PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 62

Physics

1. In the nth orbit of hydrogen atom, find the ratio of the radius of the electron orbit and de-Broglie wavelength associated with it.

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

B. $\frac{n^2}{2\pi}$

C. $\frac{1}{2\pi n}$

D. $\frac{1}{2\pi n^2}$

Answer: A

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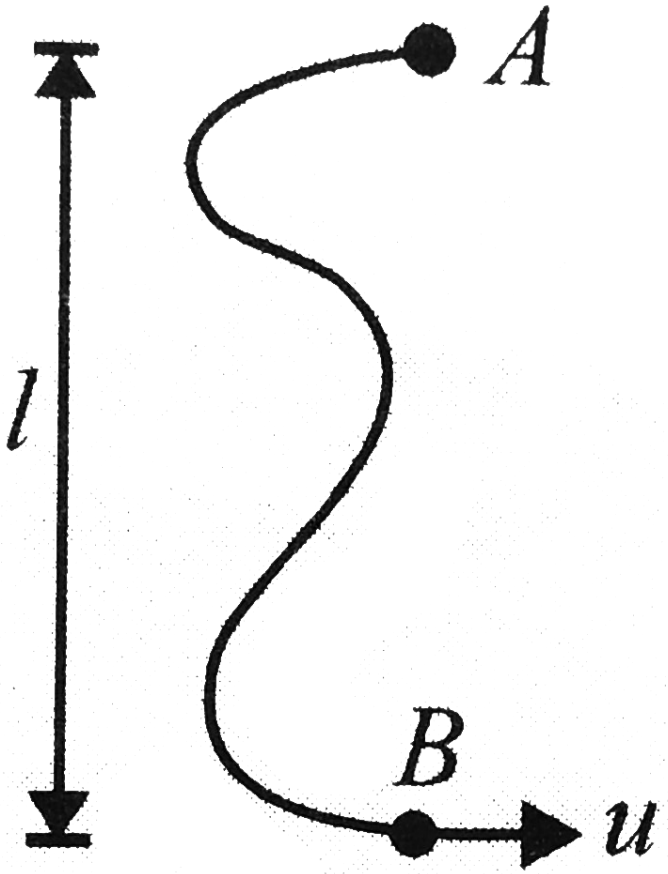
2. Two particles A and B of equal mass m are attached by a string of length $2l$ and initially placed over a smooth horizontal table in the

position shown in fig. particle B is projected across the table with speed u perpendicular to AB as shown in the figure. find the velocities of each particle after the string becomes taut

and the magnitude of the impulse tension.



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

B. $u\sqrt{3}$

C. $\frac{u\sqrt{3}}{2}$

D. $\frac{u}{2}$

Answer: A

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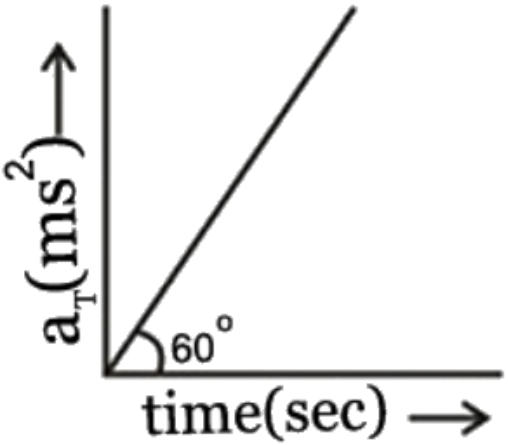
3. Tangental acceleration of a particle moving in a circle of radius 1 m varies with time t as shown in figure (initial velocity of the particle is zero). Time after which total acceleration of particle makes an angle of 30° with radial

acceleration is



A. 4 s

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

C. $2^{(2/3)}s$

D. $\sqrt{2}s$

Answer: D

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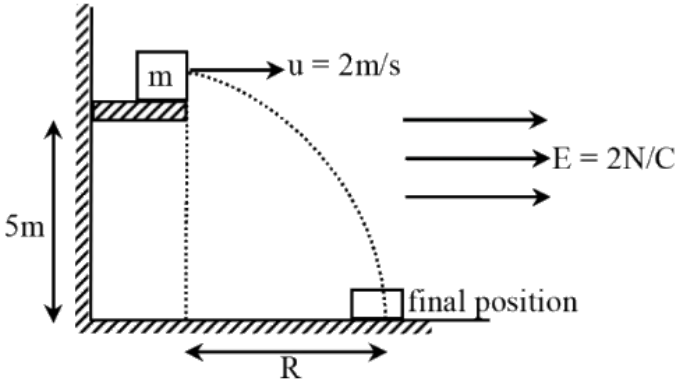
4. The block shown in the diagram has a mass of $2\mu g$ and a charge of $2 \times 10^{-9} C$. If the block is given an initial velocity of $2ms^{-1}$ in the x - direction at t = 0 and an electric field of $2NC^{-1}$ is switched on in the x - direction, then the range (R) of the block on the ground

will be



A. 4 m

B. 1 m

C. 2 m

D. 3 m

Answer: D

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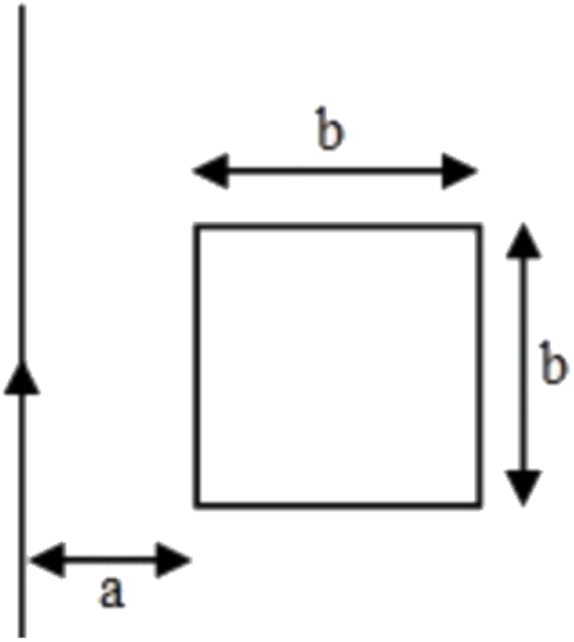
5. Mutual inductance in the figure shown is -



A. Zero

B. $\frac{\mu_0 b}{2\pi}\log_e . \frac{a}{b}$

C. $\frac{\mu_0 b}{2\pi y}\log_e\left(1+\frac{b}{a}\right)$

D. $\frac{\mu_0 b}{2\pi}\log_e\left(1+\frac{a}{b}\right)$

Answer: D

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6. A cavity of radius $R/2$ is made inside a solid sphere of radius R. The centre of the cavity is located at a distance $R/2$ from the centre of the sphere. The gravitational force on a particle of a mass $'m'$ at a distance $R/2$ from

the centre of the sphere on the line joining both the centres of sphere and cavity is (opposite to the centre of cavity). [Here $g = GM/R^2$, where M is the mass of the solid sphere]

A. $\frac{mg}{2}$

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

C. $\frac{mg}{16}$

D. None of these

Answer: B

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7. Find the change in the temperature on the Fahrenheit scale and on Kelvin scale, if an iron piece is heated from $30^\circ C$ to $90^\circ C$.

A. $108^\circ F, 60K$

B. $100^\circ F, 55K$

C. $100^\circ F, 65K$

D. $60^\circ F, 108K$

Answer: A

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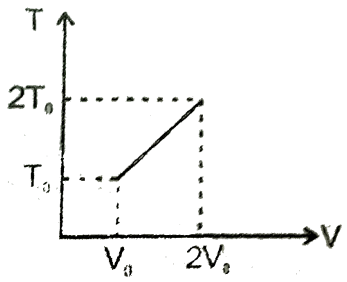
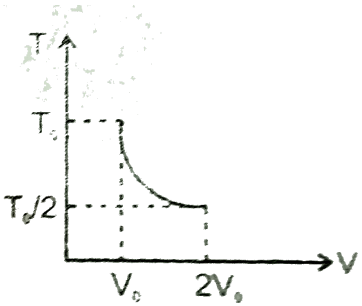
8. For two thermodynamic process temperature and volume diagram are given. In first process, it is a straight line having initial and final coordinates as (V_0, T_0) and $(2V_0, 2T_0)$, where as in second process it is a rectangular hyperbola having initial and final coordinates (V_0, T_0) and $(2V_0, T_0/2)$. Then

ratio of work done in the two process must be





A. $1:2$

B. $2:1$

C. $1:1$

D. None of these

Answer: B

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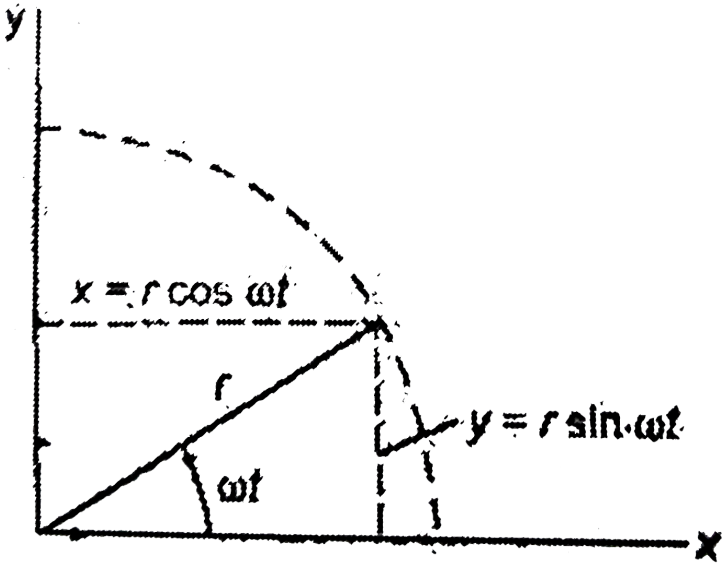
9. Consider a particle moving in the $x - y$ plane according to $r = r\left(\cos \omega t \hat{i} + \sin \omega t \hat{j}\right)$, where r and ω are constants. Find the trajectory, the velocity, and the acceleration.



A. Perpendicular to the velocity

B. Parallel to the velocity

C. Directed away from the origin

D. Perpendicular to the position vector

Answer: A

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10. The activity of a radioactive element decreases in 10 years to 1/5 of initial activity A_0. After further next 10 years, its activity will be

A. $\frac{A_0}{4}$

B. $\frac{A_0}{10}$

C. $\frac{A_0}{15}$

D. $\frac{A_0}{25}$

Answer: D

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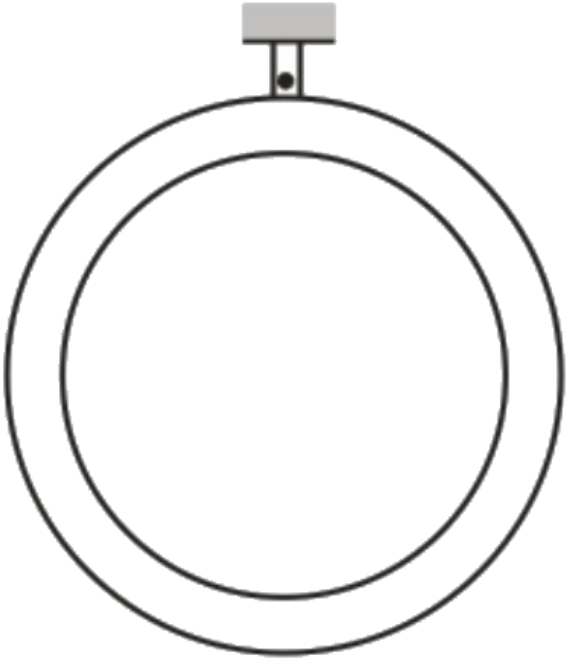
11. A ring of the radius r is suspended from a point on its circumference. If the ring is made to oscillate in the plane of the figure, then the

angular frequency of these small oscillations is



A. $\sqrt{\frac{2g}{3r}}$

B. $\sqrt{\frac{g}{2r}}$

C. $\sqrt{\frac{5g}{4r}}$

D. $\sqrt{\frac{4g}{3r}}$

Answer: B

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12. Light of frequency $7.21 \times 10^{14} Hz$ is incident on a metal surface. Electrons with a maximum speed of $6.0 \times 10^{5} ms^{-1}$ are ejected from the surface. What is the threshold frequency for photoemission of electrons?

$h = 6.63 \times 10^{-34} Js, m_e = 9.1 \times 10^{-31} kg.$

A. $4.74 \times 10^{14} Hz$

B. $5.74 \times 10^{15} Hz$

C. $6.84 \times 10^{13} Hz$

D. $4.84 \times 10^{14} Hz$

Answer: A

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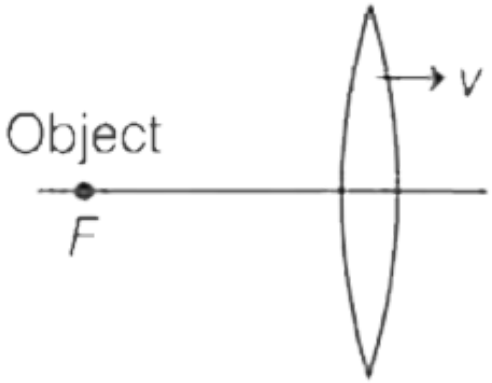
13. A point object is kept at the first focus of a convex lens. If the lens starts moving towards

right with a constant velocity, the image will



A. always move towards right

B. always move towards left

C. first move towards right and then towards left

D. first move towards left and then towards right

Answer: D

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14. A wheel of radius R rolls on the ground with a uniform velocity v. The relative acceleration of topmost point of the wheel with respect to the bottommost point is:

A. $\frac{v^2}{R}$

B. $\frac{2v^2}{R}$

C. $\frac{v^2}{2R}$

D. $\frac{4v^2}{R}$

Answer: B

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15. The current gain α of a transistor in common base mode is 0.995 . Its gain .. in the common emitter mode is

A. 200

B. 99

C. 199

D. None of these

Answer: C

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16. A gas is filled in a cylinder. its temperature is increased by 20% on the Kelvin scale and volume is reduced by 10% How much percentage of the gas has to leak for pressure to remind constant ?

A. $30\ \%$

B. $40\ \%$

C. $15\ \%$

D. $25\ \%$

Answer: D

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17. The viscosity η of a gas depends on the long - range attractive part of the intermolecular force, which varies with

molecular separation r according to $F = \mu r^{-n}$ where n is a number and μ is a constant. If η is a function of the mass m of the molecules, their mean speed v, and the constant μ than which of the following is correct-

A. $\eta \propto m^{n+1} v^{n+3} \mu^{n-2}$

B. $\eta \propto m^{\frac{n+1}{n-1}} v^{\frac{n+3}{n-1}} \mu^{\frac{-2}{n-1}}$

C. $\eta \propto m^{n} v^{-n} \mu^{-2}$

D. $\eta \propto mv\mu^{-n}$

Answer: B

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18. Interference fringes are produced on a screen by using two light sources of intensities / and 9/. The phase difference between the beams $\frac{\pi}{2}$ is at point P and πat point Q on the screen. The difference between the resultant intensities at point P and Q is

A. 2I

B. 4I

C. 6I

D. 8I

Answer: C

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19. A standing wave having 3 nodes and 2 antinodes is formed between two atoms having a distance 1.21Å between them. The wavelength of the standing wave is

A. 1.21Å

B. 1.41Å

C. 6.05Å

D. 3.63Å

Answer: A

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20. A block of mass M is kept on a rough horizontal surface and is attached with massless spring of force constant k .The

minimum constant force applied on the other end of the spring to lift the block is

A. Mg

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

C. 2Mg

D. $Mg(1+k)$

Answer: B

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21. A battery is charged at a potential fo 15 V for 8 h when the current folwing is 10A. The battery on discharge supplies a current of 5A fo 15h . The mean terminal voltage during discharge is 14V. The watt-hour efficiency of the battery is

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22. A particle leaves the origin with an initial velodty $v = \left(3.00\hat{i}\right) m/s$ and a constant

acceleration $a = \left(-1.00\hat{i} - 0.500\hat{j} \right) m/s^2$.

When the particle reaches its maximum x coordinate, what are

(a) its velocity and (b) its position vector?

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23. The magnetic induction at the centre of a current carrying circular coil of radius $10cm$ is $5\sqrt{5}$ times the magnetic induction at a point on its axis. The distance of the point from the centre of the soild in cm is

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24. An 80 kg person is parachuting and is experiencing a downward acceleration of $2.8\ \mathrm{m\ s^{-2}}$. The mass of the parachute is 5 kg. If the upward force on the open parachute is $k \times 10^2 N$, then what is the value of k? $\left(\text{Take } \ g = 9.8 ms^{-2}\right)$

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25. A liquid drop having surface energy E is spread into 512 droplets of same size. The final surface energy of the droplets is

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