

JEE-Mains-06-04-2023 [Memory Based] [Evening Shift]

Physics

Question: If initial velocity 30 m/s and acc is 2 m/s^2 after how much time vel will be 60 m/s

Options:

- (a) 5 sec
- (b) 10 sec
- (c) 15 sec
- (d) 20 sec

Answer: (c)

Question: If a_0 is bohr radius, find de broglie wavelength of electron in 3rd orbit of hydrogen atom

Options:

- (a) $6\pi a_0$
- (b) $3\pi a_0$
- (c) $9\pi a_0$
- (d) πa_0

Answer: (a)

Solution:

$$r = a_0 \frac{n^2}{2} = a_0 n^2$$

$$\lambda = \frac{h}{mv} = \frac{h}{nh} = 2\pi a_0 n^2$$

$$mvr = \frac{nh}{2\pi} = 2\lambda a_0 n = 6\pi a_0$$

Question: If in 7 minutes body cools from 60°C to 40°C . Surrounding temperature is 10°C then what will be the temperature of body in next 7 minutes?

Options:

- (a) 16°
- (b) 20°
- (c) 28°
- (d) 36°

Answer: (c)

Solution:

$$-\frac{d\theta}{dt} = b(\theta_{av} - \theta_0)$$

$$\Rightarrow \frac{20}{7} = b[50 - 10] \dots (i)$$

$$\Rightarrow \frac{40 - T}{7} = b \left[\frac{40 + T}{2} - 10 \right] \dots (ii)$$

Question: In circular motion $M = 5 \text{ kg}$, $T = \pi$ seconds, $R = 2 \text{ m}$. Find centrifugal force.

Answer: 40.00

Question: Minimum amplitude is 3 V, modulation index is 60% Find maximum amplitude

Options:

- (a) 5 V
- (b) 10 V
- (c) 12 V
- (d) 15 V

Answer: (c)

Solution:

Question: Planet is moving in elliptical path which is incorrect?

Options:

- (a) Areal velocity is constant
- (b) Total energy is constant
- (c) Velocity is constant
- (d) none of these

Answer: (c)

Solution:

Question: A body is dropped from a height of h_1 and after falling it rises to a height of h_2 , such that the ratio of speed before and after collision is 4. Find percentage loss in KE.

Options:

- (a) 6.25%
- (b) 4.34%
- (c) 10.00%
- (d) 20.00%

Answer: 93.75%

Solution:

$$u \downarrow \quad \uparrow \left(\frac{u}{4} \right)$$

$$KE_i = \frac{1}{2} mu^2$$

$$KE_f = \frac{1}{2} m \left(\frac{u}{4} \right)^2$$

$$\% \Delta KE = \frac{KE_f - KE_i}{KE_i} = \frac{\frac{1}{2} m \frac{u^2}{16} - \frac{1}{2} mu^2}{\frac{1}{2} mu^2} = \left(\frac{1}{16} - 1 \right) = \frac{-15}{16}$$

or 93.75%

Question: A body weighs 100N on surface of earth find weight of body at height $H = R/4$ from surface of earth ($R =$ radius of earth)

Options:

- (a) 50 N
- (b) 64 N
- (c) 25 N
- (d) 80 N

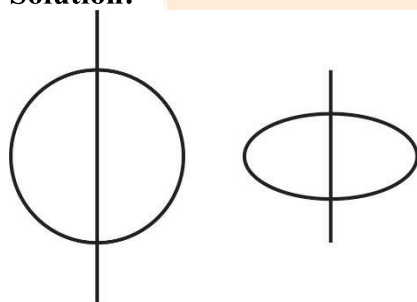
Answer: (b)

Solution:

Question: A solid sphere and a ring have equal masses and equal radii of gyration. If sphere is rotating about its diameter and ring about an axis passing through centre and perpendicular to its plane, then the ratio of radius is $\sqrt{\left(\frac{x}{2}\right)}$ then find the value of x .

Answer: 5.00

Solution:



$$m_1 = m_2$$

$$K_1 = K_2$$

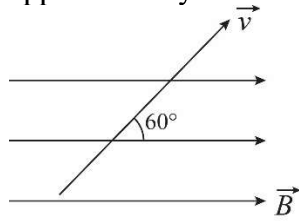
$$\sqrt{\frac{2 m_1 R_1^2}{5 m_1}} = \sqrt{\frac{m_2 R_2^2}{m_2}}$$

$$\sqrt{\frac{2}{5}} R_1 = R_2$$

$$\frac{R_1}{R_2} = \sqrt{\frac{5}{2}}$$

So $x = 5$

Question: A proton is projected with speed v in magnetic field B of magnitude 1T. If angle between velocity and magnetic field is 60° as shown below. Kinetic energy of proton is 2 eV (mass of proton = 1.67×10^{-27} kg, $e = 1.6 \times 10^{-19}$ C). The pitch of the path of proton is approximately.



Options:

- (a) 6.28×10^{-2} m
- (b) 6.28×10^{-4} m
- (c) 3.14×10^{-2} m
- (d) 3.14×10^{-4} m

Answer: (b)

Solution:

$$\begin{aligned} \text{Pitch} &= v \sin \theta T = v \cos 60^\circ \frac{2\pi m}{9\beta} \\ \Rightarrow \frac{1}{2}mv^2 &= kE \Rightarrow v = \sqrt{\frac{2KE}{m}} \\ \Rightarrow P &= \sqrt{\frac{2KE}{m}} \cdot \frac{1}{2} \cdot \frac{2\pi m}{9\beta} \\ &= \left(\sqrt{2kEm}\right) \frac{\pi}{9B} = \frac{\pi \sqrt{2 \times 2 \times 1.6 \times 10^{-19} \times 1.67 \times 10^{-27}}}{1.6 \times 10^{-19} \times 1} = 6.3 \times 10^{-4} \end{aligned}$$

Question: Find the ratio of RMS speed of oxygen molecules to that of Hydrogen molecules at same temperature

Options:

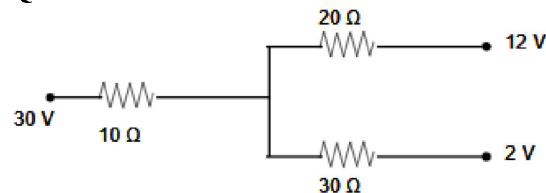
- (a) 1/4
- (b) 1/8
- (c) 1/16
- (d) 1/32

Answer: (a)

Solution:

$$\frac{V_{rms O_2}}{V_{rms H_2}} = \frac{\sqrt{\frac{3RT}{32 \times 10^{-3}}}}{\sqrt{\frac{3RT}{2 \times 10^{-3}}}} = \sqrt{\frac{2}{32}} = \frac{1}{4}$$

Question: Find current is 20 Ω resistance



Answer: 0.4

Solution:

Question: Assertion : Phase diff of two lightwave changes when 2 medium of same thickness and different RI are used.

Reason : Wavelength of wave depends upon RI of medium.

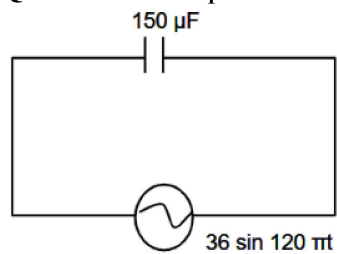
Options:

- (a) Assertion is true reason is true and reason is correct explanation of assertion
- (b) Assertion is true reason is true but reason is not correct explanation of assertion
- (c) Assertion is true reason is false
- (d) Assertion is false reason is true

Answer: (a)

Solution:

Question: Find peak value of current



Answer: 2.00

Solution:

$$C = 150 \mu F$$

$$V_0 = 36$$

$$\omega = 120\pi$$

$$i_0 = \frac{V_0}{X_C} = \frac{V_0}{1/\omega C} = (\omega C V_0)$$

$$i_0 = 120\pi \times 150 \times 10^{-6} \times 36 = 2.03$$

$$i_0 = 2A$$

Question: The temperature of an ideal gas is increased from 200K to 800K. If r.m.s. Speed of gas at 200K is V_0 , r.m.s. Speed at 800K is

Options:

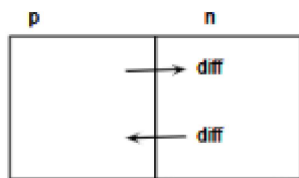
- (a) $v_0/2$
- (b) v_0
- (c) $4v_0$
- (d) $2v_0$

Answer: (d)

Solution:

Question: S1: Diffusion current is more in magnitude than drift in forward bias

S2: Diffusion current is from n to p in forward bias



Options:

- (a) S1 - True, S2 - False
- (b) S1 - false, S2 - False
- (c) S1 - True, S2 - True
- (d) S1 - false, S2 - True

Answer: (a)

Solution:

