



PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 37

Physics

1. A sphere is moving with velocity vector $2\hat{i} + 2\hat{j}$ immediately before it hits a vertical wall. The wall is parallel to \hat{j} and the

coefficient of restitution of the sphere and the wall is $e = \frac{1}{2}$. Find the velocity of the sphere after it hits the wall?

A. $\hat{i} - \hat{j}$

B. $-\hat{i} + 2\hat{j}$

C. $-\hat{i} - \hat{j}$

D. $2\hat{i} - \hat{j}$

Answer: B



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2. A resistor is constructed as hollow cylinder with inner and outer radii $r_a = 0.5\text{cm}$, $r_b = 1.0\text{ cm}$ respectively and resistivity $\rho = 3.5 \times 10^{-5}\Omega$. The resistance of the configuration for the length of 5 cm cylinder is _____ $\times 10^{-3}\Omega$.

- A. 7.42
- B. 10.56
- C. 14.38
- D. 16.48

Answer: A



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3. The magnetic flux through a stationary loop with resistance R varies during interval of time T as $\phi = at(T - t)$. The heat generated during this time neglecting the inductance of loop will be

A. $\frac{aT}{3R}$

B. $\frac{a^2T^2}{3R}$

C. $\frac{a^2 T^2}{R}$

D. $\frac{a^2 T^3}{3R}$

Answer: D



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4. Plates of a parallel plate capacitor, having a potential difference 100 V applied across them, carry a surface charge density of 50 nC cm^{-2} . Spacing between the plates is

A. $329\mu m$

B. $259\mu m$

C. $177\mu m$

D. $125\mu m$

Answer: C



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5. An artificial satellite is moving in a circular orbit around the earth with a speed equal to half the escape velocity from the earth of

radius R . The height of the satellite above the surface of the earth is

A. R

B. $2R$

C. $3R$

D. $4R$

Answer: A



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6. An ideal Carnot's engine works between $227^{\circ}C$ and $57^{\circ}C$. The efficiency of the engine will be

A. 22 %

B. 34 %

C. 55 %

D. 13.5 %

Answer: B



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7. At the centre of a current - carrying circular coil of radius 5 cm, magnetic field due to earth is $0.5 \times 10^{-5} \text{Wb m}^{-2}$. The current flowing through the coil, so that it equals the Earth's magnetic field, is

A. 40 A

B. 4A

C. 0.4 A

D. 0.2 A

Answer: C



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8. A gun of mass 10kg fires 4 bullets per second. The mass of each bullet is 20 g and the velocity of the bullet when it leaves the gun is 300ms^{-1} . The force required to hold the gun while firing is

A. 6 N

B. 8 N

C. 24 N

D. 240 N

Answer: C



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9. A particle performs SHM with an amplitude of 5 m. If at $x = 4$ m, the magnitude of velocity and acceleration are equal, then the time period of SHM (in seconds) is

A. $\frac{2\pi}{3}$

B. $\frac{4\pi}{3}$

C. $\frac{8\pi}{3}$

D. $\frac{6\pi}{3}$

Answer: C



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10. In an electromagnetic wave, the maximum value of the electric field is $100V\,m^{-1}$. The average intensity is

$$[\epsilon_{90}) = 8.8 \times 10^{-12} c^{-2} N^{-1} m^2]$$

A. 13.2 W m^{-2}

B. 36.5 W m^{-2}

C. 46.7 W m^{-2}

D. 765 W m^{-2}

Answer: A



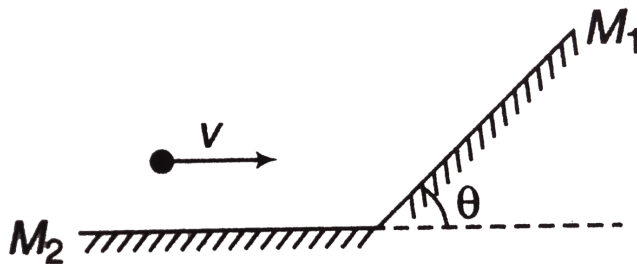
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11. A point object is moving with a speed v before an arrangement of two mirrors as shown in

figure. Find the magnitude of velocity of image

in

mirror M_1 with respect to image in mirror M_2



A. $2v \sin \theta$

B. $v \sin \theta$

C. $3v \sin \theta$

D. $4v \sin \theta$

Answer: A



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12. A playground merry-go-round is at rest, pivoted about a frictionless axis. A child of mass m runs along a path tangential to the rim with speed v and jumps on to the merry-go-round. If R is the radius of the merry-go-round and I is its moment of inertia, then the angular velocity of the merry-go-round is

A. $\frac{mvR}{mR^2 + I}$

B. $\frac{mvR}{I}$

C. $\frac{mR^2 + I}{mvR}$

D. $\frac{I}{mvR}$

Answer: A



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13. Amplitude modulation is the process of

- A. superimposing a high frequency signal on a high frequency carrier signal
- B. superimposing a low frequency signal on a high frequency carrier signal
- C. single sideband communication
- D. amplitude shift and phase shift

Answer: B



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14. If the temperature is raised by 1 K from 300 K, the percentage change in the speed of sound in the gaseous mixture is

$$\left[R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1} \right]$$

A. 0.167 %

B. 0.334 %

C. 1 %

D. 2 %

Answer: A



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15. In a reverse biased diode, when the applied voltage changes by $1V$, the current is found to change by $0.5\mu A$. The reverse bias resistance of the diode is

A. $2 \times 10^5 \Omega$

B. $2 \times 10^6 \Omega$

C. 200Ω

D. 2Ω

Answer: B



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16. A rod of mass ' M ' and length ' $2L$ ' is suspended at its middle by a wire. It exhibits torsional oscillations, if two masses each of ' m ' are attached at distance ' $L/2$ ' from its centre on both sides, it reduces the oscillation frequency by 20%. The value of ratio m/M is close to :

A. 0.17

B. 0.77

C. 0.57

D. 0.37

Answer: D



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17. Two full turns of the circular scale of a screw gauge cover a distance of 1mm on its main scale. The total number of divisions on

the circular scale is 50. Further, it is found that the screw gauge has a zero error of -0.03mm . While main scale reading of 3mm and the number of circular scale divisions in line with the main scale as 35. the diameter of the wire is

A. 3.38 mm

B. 3.32 mm

C. 3.73 mm

D. 3.67 mm

Answer: A



18. An infinite wire placed along the z-axis has current I_1 in the positive z-direction. A conducting rod placed in the xy-plane parallel to the y-axis has current I_2 in the positive y-direction. The ends of the rod subtend $+30^\circ$ and -60° at the origin with positive x-direction. The rod is at a distance a from the origin. Find the net force on the rod.

$$\text{A. } F = \frac{\mu_0}{4\pi} I_1 I_2 \ln 3 \left(-\hat{k} \right)$$

$$\text{B. } F = \frac{\mu_0}{4\pi} 2l_1 l_2 \ln 3 \left(- \hat{i} \right)$$

$$\text{C. } F = \frac{\mu_0}{4\pi} 2l_1 l_2 \ln 3 \left(\hat{k} \right)$$

$$\text{D. } F = \frac{\mu_0}{4\pi} 2l_1 l_2 \ln 3 \left(\hat{k} \right)$$

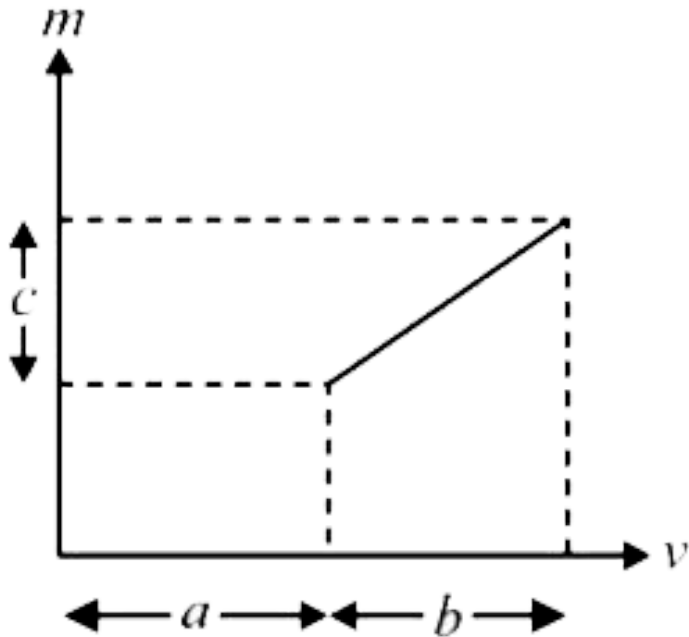
Answer: A



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19. The graph shows how the magnification m produced by a thin lens varies with image distance v . What is the focal length of the lens

used?



- A. $\frac{b}{c}$
- B. $\frac{a}{c}$
- C. $\frac{b^2 c}{a}$
- D. $\frac{b^2}{ac}$

Answer: A



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20. Two points on a travelling wave having frequency 500 Hz and velocity 300ms^{-1} are 60° out of phase, then the minimum distance between the two point is

A. 0.2

B. 0.1

C. 0.5

D. 0.4

Answer: B

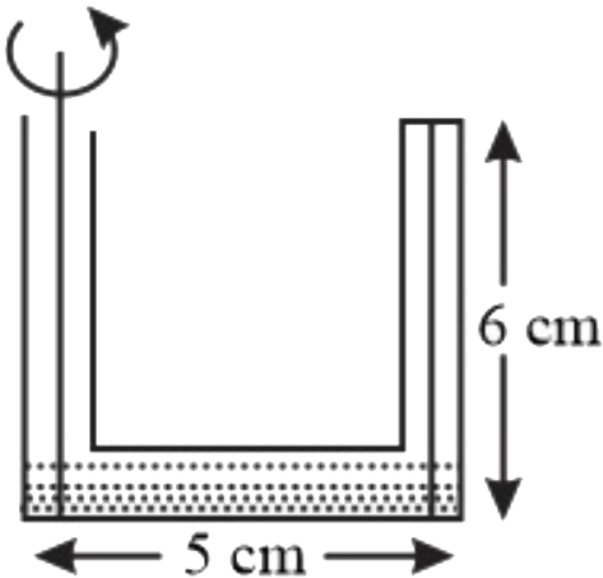


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21. Length of the horizontal arm of a uniform cross - section U - tube is $l = 5$ cm and both ends of the vertical arms are open to the surrounding pressure of 7700 N m^{-2} . A liquid of density $\rho = 10^3 \text{ kg m}^{-3}$ is poured into the tube such that the liquid just fills the

horizontal part of the tube. Now, one of the open ends is sealed and the tube. Now, one of the open ends is sealed and the tube is then rotated about a vertical axis passing through the other vertical arm with angular velocity ω due to which the liquid rises up to half the length of the vertical arm. If length of each vertical arm is $a = 6$ cm. What is the value of

ω (in rad s^{-1})?



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22. A wire suspended vertically from one of the its ends is stretched by attaching a weight of

200 N to the lower end. The weight stretches the wire by 1 mm. then the elastic energy stored in the wire is



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23. The moment of inertia of a hollow cubical box of mass M and side a about an axis passing through the centres of two opposite faces is equal to.




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24. A horizontal platform with an object placed on it is executing SHM in the vertical direction . The amplitude of oscillation is 2.5 cm what must be the least period of these oscillations so that the object is not detached ?



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25. In a Wheatstone's network, $P = 2\Omega$, $Q = 2\Omega$, $R = 2\Omega$ and $S = 3\Omega$. The resistance with which S is to be shunted in order that the bridge may be balanced is 



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