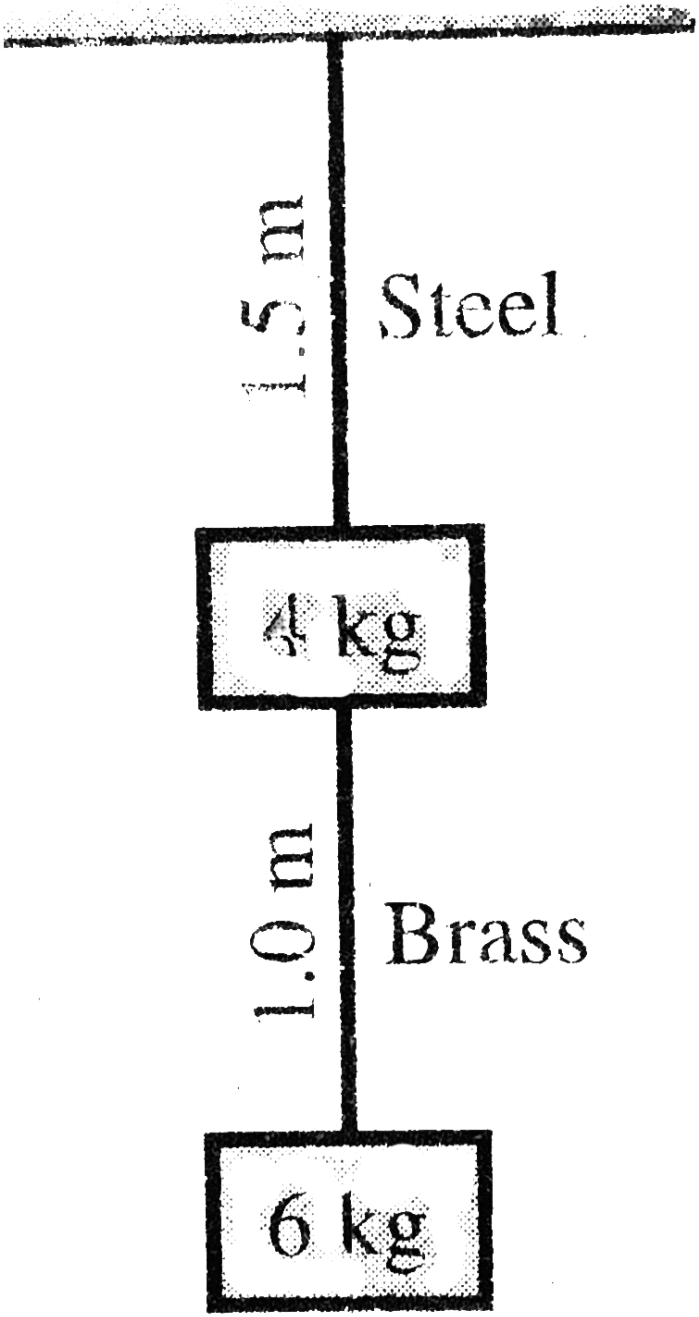
19. Two wires of diameter $0.25cm$, one made of steel and other made of brass, are loaded as shown in the figure. The unloaded length of the steel wire is $1.5m$ and that of brass is $1.0m$. Young's modulus of steel is 2.0×10^{11} Pa

and that of brass is 1.0×10^{11} Pa. Compute the ratio of elongations of steel and brass

wires. $\frac{\triangle l_{\text{steel}}}{\triangle l_{\text{brass}}} = ?$



A. $1.3 \times 10^{-2} m, 1.5 \times 10^{-4} m$

B. $1.5 \times 10^{-4} m, 1.3 \times 10^{-2} m$

C. $2.0 \times 10^{-5} m, 1.8 \times 10^{-3}$

D. $1.8 \times 10^{-3}, 2.0 \times 10^{-5} m$

Answer: B

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20. A bullet of mass m strikes an obstruction and deviates off at 60° to its original direction. If its speed is also changed from u to v, find

the magnitude of the impulse acting on the bullet.

A. $m\sqrt{u^2 - uv + v^2}$

B. $m\sqrt{u^2 + uv - v^2}$

C. $m\sqrt{u^4 - uv + v^4}$

D. $m\sqrt{u^4 + uv - v^4}$

Answer: A

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21. The equation of motion of a projectile is $y = 12x - \frac{3}{4}x^2$. The horizontal component of velocity is $3ms^{-1}$. What is the range of the projectile ?

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22. A 2 kg stone at the end of a string 1 m long is whirled in a vertical circle at a constant speed. The speed of the stone is $4m/\sec$. The

tension in the string will be 52N, when the stone is

A. At the top of the circle

B. At the bottom of the circle

C. Halfway down

D. None of the above

Answer: 52

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23. The ratio of acceleration due to gravity at a height 3R above earth 's surface to the acceleration due to gravity on the surface of the earth is (where R=radius of earth)

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24. Two identical systems, with heat capacity at a constant volume that varies as $C_v = bT^3$ (where b is a constant) are thermally isolated. Initially, one system is at a temperature 100 K

and the other is at 200K. The systems are then brought to thermal contact and the combined system is allowed reach thermal equilibrium. If $T_0^4 = n \times 10^8$ then what will be the value of n, where T_0 is the final temperature in kelvin?

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25. A simple harmonic wave of amplitude 8 units travels along positive x-axis. At any given instant of time, for a particle at a distance of $10cm$ from the origin, the displacement is

$+6units$, and for a particle at a distance of $25cm$ from the origin, the displacement is $+4$ units. Calculate the wavelength.

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