PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 64

Physics

1. A particle moves in a circle with a uniform speed. When it goes from a point A to a diametrically opposite point B, the momentum

of the particle changes by $\overrightarrow{P}_A - \overrightarrow{P}_B = 2$ kg m/s $\left(\hat{j}\right)$ and the centripetal force acting on it changes by $\overrightarrow{F}_A - \overrightarrow{F}_B = 8N\left(\hat{i}\right)$ where $\hat{i}, \hat{j}$ are unit vectors along X and Y axes respectively. The angular velocity of the particle is

A. $8\,\mathrm{rad\,s^{-1}}$

B. $4\,\mathrm{rad\,s^{-1}}$

C. $2\,\mathrm{rad\,s^{-1}}$

D. $16\,\mathrm{rad\,s^{-1}}$

Answer: B

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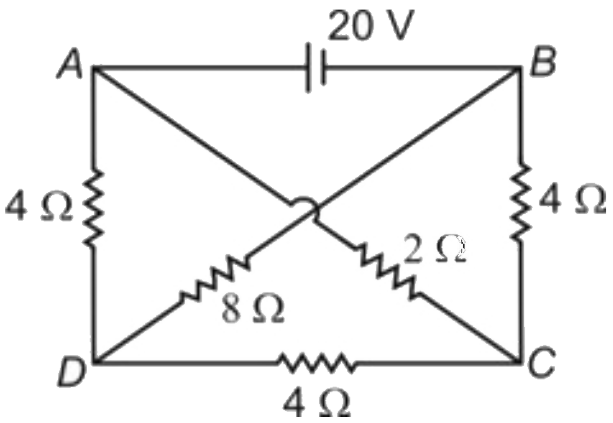
2. Consider the circuit shown in the figure.



Which of the following statements are correct ?

A. Current through the battery is 5 A

B. Current through branch AD is 2 A

C. Current through branch BC is 3 A

D. The potential difference between points D and C is 4 V

Answer: A

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3. A copper disc of radius 0.1 m is rotated about its centre with 20 revolution per second in a uniform magnetic field of 0.1 T with its

plane perpendicular to the field. The emf induced across the radius of the disc is-

A. $\frac{\pi}{20}V$

B. $\frac{\pi}{10}V$

C. $20\pi mV$

D. $100\pi mV$

Answer: C

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4. You have a parallel plate capacitor, a spherical capacitor and a cylindrical capacitor. Each capacitor is charged and then removed from the same battery. Consider the following situations :

I:· Separation between the plates of parallel plate capacitor is reduced

II: Radius of the outer spherical shell of the spherical capacitor is increased

Ill: Radius of the outer cylinder of cylindrical capacitor is increased.

Which of the following is correct?

A. In each of these situations (i), (ii) and (iii), charge on the given capacitor remains the same and potential difference across it also remains the same

B. In each of these situations (i), (ii) and (iii), charge on the given capacitor remains the same but potential difference, in situations (i) and (iii), decreases, and in situation (ii), increases

C. In each of these situations (i), (ii) and (iii), charge on the given capacitor remains the same but potential dfference, in situations (i), decreases, and in situations (ii) and (iii), increases

D. Charge on the capacitor in each situation changes. It increases in all these situations but potential difference remains the same

Answer: C

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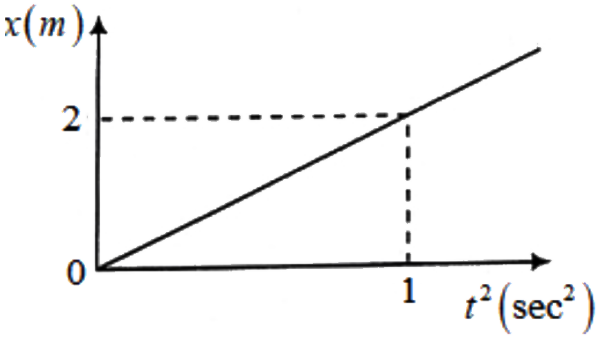
5. Displacement x versus t^2 graph is shown for a particle. The acceleration of particle is



A. $4\ \mathrm{m\ s^{-2}}$

B. $8\ \mathrm{m\ s^{-2}}$

C. Zero

D. $2\ \mathrm{m\ s^{-2}}$

Answer: A

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6. Find the binding energy of a satellite of mass m in orbit of radius r, (R = radius of earth, g = acceleration due to gravity)

A. $\frac{mgR^2}{r}$

B. $\frac{mgR^2}{2r}$

C. $\frac{mgR^2}{4r}$

D. $\frac{2mgR^2}{r}$

Answer: B

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7. In a motor the electrical power input is 500 W and the mechanical power output is 0.54 horse power. Heat developed in the motor in 1 h is (assuming that all the electric energy

which is not converted to mechanical energy is converted to heat) is

A. $4.18 \times 10^4 \quad \text{cal}$

B. $3.6 \times 10^5 \quad \text{cal}$

C. $8.6 \times 10^4 \quad \text{cal}$

D. $1.28 \times 10^5 \quad \text{cal}$

Answer: C

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8. N moles of an ideal diatomic gas are in a cylinder at temperature T. suppose on supplying heat to the gas, its temperature remain constant but n moles get dissociated into atoms. Heat supplied to the gas is

A. Zero

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

C. $\frac{3}{2}nRT$

D. $\frac{3}{2}RT$

Answer: B

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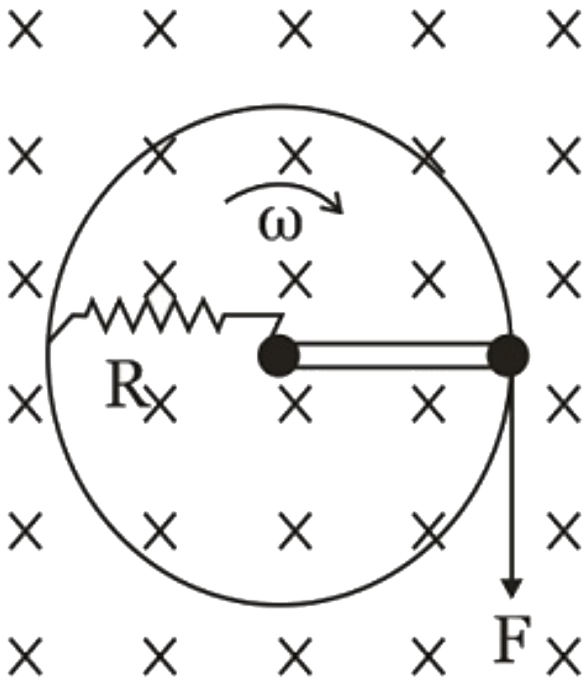
9. A metallic ring of mass 2 kg and radius 1 m with with a uniform metallic spoke of same mass 2 kg and length 1 m is rotated about its axis with angular velocity $1\,\mathrm{rev}\,\mathrm{sec}^{-1}$. In a perpendicular uniform magnetic field B of magnitude 10 T as shown in the figure. If the central end of the spoke is connected to the rim of the wheel through a resistor R of magnitude $\pi\Omega$ as shown. The resistor does not rotate, It's one end is always at the centre

of the ring and another end is always in contact with the ring. A force F as shown is needed to maintain the constant angular velocity of the spoke then, F is equal to (The ring and the spoke has zero resistance)



A. 10 N

B. 20 N

C. 50 N

D. None of these

Answer: C

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10. The coordinates of a moving particle at any time't' are given by $x = \alpha t^3$ and $y = \beta t^3$. The speed of the particle at time 't' is given by

A. $3t\sqrt{\alpha^2+\beta^2}$

B. $t^2\sqrt{\alpha^2+\beta^2}$

C. $\sqrt{\alpha^2+\beta^2}$

D. $3t^2\sqrt{\alpha^2+\beta^2}$

Answer: D

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11. A man is slipping on a frictionless inclined plane and a bag falls down from the same height. Then the velocity of both is related as (

$V_B =$ velocity of bag and $V_m =$ velocity of man)

A. $V_M < V_B$

B. $V_M = V_B$

C. They depend on the masses

D. $V_M > V_B$

Answer: B

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12. A nucleus of mass 20 u emits a γ-photon of energy 6 MeV. If the emission assume to occur when nucleus is free and rest, then the nucleus will have kinetic energy nearest to (take $1u = 1.6 \times 10^{-27}$ kg)

A. 10 keV

B. 1 keV

C. 0.1 keV

D. 100 keV

Answer: B

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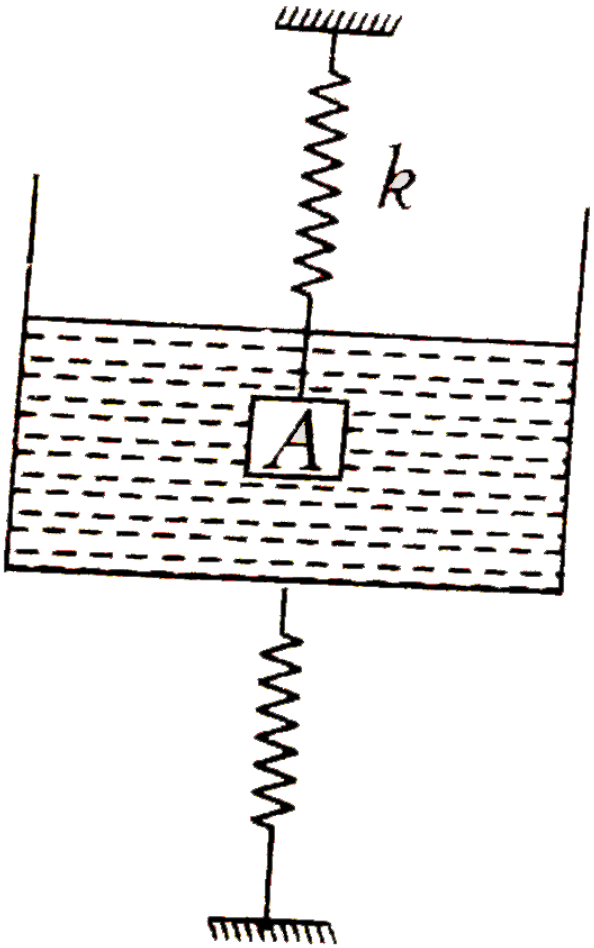
13. The system shown in figure is in equilibrium . The mass of the container with Liquid is M, density of liquid in the container is ρ and the volume of the block is V. If the container is now displaced downwards through a distance x_0 and released such that the block remains well inside the liquid then

during subsequent motion



A. Time period of SHM of the container will be $2\pi\sqrt{\frac{(M_2\rho v)}{k}}$

B. Time period of SHM of the container will be $2\pi\sqrt{\frac{(M+\rho v)}{k}}$

C. The amplitude of SHM of the container will be $\frac{x_0}{2}$

D. Container will not perform SHM

Answer: B

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14. A light of intensity 16 mW and energy of each photon 10 eV incident on a metal plate of work function 5 eV and area $10^{-4}m^2$ then find the maximum kinetic energy of emitted electrons and the number of photoelectrons emitted per second if photon efficiency is $10\,\%$.

A. 5 eV, 10^{11}

B. 10 eV, 10^{12}

C. 5 eV, 10^{13}

D. 10 eV, 10^{14}

Answer: A

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15. When a large bubble rises from the bottom of a lake to the surface its radius doubles. If atmospheric pressure is equal to that of column of water height H then the depth of lake is

A. H

B. 2H

C. 7H

D. 8H

Answer: C

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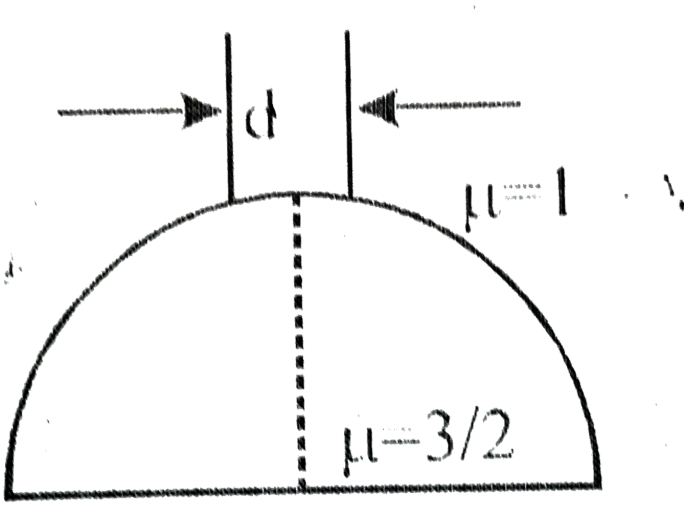
16. A beam of diameter 'd' is incident on a glass hemisphere as shown. If the radius of curvature of the hemisphere is very large in comparison to d, then the diameter of the

beam at the base of the hemisphere will be :



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

B. d

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

D. $\frac{2}{3}d$

Answer: D

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17. If the height of TV tower is increased by 21%, then the transmission range is enhanced by

A. 10%

B. 5%

C. 15%

D. 25%

Answer: A

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18. A steel rod is 4000cm in diameter at $30^\circ C$ A brass ring has an interior diameter of 3.992cm at 30° in order that the ring just slides onto the steel rod the common temperature of the two should be nearly

$(\alpha_{steel}$=$11 \times 10^{-6}(\hat{}\ (\circ)C)$ and

$\alpha_{brass} = 19 \times 10^{-6}(\hat{}\ (\circ)C)$

A. $200^\circ C$

B. $350^\circ C$

C. $280^\circ C$

D. $300^\circ C$

Answer: C

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19. If C, R, L and I denot capacity resitance, inductance and electric current respecitively, the quantities having the same dimensions of time are

(a) CR, (b) L/R, (c) $\sqrt{L/C}$, (d) LI^2

A. (1) and (2) only

B. (1) and (3) only

C. (1) and (4) only

D. (1), (2) and (3) only

Answer: D

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20. A polarizer - analyser set is adjusted such that the intensity of llight coming out of the analyser is just 36% of the original intensity.

Assuming that the polarizer - analyser set does not absorb any light, the angle by which the analyser needs to be rotated further, to reduce the output intensity to zero, is $\left(\sin^{-1}\left(\frac{3}{5}\right) = 37^\circ\right)$

A. 53°

B. 37°

C. 90°

D. 45°

Answer: B

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21. The ratio between total acceleration of the electron in singly ionized helium atom and hydrogen atom (both in ground state) is

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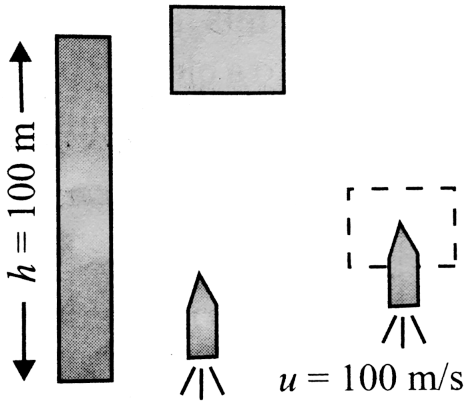
22. A wooden block of mass $10g$ is dropped from the top of a tower $100m$ high. Simultaneously, a bullet of mass $10g$ is fired from the foot of the tower vertically upwards

with a velocity of $100m/s$. If the bullet is embedded in it, how high will the block rise above the top of tower before it starts falling? $(g = 10m/s^2)$



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23. A stone of mass 1 kg tied to a light inextensible string of lenth $L = \frac{10}{3}m$, whirling in a circular path in a vertical plane. The ratio of maximum tension to the minimum tension in the string is 4. If g is taken to be $10ms^{-2}$, the speed of the stone at the highest point of the circle is

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24. A transverse wave propagating along x-axis is represented by: $y(x,t) = 8.0\sin\left(0.5\pi x - 4\pi t - \frac{\pi}{4}\right)$ Where x is in metres and t is in seconds. The speed of the wave is:

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25. The potential energy of a particle under a conservative force is given by $U(x) = \left(x^2 - 3x\right)J$. The equilibrium position

of the particle is at x m. The value of 10 x will be

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