PHYSICS

Section-1

1. An electron and proton are separated by a large distance. The electron starts approaching theproton with energy 3 eV. The proton captures the electrons and forms a hydrogen atom in secondexcited state. The resulting photon is incident on a photosensitive metal of threshold wavelength4000 Å. What is the maximum kinetic energy of the emitted photo electron?

A) 7.61 eV

B) 1.41 eV

C) 3.3 eV

D) No photo electron would be emitted

Answer: B,
Explanation:
Initially, energy of electron = +3eVfinally, in 2^{nd} excited state,

energy of electron = $-\frac{(13.6eV)}{3^2}$

= -1.51eV

Loss in energy is emitted as photon,So, photon energy $\frac{hc}{\lambda} = 4.51eV$

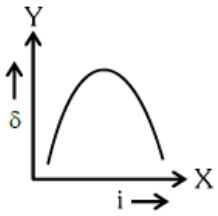
Now, photoelectric effect equation

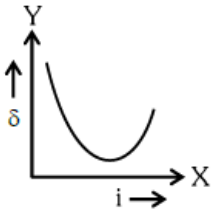
$$KE_{max} = \frac{hc}{\lambda} - \phi = 4.51 - \left(\frac{hc}{\lambda_{th}}\right)$$

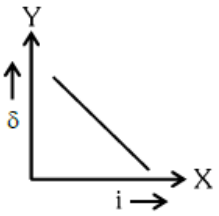
$$= 4.51eV - \frac{12400\ eV\mathring{A}}{4000\ \mathring{A}}$$

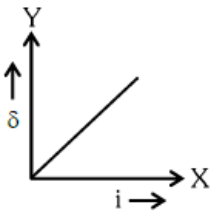
$$= 1.41eV$$

2. The expected graphical representation of the variation of angle of deviation 'δ' with angle ofincidence 'i' in a prism is :

A) 

B) 

C) 

D) 

Answer: B,
Explanation:
Standard graph between angle of deviation and incident angle

3. A raindrop with radius R = 0.2 mm falls from a cloud at a height h = 2000 m above the ground.Assume that the drop is spherical throughout its fall and the force of buoyance may be neglected,then the terminal speed attained by the raindrop is :

[Density of water f_w = 1000 kgm^{-3} and Density of air f_a = 1.2 kgm^{-3}, g = 10 m/s^2

Coefficient of viscosity of air =$1.8\times10^{-5}Nsm^{-2}$]

A) 250.6 ms^{-1}

B) 43.56ms^{-1}

C) 4.94ms^{-1}

D) 14.4ms^{-1}

Answer: C,

Explanation:

At terminal speed

a=0

$$F_{net}=0$$

$$mg = F_v = 6\pi\eta Rv$$

$$v=\frac{mg}{6\pi\eta Rv}$$

$$v=\frac{\rho_w\frac{4\pi}{3}R^3g}{6\pi\eta Rv}$$

$$=\frac{2\rho_w R^2 g}{9\eta}$$

$$=\frac{400}{81}m/s$$

= 4.94 m/s

4. **One mole of an ideal gas is taken through an adiabatic process where the temperature rises from27°C to 37°C. If the ideal gas is composed of polyatomic molecule that has 4 vibrational modes,which of the following is true?**

$[R = 8.314\ j\ mol^{-1}k^{-1}]$

A) work done by the gas is close to 332 J

B) work done on the gas is close to 582 J

C) work done by the gas is close to 582 J

D) work done on the gas is close to 332 J

Answer: B,

Explanation:

Since, each vibrational mode, corresponds to twodegrees of freedom, hence, f = 3 (trans.) + 3(rot.) +8 (vib.) = 14

$$y = 1 + \frac{2}{f}$$

$$y = 1 + \frac{2}{14} = \frac{8}{7}$$

$$W = \frac{nR\Delta T}{y-1} = -582$$

&

As W < 0. work is done on the gas.

5. An object of mass 0.5 kg is executing simple harmonic motion. It amplitude is 5 cm and timeperiod (T) is 0.2 s. What will be the potential energy of the object at an instant $t = \frac{T}{4} s$ startingfrom mean position. Assume that the initial phase of the oscillation is zero.

A) 0.62 J

B) $6.2 \times 10^{-3} J$

C) $1.2 \times 10^{3} J$

D) $6.2 \times 10^{3} J$

Answer: A,
Explanation:

$$T = 2\pi\sqrt{\frac{m}{k}}$$

$$0.2 = 2\pi\sqrt{\frac{0.5}{k}}$$

$$k = 50\pi^2$$

$$\approx 500$$

$$x = A\sin(\omega t + \phi)$$

$$= 5\ cm\ \sin(\frac{\omega T}{4} + 0)$$

$$= 5\ cm\ \sin(\frac{\pi}{2})$$

$$= 5cm$$

$$PE = \frac{1}{2}kx^2$$

$$= \frac{1}{2}(500)(\frac{5}{100})^2$$

$$= 0.6255$$

6. Match List I with List II.List-I List-II

(a) Capacitance, C (i)$M^1L^1T^{-3}A^{-1}$

(b) Permittivity of free space,ε_0 (ii)$M^{-1}L^{-3}T^4A^2$

(c) Permeability of free space,μ_0 (iii)$M^{-1}L^{-2}T^4A^2$

(d) Electric field, E (iv)$M^1L^1T^{-2}A^{-2}$

Choose the correct answer from the options givenbelow

A) (a) → (iii), (b) → (ii), (c) → (iv), (d) → (i)

B) (a) → (iii), (b) → (iv), (c) → (ii), (d) → (i)

C) (a) → (iv), (b) → (ii), (c) → (iii), (d) → (i)

D) (a) → (iv), (b) → (iii), (c) → (ii), (d) → (i)

Answer: A,

Explanation:

$$q = CV$$

$$[C] = [\frac{q}{v}] = \frac{(A \times T)^2}{ML^2T^{-2}}$$

$$= M^{-1}L^{-2}T^4A^2$$

$$[E] = [\frac{F}{q}] = \frac{MLT^{-2}}{AT}$$

$$= MLT^{-3}A^{-1}$$

$$F = \frac{q_1q_2}{4\pi\epsilon_0 r^2}$$

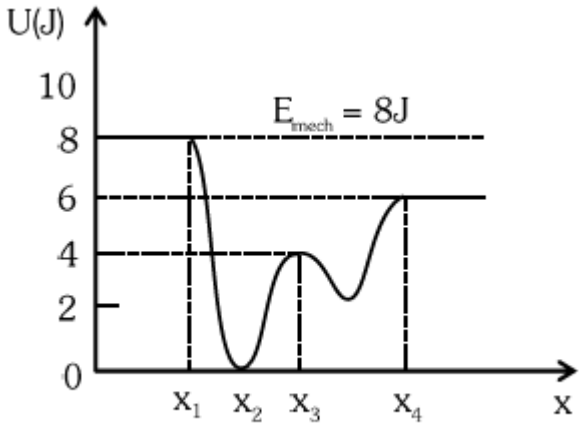
$$\text{Speed of light c} = \frac{1}{\sqrt{\mu_0\epsilon_0}}$$

$$\mu_0 = \frac{1}{\epsilon_0 c^2}$$

$$[\mu_0] = \frac{1}{[M^{-1}L^{-3}T^4A^2][LT^{-1}]^2}$$

$$= [M^1L^1T^{-2}A^{-2}]$$

7. Given below is the plot of a potential energy function U(x) for a system, in which a particle is inone dimensional motion, while a conservative force F(x) acts on it. Suppose that $E_{mech} = 8J$, theincorrect statement for this system is :



[where K.E. = kinetic energy]

A) at $x > x_4$, K.E. is constant throughout the region.

B) at $x > x_1$, K.E. is smallest and the particle ismoving at the slowest speed.

C) at $x = x_2$, K.E. is greatest and the particle ismoving at the fastest speed.

D) at $x = x_3$ K.E. = 4 J.

Answer: B,

Explanation:

$E_{mech} = 8J$

$(A) at\ x > x_4\ U = \text{constant} = 6J$

$K = E_{mech} - U = 2J = \text{constant}$

$(B) at\ x < x_1\ U = \text{constant} = 8J$

$K = E_{mech} - U = 8 - 8 = 0\ J$

Particle is at rest

$(C)\ At\ x = x_2, U = 0 \Rightarrow E_{mech} = K = 8J$

KE is greatest, and particle is moving at fastest speed.

$(D)\ At\ x = x_3\ U = 4\ J$

$U + K = 8J$

$K = 4J$

8. A 100Ω resistance, a 0.1 μ F capacitor and an inductor are connected in series across a 250 Vsupply at variable frequency. Calculate the value of inductance of inductor at which resonance willoccur. Given that the resonant frequency is 60 Hz.

A) 0.70 H

B) 70.3 mH

C) $7.03\times10^{-5}H$

D) 70.3 H

Answer: D,
Explanation:

$C = 0.1\,\mu F = 10^{-7} F$

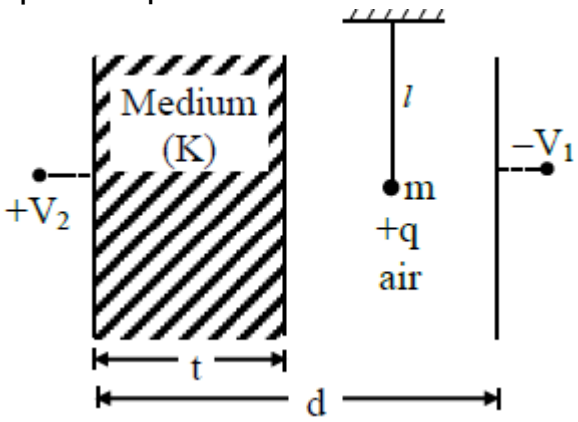
Resonant frequency $= 60\,Hz$

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$2\pi f_0 = \frac{1}{\sqrt{LC}} \Rightarrow L = \frac{1}{4\pi^2 f_0^2 C}$$

by putting values $L \simeq 70.3\,Hz$

9. **A simple pendulum of mass 'm', length 'l' and charge '+q' suspended in the electric field produced by twoconducting parallel plates as shown. The value of deflection of pendulum in equilibrium position will be**



A) $\tan^{-1}[\frac{q}{mg}\times\frac{C_1(V_2-V_1)}{(C_1+C_2)(d-t)}]$

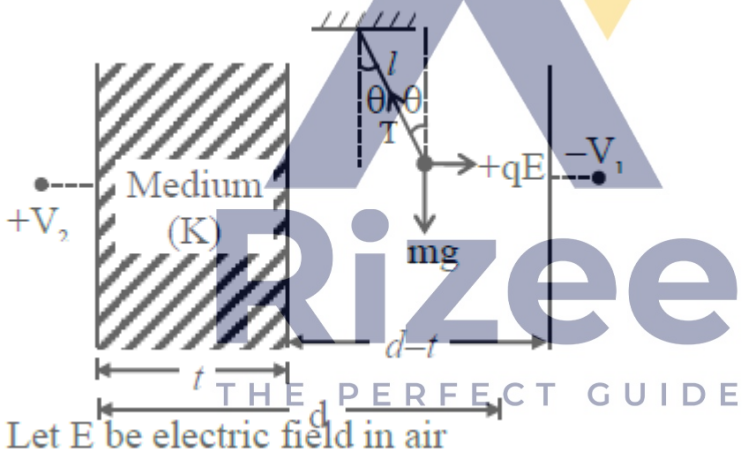
B) $\tan^{-1}[\frac{q}{mg}\times\frac{C_2(V_2-V_1)}{(C_1+C_2)(d-t)}]$

C) $\tan^{-1}[\frac{q}{mg}\times\frac{C_2(V_2+V_1)}{(C_1+C_2)(d-t)}]$

D) $\tan^{-1}[\frac{q}{mg}\times\frac{C_1(V_1+V_2)}{(C_1+C_2)(d-t)}]$

Answer: C,

Explanation:

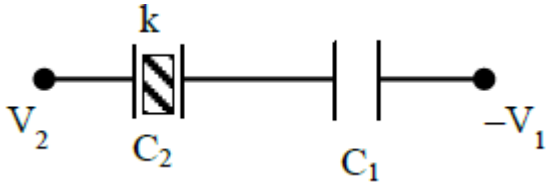


Let E be electric field in air

$T\sin\theta = qE$

$T\cos\theta = mg$

$\tan\theta = \frac{qE}{mg}$



$$Q=[\frac{C_1C_2}{C_1+C_2}][V_1+V_2]$$

$$E=\frac{Q}{A\in_0}=[\frac{C_1C_2}{C_1+C_2}]\frac{[V_1+V_2]}{A\in_0}$$

$$C_1=\frac{\in_0 A}{d-t}\Rightarrow E=\frac{C_2[V_1+V_2]}{(C_1+C_2)(d-t)}$$

$$Now\,\theta=\tan^{-1}[\frac{q.E}{mg}]$$

$$\theta=\tan^{-1}[\frac{q}{mg}\times\frac{C_2(V_1+V_2)}{(C_1+C_2)(d-t)}]$$

10. Two Carnot engines A and B operate in series such that engine A absorbs heat at T_1 and rejects heat toa sink at temperature T. Engine B absorbs half of the heat rejected by Engine A and rejects heat tothe sink at T_3. When work done in both the cases is equal, to value of T is :

A) $\frac{2}{3}T_1+\frac{3}{2}T_3$

B) $\frac{1}{3}T_1+\frac{2}{3}T_3$

C) $\frac{3}{2}T_1+\frac{1}{3}T_3$

D) $\frac{2}{3}T_1+\frac{1}{3}T_3$

Answer: D,
Explanation:

$$W_A=1-\frac{Q_2}{Q_1}=1-\frac{T}{T_1}\Rightarrow\frac{Q_2}{Q_1}=\frac{T}{T_1}$$

$$W_B=1-\frac{Q_3}{(Q_2/2)}=1-\frac{T_3}{T}\Rightarrow\frac{2Q_3}{Q_2}=\frac{T_3}{T}$$

$$Now,\,W_A=W_B$$

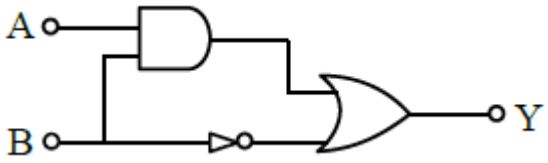
$$Q_1-Q_2=\frac{Q_2}{2}-Q_3$$

$$\Rightarrow\frac{2Q_1}{Q_2}+\frac{2Q_3}{Q_2}=3$$

$$\Rightarrow\frac{2T_1}{T}+\frac{T_3}{T}=3$$

$$\frac{2T_1}{3}+\frac{T_3}{3}=T$$

11. Find the truth table for the function Y of A and B represented in the following figure.



A)

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	0

B)

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	1

C)

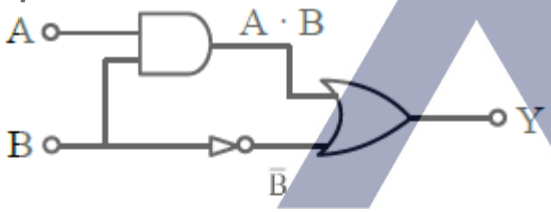
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

D)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

Answer: B,

Explanation:



$$Y = A \cdot B + \bar{B}$$

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	1

12. Figure A and B shown two long straight wires of circular cross-section (a and b with a < b), carryingcurrent I which is uniformly distributed across the cross-section. The magnitude of magnetic field Bvaries with radius r and can be represented as :

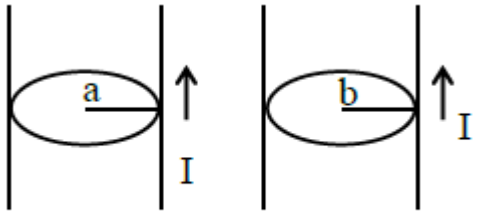
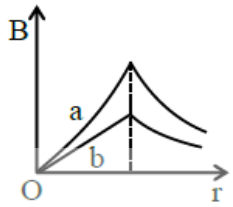
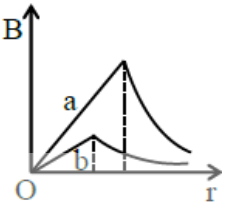
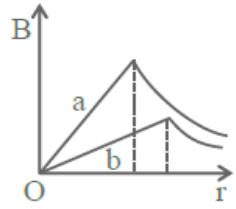
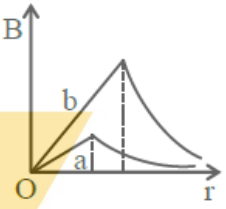


Fig. A Fig. B

A) 

B) 

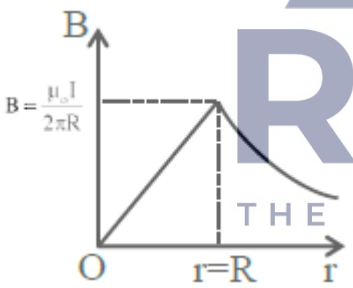
C) 

D) 

Answer: C,

Explanation:

Graph for wire of radius R :



$As\ b > a$

$B_a > B_b$

$$B_a = \frac{\mu_0 i}{2\pi a}$$

$$B_b = \frac{\mu_0 i}{2\pi b}$$

13. Two identical particles of mass 1 kg each go round a circle of radius R, under the action of theirmutual gravitational attraction. The angular speed of each particle is :

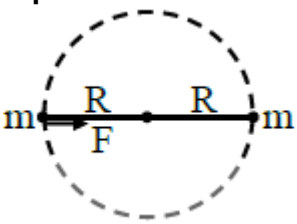
A) $\sqrt{\frac{G}{2R^3}}$

B) $\frac{1}{2}\sqrt{\frac{G}{R^3}}$

C) $\frac{1}{2R}\sqrt{\frac{1}{G}}$

D) $\sqrt{\frac{2G}{R^3}}$

Answer: B,
Explanation:



$$F = \frac{Gm^2}{(2R)^2} = mR\omega^2$$

$$\omega = \frac{1}{2}\sqrt{\frac{G}{R^3}}$$

14. Consider the following statements :A. Atoms of each element emit characteristicsspectrum.B. According to Bohr's Postulate, an electron in ahydrogen atom, revolves in a certain stationaryorbit.C. The density of nuclear matter depends on thesize of the nucleus.D. A free neutron is stable but a free proton decayis possible.E. Radioactivity is an indication of the instabilityof nuclei.Choose the correct answer from the options givenbelow :

A) A, B, C, D and E

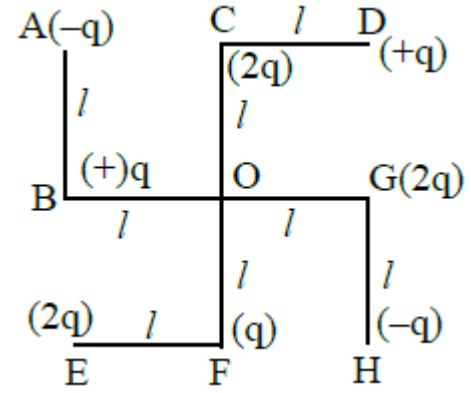
B) A, B and E only

C) B and D only

D) A, C and E only

Answer: B,
Explanation:
(A) True, atom of each element emits characteristicspectrum.(B) True, according to Bohr's postulates $mvr = \frac{nh}{2\pi}$ **and hence electron resides intoorbits of specific radius called stationary orbits.(C) False, density of nucleus is constant(D) False, A free neutron is unstable decays intoproton and electron and anti neutrino.(E) True unstable nucleus show radioactivity.**

15. What will be the magnitude of electric field at point O as shown in figure? Each side of the figureis l and perpendicular to each other?



A) $\frac{1}{4\pi\varepsilon_0}\frac{q}{l^2}$

B) $\frac{1}{4\pi\varepsilon_0}\frac{q}{(2l^2)}(2\sqrt{2}-1)$

C) $\frac{q}{4\pi\varepsilon_0(2l)^2}$

D) $\frac{1}{4\pi\varepsilon_0}\frac{2q}{2l^2}(\sqrt{2})$

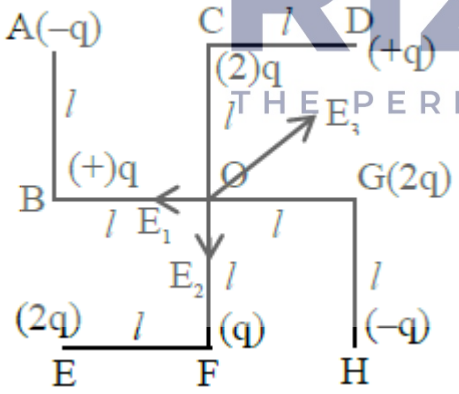
Answer: B,

Explanation:

$$E_1 = \frac{kq}{l^2} = E_2$$

$$E_3 = \frac{kq}{(\sqrt{2}l)^2} = \frac{kq}{2l^2}$$

$$E = \frac{\sqrt{2}kq}{l^2} - \frac{kq}{2l^2} = \frac{kq}{2l^2}(2\sqrt{2}-1)$$



16. A physical quantity 'y' is represented by the formula $y = m^2 r^{-4} g^x l^{-\frac{3}{2}}$ If the percentage errors found in y, m, r, l and g are 18, 1, 0.5, 4 and p respectively, then find the value of x and p.

A) 5 and ±2

B) 4 and ±3

C) $\frac{16}{3}$ and $\pm\frac{3}{2}$

D) 8 and ±2

Answer: C,
Explanation:

$$\frac{\Delta y}{y} = \frac{2\Delta m}{m} + \frac{4\Delta r}{r} + \frac{x\Delta g}{g} + \frac{3}{2}\frac{\Delta l}{l}$$

$$18 = 2(1) + 4(0.5) + xp + \frac{3}{2}(4)$$

$$8 = xp$$

By checking from options

$$x = \frac{16}{3}, p = \pm\frac{3}{2}$$

17. An automobile of mass 'm' accelerates starting from origin and initially at rest, while the enginesupplies constant power P. The position is given as a function of time by :

A) $(\frac{9P}{8m})^{\frac{1}{2}} t^{\frac{3}{2}}$

B) $(\frac{8P}{9m})^{\frac{1}{2}} t^{\frac{2}{3}}$

C) $(\frac{9m}{8P})^{\frac{1}{2}} t^{\frac{3}{2}}$

D) $(\frac{8P}{9m})^{\frac{1}{2}} t^{\frac{3}{2}}$

Answer: D,
Explanation:

$$P = const$$

$$P = Fv = \frac{mv^2 dv}{dx}$$

$$\int_0^x \frac{P}{m} dx = \int_0^v v^2 dv$$

$$\frac{Px}{m} = \frac{v^3}{3}$$

$$(\frac{3Px}{m})^{1/3} = v = \frac{dx}{dt}$$

$$(\frac{3P}{m})^{1/3} \int_0^t dt = \int_0^x x^{-1/3} dx$$

$$\Rightarrow x = (\frac{8P}{9m})^{1/2} t^{3/2}$$

18. The planet Mars has two moons, if one of them has a period 7 hours, 30 minutes and an orbital radiusof $9.0\times10^{3}km$. Find the mass of Mars.

{Given $\frac{4\pi^2}{G}=6\times10^{11}N^{-1}m^{-2}kg^{2}$}

A) $5.96\times10^{19}kg$

B) $3.25\times10^{21}kg$

C) $7.02\times10^{25}kg$

D) $6.00\times10^{23}kg$

Answer: D,
Explanation:
Option D is correct

$$T^2=\frac{4\pi^2}{GM}.r^3$$

$$M=\frac{4\pi^2}{G}.\frac{r^3}{T^2}$$

by putting values

$$M=6\times10^{23}$$

19. A particle of mass M originally at rest is subjected to a force whose direction is constant butmagnitude varies with time according to the relation

$$F=F_0[1-(\frac{t-T}{T})^2]$$

Where F_0 and T are constants. The force acts only for the time interval 2T. The velocity v of theparticle after time 2T is :

A) $2F_0T/M$

B) $F_0T/2M$

C) $4F_0T/3M$

D) $F_0T/3M$

Answer: C,
Explanation:

$$t=0,\ u=0$$

$$a=\frac{F_0}{M}-\frac{F_0}{MT^2}(t-T)^2=\frac{dv}{dt}$$

$$\int_0^v dv=\int_{t=0}^{2T}(\frac{F_0}{M}-\frac{F_0}{MT^2}(t-T)^2)dt$$

$$V=[\frac{F_0}{M}t]_0^{2T}-\frac{F_0}{MT^2}[\frac{t^3}{3}-t^2T+T^2t]_0^{2T}$$

$$V=\frac{4F_0T}{3M}$$

20. **The resistance of a conductor at 15°C is 16Ω and at 100°C is $20\,\Omega$. What will be the temperaturecoefficient of resistance of the conductor?**

A) $0.010^{o}C^{-1}$

B) $0.033^{o}C^{-1}$

C) $0.003^{o}C^{-1}$

D) $0.042^{o}C^{-1}$

Answer: C,
Explanation:

$16 = R_0[1+\alpha(15-T_0)]$

$20 = R_0[1+\alpha(100-T_0)]$

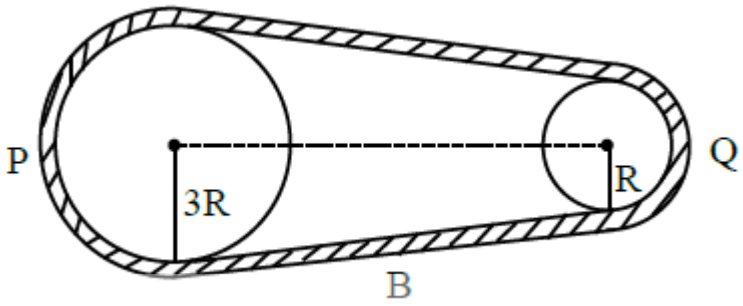
Assuming $T_0 = 0^{o}C$, *as a general convention*

$$\Rightarrow \frac{16}{20} = \frac{1+\alpha\times 15}{1+\alpha\times 100}$$

$\Rightarrow \alpha = 0.003\,^{o}C^{-1}$

Section-2

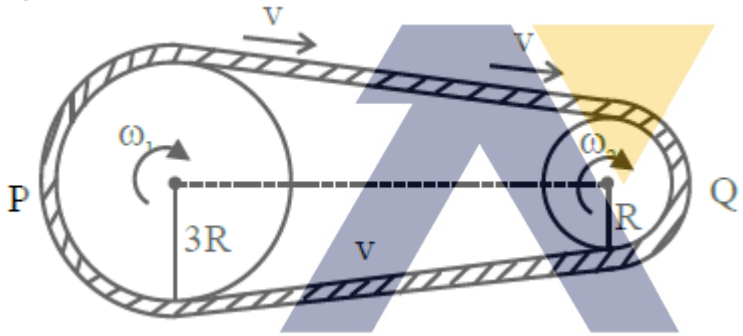
21. In the given figure, two wheels P and Q are connected by a belt B. The radius of P is threetimes as that of Q. In case of same rotational kinetic energy, the ratio of rotational inertias $\left(\frac{I_1}{I_2}\right)$ will be x : 1. The value of x will be _____.



Answer: _____

Answer: 9

Explanation:



$$\frac{1}{2}I_1(\omega_1)^2 = \frac{1}{2}I_2(\omega_2)^2$$

$$I_1\left(\frac{v}{3R}\right)^2 = I_2\left(\frac{v}{R}\right)^2$$

$$\frac{I_1}{I_2} = \frac{9}{1}$$

22. The difference in the number of waves when yellow light propagates through air and vacuumcolumns of the same thickness is one. The thickness of the air column is _____ mm. [Refractive index of air = 1.0003, wavelength of yellow light in vacuum = 6000 Å]

Answer: _____

Answer: 2

Explanation:

Thickness $t = n\lambda$

$$So, n\,\lambda_{vac} = (n+1)\lambda_{air}$$

$$n\,\lambda = (n+1)\frac{\lambda}{\mu_{air}}$$

$$n = \frac{1}{\mu_{air} - 1} = \frac{10^4}{3}$$

$$t = n\lambda$$

$$= \frac{10^4}{3} \times 6000\ \text{Å}$$

$$= 2\,mm$$

23. The maximum amplitude for an amplitude modulated wave is found to be 12V while theminimum amplitude is found to be 3V. The modulation index is 0.6x where x is _____.

Answer: _____

Answer: 1

Explanation:

$$A_{max} = A_c + A_m = 12$$

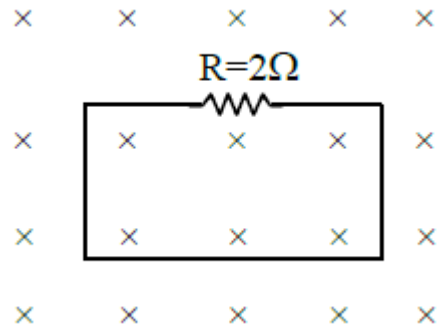
$$A_{min} = A_c - A_m = 3$$

$$\Rightarrow A_c = \frac{15}{2} \& A_m = \frac{9}{2}$$

$$\text{modulation index} = \frac{A_m}{A_c} = \frac{9/2}{15/2} = 0.6$$

$$\Rightarrow x = 1$$

24. In the given figure the magnetic flux through the loop increases according to the relation $\phi_B(t) = 10t^2 + 20t$, where ϕ_B is in milli webers and t is in seconds.The magnitude of current through R = 2Ω resistorat t = 5 s is _____ mA.



Answer: _____

Answer: 60

Explanation:

$$|\in| = \frac{d\phi}{dt} = 20t + 20\,mV$$

$$|i| = \frac{|\in|}{R} = 10t + 10\,mA$$

$$at\ t = 5$$

$$|i| = 60\,mA$$

25. A particle executes simple harmonic motion represented by displacement function as$x(t)=A\sin(\omega t+\varphi)$If the position and velocity of the particle at t = 0 s are 2 cm and2ω cm s^{-1} respectively, then its amplitude is$x$2 cm where the value of x is ____.

Answer: _____

Answer: 2

Explanation:

$$x(t) = A\sin(\omega t + \phi)$$

$$v(t) = A\omega\cos(\omega t + \phi)$$

$$2 = A\sin\phi \ldots\ldots(1)$$

$$2\omega = A\omega\cos\phi \ldots\ldots(2)$$

From (1) *and* (2)

$$\tan\phi = 1$$

$$\phi = 45^0$$

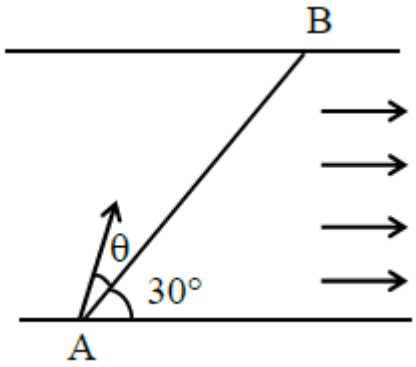
Putting value of ϕ *in equation* (1)

$$2 = A\{\frac{1}{\sqrt{2}}\}$$

$$A = 2\sqrt{2}$$

$$x = 2$$

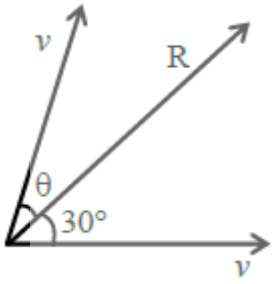
26. A swimmer wants to cross a river from point A to point B. Line AB makes an angle of 30° with theflow of river. Magnitude of velocity of the swimmer is same as that of the river. The angle θ with the line AB should be ____°, so that the swimmer reaches point B.



Answer: _____

Answer: 30

Explanation:



Both velocity vectors are of same magnitudetherefore resultant would pass exactly midwaythrough them

$\theta = 30^{o}$

27. For the circuit shown, the value of current at time t = 3.2 s will be _____ A.

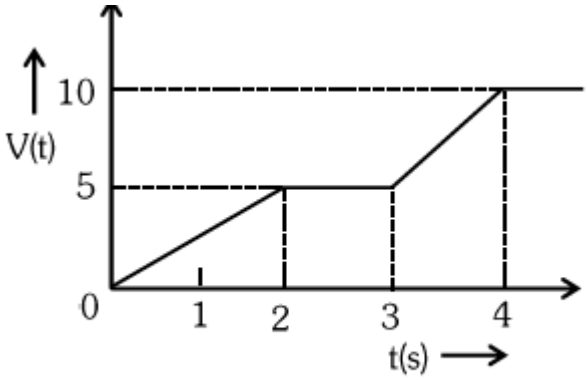


Figure 1

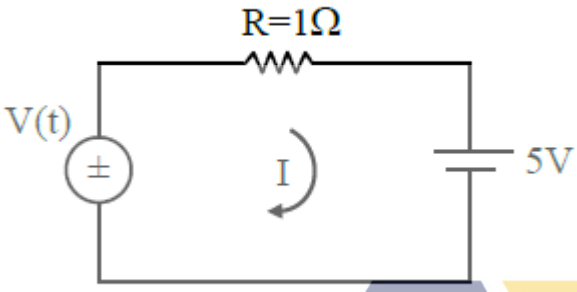


Figure-2

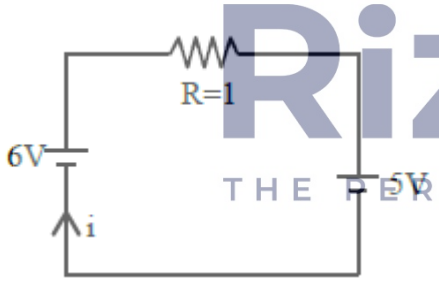
[Voltage distribution V(t) is shown by Fig. (1) andthe circuit is shown in Fig. (2)]

Answer: _____

Answer: 1

Explanation:

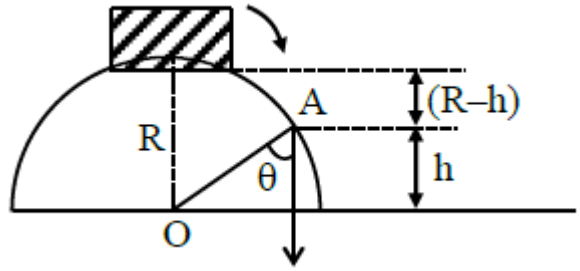
From graph voltage at t = 3.2 sec is 6 volt.



$$i = \frac{6-5}{1}$$

$$i = 1A$$

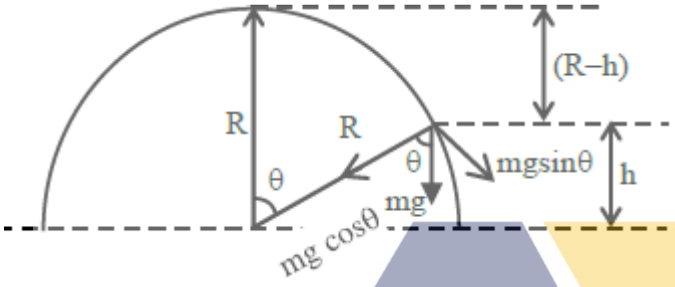
28. A small block slides down from the top of hemisphere of radius R = 3 m as shown in thefigure. The height 'h' at which the block will lose contact with the surface of the sphere is ____m. (Assume there is no friction between the block and the hemisphere)



Answer: _____

Answer: 2

Explanation:



$$mg\cos\theta = \frac{mv^2}{R} \quad .....(1)$$

$$\cos\theta = \frac{h}{R}$$

Energy conservation

$$mg\{R-h\} = \frac{1}{2}mv^2 \quad .....(2)$$

$$from\ (1)\&(2) \Rightarrow mg\{\frac{h}{R}\} = \frac{2mg\{R-h\}}{R}$$

$$h = \frac{2R}{3} = 2m$$

29. The K_α X-ray of molybdenum has wavelength 0.071 nm. If the energy of a molybdenum atomswith a K electron knocked out is 27.5 keV, the energy of this atom when an L electron is knockedout will be _____ keV. (Round off to the nearest integer)

$[h = 4.14 \times 10^{-15} eVs, c = 3 \times 10^{8} ms^{-1}]$

Answer: _____

Answer: 10

Explanation:

$$E_{k_\alpha} = E_k - E_L$$

$$\frac{hc}{\lambda_{k\alpha}} = E_k - E_L$$

$$E_L = E_k - \frac{hc}{\lambda_{k_\alpha}}$$

$$= 27.5KeV - \frac{12.42 \times 10^{-7} \text{eVm}}{0.071 \times 10^{-9} m}$$

$$E_L = (27.5 - 17.5) keV$$

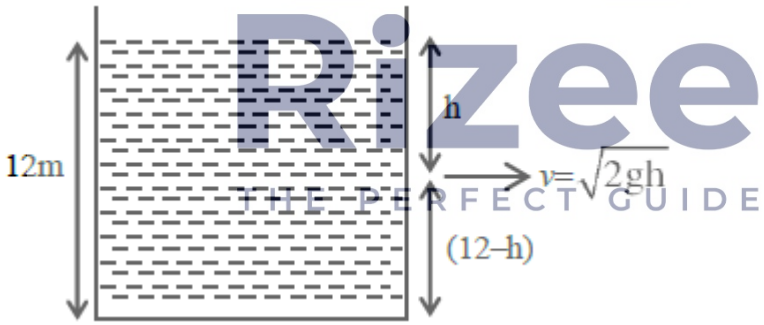
$$= 10\, keV$$

30. The water is filled upto height of 12 m in a tank having vertical sidewalls. A hole is made in one ofthe walls at a depth 'h' below the water level. The value of 'h' for which the emerging stream of waterstrikes the ground at the maximum range is ___ m.

Answer: _____

Answer: 6

Explanation:



$$R = \sqrt{2gh} \times \sqrt{\frac{(12-h) \times 2}{g}}$$

$$\sqrt{4h(12-h)} = R$$

For maximum R

$$\frac{dR}{dh} = 0$$

$$\Rightarrow h = 6m$$