PHYSICS

BOOKS - JEE MAINS PREVIOUS YEAR ENGLISH

JEE MAINS 2020

Physics

1. If x and y are arbitrary intensive variables, then

A. 0.44

B. 1.25

C. 1.5

D. 2.25

Answer:

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2. A plane electromagnetic wave , has frequency of 2.0×10^{10} Hz and its energy density is $1.02 \times 10^{-8} J/m^3$ in vacuum. The amplitude of the magnetic field of the wave is close to $\left(\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \frac{Nm^2}{C^2} \text{ and } \text{speed of light } = 3 \times 10^8 ms^{-1} \right)$:

A. 190nT

B. 180 nT

C. 160nT

D. 150 nT

Answer:

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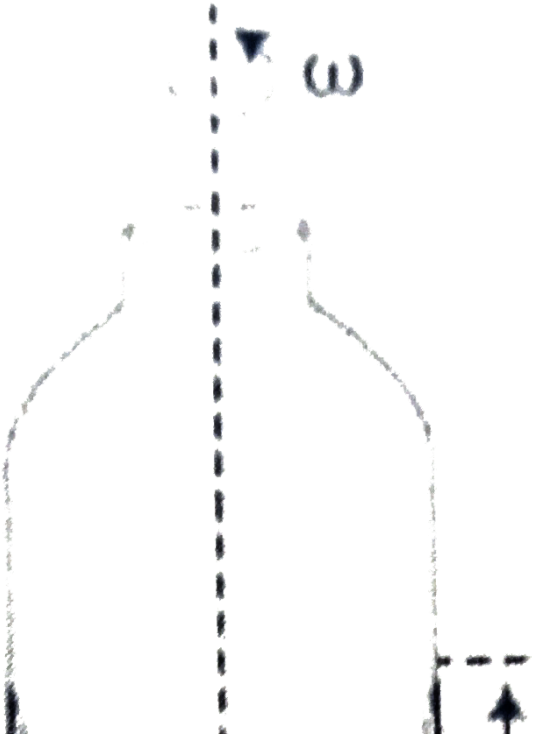
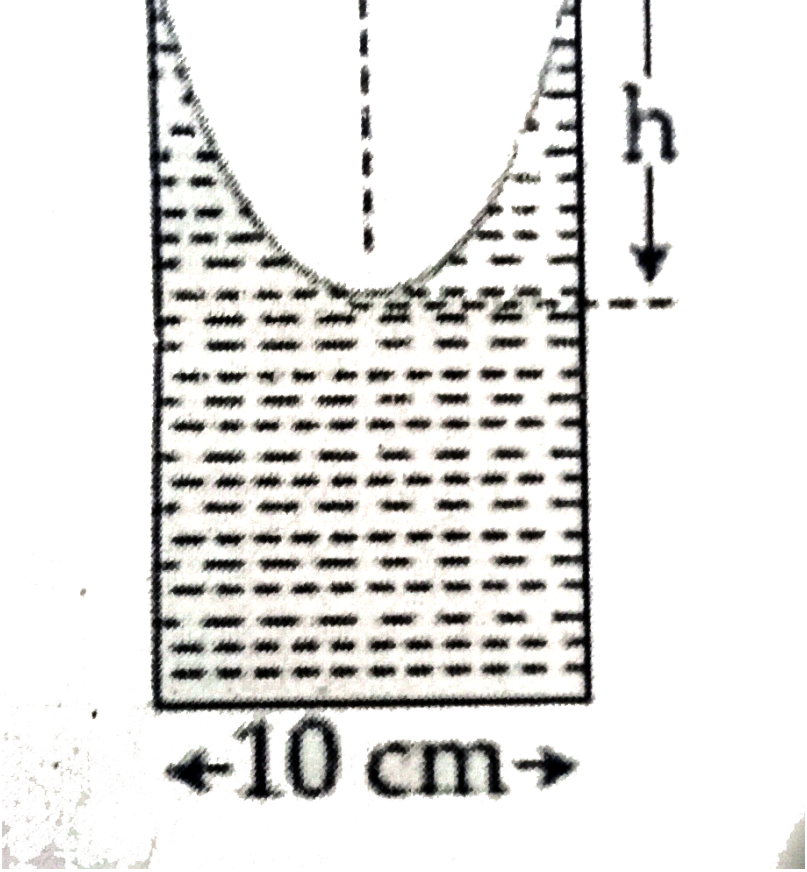
3. A cylindrical vessel containing a liquid is rotated about its axis so that the liquid rises at its sides as shown in the figure . The radius of vessel is 5 cm and the angular speed of rotation is ω rad s^{-1}. The difference in the height , h (in cm) of liquid at the centre of vessel and at the side will be :





A. $\frac{25\omega^2}{2g}$

B. $\frac{2\omega^2}{25g}$

C. $\frac{2\omega^2}{5g}$

D. $\frac{5\omega^2}{2g}$

Answer:

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4. The mass density of a spherical galaxy varies as $\frac{K}{r}$ over a large distance 'r' from its centre . In that region , a small star is in a circular orbit of radius R . Then the period of revolution , T depends on R as :

A. $T \propto R$

B. $T^2 \propto R$

C. $T^2 \propto \frac{1}{R^3}$

D. $T^2 \propto R^3$

Answer:

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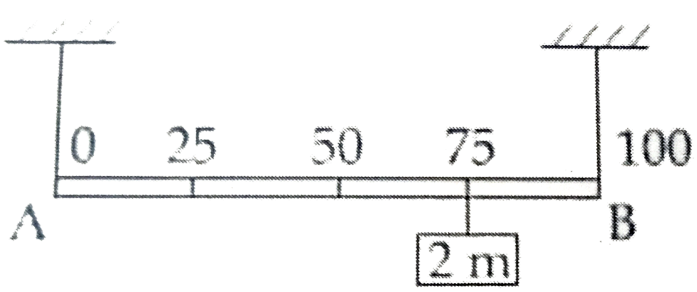

5.

Shown in the figure is rigid and uniform one meter long rod AB held in horizontal position by two strings tied to its ends and attached to the ceiling . The rod is of mass 'm' and has another weight of mass 2 m hung at a distance of 75 cm from A . The tension in the string at A is :

A. 0.75 mg

B. 0.5mg

C. 1mg

D. 2mg

Answer:

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6. Interference fringes are observed on a screen by illuminating two thin slits 1 mm apart with a light source $(\lambda = 632.8nm)$. The distance between the screen and the slits is 100 cm. If a bright fringes is observed on a screen at a distance of 1.27 mm from the central bright fringe , then the path difference between the waves , which are reaching this point from the slits is close to :

A. 1.27 μm

B. $2.05\mu m$

C. $2nm$

D. 2.87 nm

Answer:

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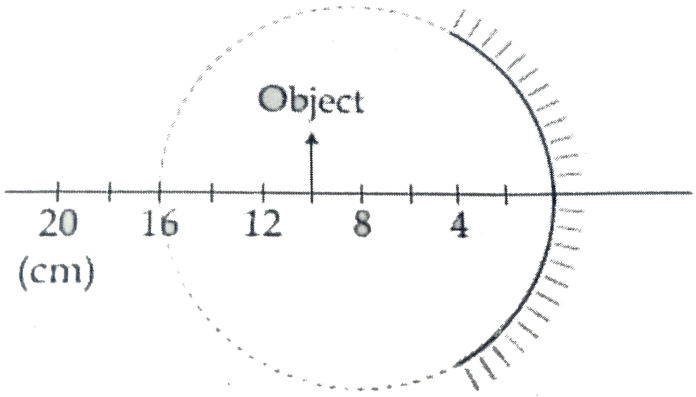

7.

A spherical mirror is obtained as shown in the figure from a hollow glass sphere. If an object is positioned in front of the mirror, what will be the nature and magnification of the image of the object ? (Figure drawn as schematic and not to scale)

A. Inverted , real and unmagnified

B. Erect , virtual and magnified

C. Inverted , real and magnified

D. Erect , virtual and unmagnified

Answer:

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8. A gas mixture consists of 3 moles of oxygen and 5 moles of argon at temperature T . Assuming the gases to be ideal and the oxygen bond to be rigid, the total internal energy (in units of RT) of the mixture is :

A. 11

B. 13

C. 20

D. 15

Answer:

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9. A particle of mass m with an initial velocity $u\hat{i}$ collides perfectly elastically with a mass 3 m at rest . It moves with a velocity $v\hat{j}$ after collision , then , v is given by :

A. $v = \sqrt{\frac{2}{3}}u$

B. $v = \frac{1}{\sqrt{6}}$u

C. $v = \frac{u}{\sqrt{3}}$

D. $v = \frac{u}{\sqrt{2}}$

Answer:

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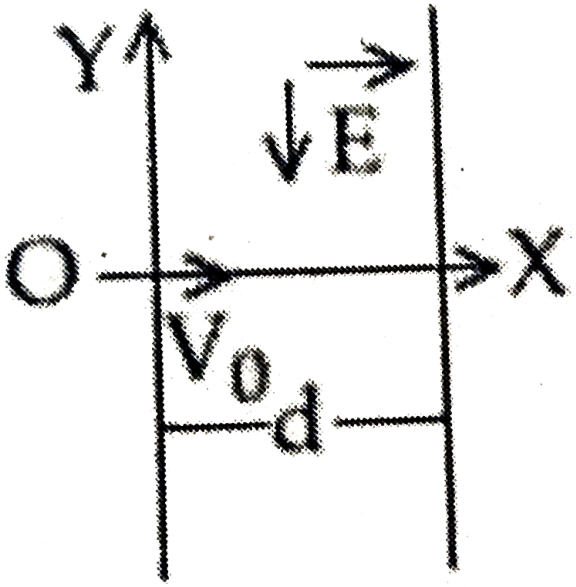
10. A charged particle (mass m and charge q) moves along X axis with velocity V_0 . When it passes through the origin it enters a region having uniform electric field $\overrightarrow{E} = -E\hat{j}$ which extends upto x=d . Equation of path of electron in the region . $x > d$ is :



A. $y = \frac{qEd}{mV_0^2}\left(\frac{d}{2} - x\right)$

B. $y = \frac{qEd}{mV_0^2}(x - d)$

C. $y = \frac{qEd^2}{mV_0^2}x$

D. $y = \frac{qEd}{mV_0^2}x$

Answer:

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11. An amplitude modulated wave is represented by the expression

$v_m = 5(1 + 0.6\cos 6280t)\sin\left(211 \times 10^4 t\right)$ volts.

The miniumum and maximum amplitudes of the amplitude modulated wave are , respectively :

A. 3V ,5V

B. 2V,8V

C. $\frac{5}{2}V, 8V$

D. $\frac{3}{2}V, 5V$

Answer:

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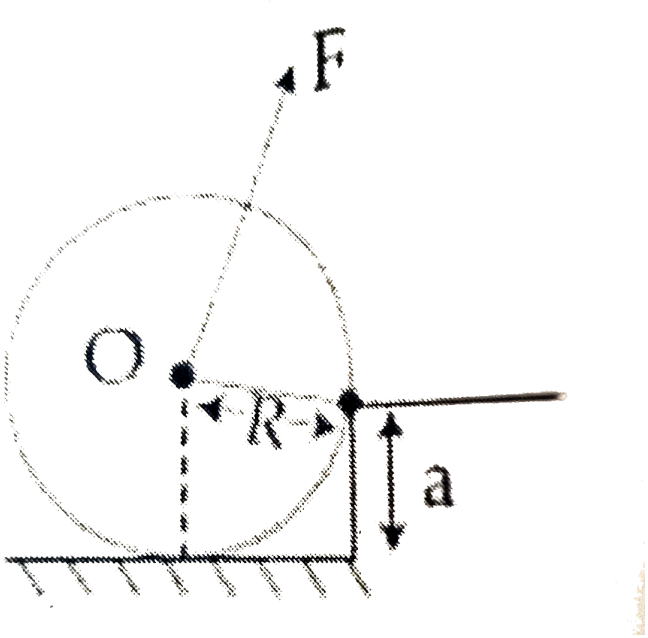
12. A uniform cylinder of mass M and radius R is to be pulled over a step of height a $(a < R)$ by applying a force F at its centre O perpendicular to the plane through the axes of the cylinder on the edge of the step (see figure) . The minimum

value of F required is :



A. $M\frac{g(a)}{R}$

B. $Mg\sqrt{\left(\frac{R}{R-a}\right)^2-1}$

C. $Mg\sqrt{1-\frac{a^2}{R^2}}$

D. $Mg\sqrt{1-\left(\frac{R-a}{R}\right)^2}$

Answer:

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13. In reactor 2, kg of $_{92}U^{235}$ fuel is fully used up in 30 days . The energy released per fission is 200 MeV. Given that the Avogadro number , $N = 6.023 \times 10^{26}$ per kilo mole and $1eV = 1.6 \times 10^{-19}J$. The power output of the reactor is close to

A. 125 MW

B. 54 MW

C. 35 MW

D. 60 MW

Answer:

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14. Order of resistivity for aluminium, mercury, copper and tungsten is

A. $\rho C > \rho A > \rho r$

B. $\rho A > \rho M > \rho C$

C. $\rho A > \rho T > \rho C$

D. $\rho M > \rho A > \rho C$

Answer:

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15. A beam of protons moving with a velocity of $4 \times 10^5 \frac{m}{s}$ enters a uniform magnetic field of 0.3 T at an angle of 60◦ with the magnetic field. What is the radius of the helical path

described by the proton beam? $[m_p = 1.67 \times 10^{-27} kg$ and the charge on the proton $= 1.6 \times 10^{-19}$C]

A. 2 cm

B. 1.2 cm

C. 4 cm

D. 5 cm

Answer:

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16. Train A and train B are running on parallel trackes in the opposite directions with speeds of 36 km/ hour and 72 km / hour respectively . A person is walking in train A in the direction opposite to its motion with a speed of 1.8 km / hour.

Speed $\left(\text{in} ms^{-1}\right)$ of this person as observed from train B will be close to : (take the distance between the tracks as negligible)

A. $29.5ms^{-1}$

B. $30.5ms^{-1}$

C. $31.5ms^{-1}$

D. $28.5ms^{-1}$

Answer:

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17. The least count of the main scale of vernier callipers is 1 mm. Its vernier scale is divided into 10 divisions and coincide with 9 division of the main scale. When jaws are touching each other,

the 7^{th} division of main scale and zero of main scale. When this vernier is used to measure lenght of a cylinder the zero of the vernier scales between 3.1 cm and 3.2 cm and 4^{th} VSD coincider with a main scale division . The lehgth of the cylinder is : (VSD is vernier scale division)

A. 2.99 cm

B. 3.2 cm

C. 3.07 cm

D. 3.21 cm

Answer:

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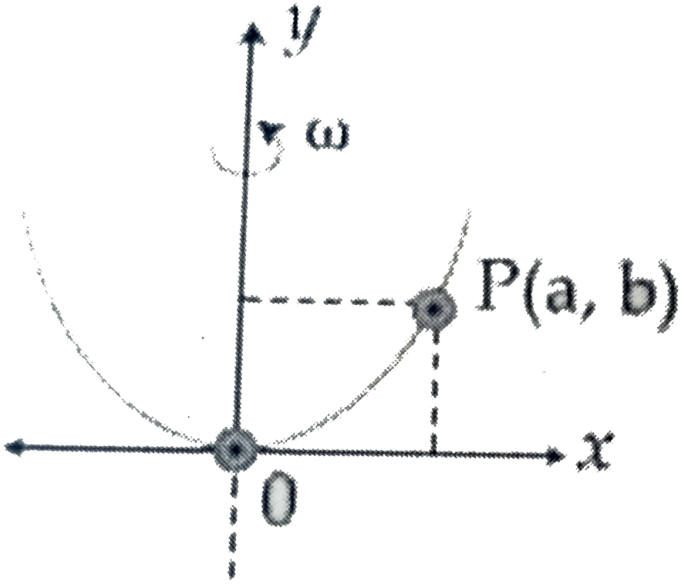
18. A bead of mass m stays at point P (a,b) on a wire bent in the shape of a parabola $y = 4Cx^2$ and rotating with angular speed ω (see figure) . The value of ω is (neglect friction),



A. $2\sqrt{gC}$

B. $2\sqrt{2gC}$

C. $\sqrt{\frac{2gC}{ab}}$

D. $\sqrt{\frac{2g}{C}}$

Answer:

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19. If speed (V),acceleration (A) and force (F) are considered as fundamental units, the dimesnion of Young 's modulus will be :

A. FA^2V^{-2}

B. FA^2V^{-1}

C. FA^2V^{-3}

D. $FA^{-1}V^0$

Answer:

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20. Magnetic materials used for making permanent magnets (P) and magnets in a transformer (T) have different properties of the following , which property best matches for the type of magnet required ?

A. T: Large retentivity, small coercivity

B. T: Large retentivity, large coercivity

C. P: Small retentivity, large coercitvity

D. P: Large retentivity, large coercivity

Answer:

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21. When radiation of wavelength λ is used to illuminate a metallic surface , the stopping potential is V. When the same

suface is illuminated with radiation of wavelength 3λ the stopping is $\frac{V}{4}$. If the therehold wavelength for the metallic

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22. A $5\mu F$ capacitor is charged fully by a 220 V supply. It is then disconnected from the supply and is connected in series to another uncharged 2.5 μF capacitor . If the energy change during the charge redistribution is $\frac{X}{100}$ J then value of X to the nearest interger is _____.

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23. A circular coil of radius 10 cm is placed in uniform magnetic field of 3.0×10^{-5} T with its plane perpendicular to the field initially. It is rotated at constant angular speed about an axis

along the diameter of coil and perpendicular to magnetic field so that it undergoes half of rotation in 0.2s. The maximum value of EMF induced $(\text{in}\mu V)$ in the coil will be close to the integer._____.

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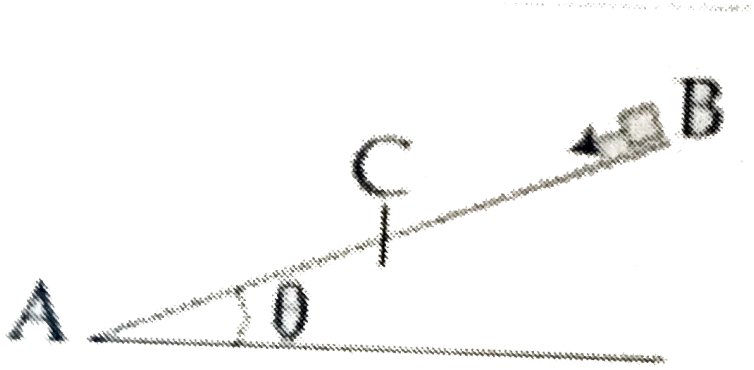

24.

A small back starts slipping down from a point B on an inclined plane AB, which is making an angle θ with the remaining section CA is rough with a coefficient of friction μ. It is found that bottom (point A) of the inclined plane. If $BC = 2AC$, the

coefficient of friction is given by $\mu = K\tan\theta$

The value of K is _____.

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25. An engine takes in 5 moles of air at $20^\circ C$ and 1 atm, and compresses it adiabaticaly to $1/10^{th}$ of the original volume. Assuming air to be a diatomic ideal gas made up of rigid molecules, the change in its internal energy during this process comes out ot be X kj. The value of X to the nearest interger is _____.

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26. A metallic sphere cools from $50^\circ C$ to $40^\circ C$ in 300 seconds. If the room temperature is $20^\circ C$ then its temperature in next

5 minutes will be -

A. $35^\circ C$

B. $28^\circ C$

C. $31^\circ C$

D. $33^\circ C$

Answer:

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27. A uniform magnetic field B exist in a direction perpedicuar to the plane of a square loop made of a metal wire. The wire has diameter of 4 mm and a total length of 30 cm . The magnetic field changes with time at a steady rate dB/dt = 0.032

Ts^{-1} . The induced current in the loop is close to (Resistivity of the metal wire is $1.23 \times 10^{-8}\Omega m$)

A. 0.53 A

B. 0.34 A

C. 0.61 A

D. 0.43 A

Answer:

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28. The mass density of a planet of radius R varie with the distance r form its centre as $\rho(r) = p_0\left(1 - \frac{r^2}{R^2}\right)$. Then the graviational field is maximum at :

A. $r = \sqrt{\frac{5}{9}}R$

B. $r = \frac{1}{\sqrt{3}}R$

C. $r = R$

D. $r = \sqrt{\frac{3}{4}}R$

Answer:

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29. Two resistor 400Ω and 800Ω connected in series across a 6 V battery . Reading of Voltmeter of $10k\Omega$ across 400Ω resistor is close to :

A. 2V

B. 1.95V

C. 1.8 V

D. 2.05V

Answer:

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30. Two source of light emit X - rays of wavelenght 1 nm and visible light of wavelength 500 nm respectively . Both the source emit light of the same power 200 W. The ratio of the number density of photons of X - rays to the number density of photons of the visible light of the given wavelengths

A. $\frac{1}{250}$

B. 250

C. 500

D. $\frac{1}{500}$

Answer:

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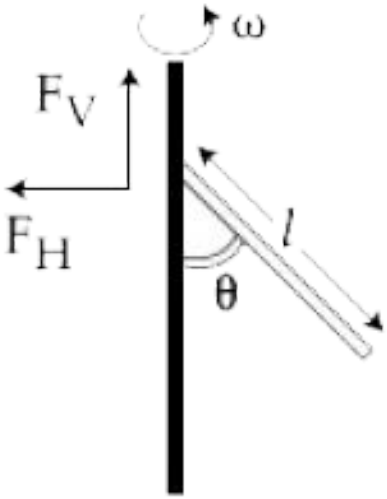

31.

A uniform rod of length 'l' is pivoted at one of itd ends on a vertical shaft of negligible radius When the shaft rotates at angular speed ω the rod makes an angle θ with it (see figure) . To find θ equate the rate of change of angular momentum

(direction going into the paper) $\frac{ml^2}{12}\omega^2 \sin\theta\cos\theta$ about the centre of mass (CM) to the torque provided by the horizontal and vertical forces F_H and F_V about the CM. The value of θ is then such that :

A. Option1 $\cos\theta = \frac{g}{2l\omega^2}$

B. Option2 $\cos\theta = \frac{3g}{2l\omega^2}$

C. Option3 $\cos\theta = \frac{g}{l\omega^2}$

D. Option4 $\cos\theta = \frac{2g}{3l\omega^2}$

Answer:

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32. Dimension of solar constant is:

A. ML^2T^{-2}

B. ML^0T^{-3}

C. MLT^{-2}

D. $M^2L^0T^{-1}$

Answer:

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33. Concentric metallic hollow spheres of radii R and 4R hold charges Q_1 and Q_2 respectively. Given that surface charge densities of the concentric spheres are equal, the potential difference $V(R) - V(4R)$ is :

A. $\frac{3Q_2}{4\pi\varepsilon_0 R}$

B. $\frac{3Q_1}{16\pi\varepsilon_0 R}$

C. $\frac{Q_2}{4\pi\varepsilon_0 R}$

D. $\frac{3Q_1}{4\pi\varepsilon_0 R}$

Answer:

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34. A perfectily diamagnetic sphere has a small spherical cavity at its centre, which is filled with a paramagentic substance. The whole system is places in a uniform magnetic field $\overrightarrow{B}$ Then the

field inside the paramagnetic substance is

A. much larger than $\left|\vec{B}\right|$ but opposite to $\vec{B}$

B. much larger than $\left|\vec{B}\right|$ but parallel to $\vec{B}$

C. zero

D. $\vec{B}$

Answer:

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35. Hydrogen ion and singly ionized helium atom are accelerated , from rest , through the same potential difference . The ratio of final speeds of hydrogen and helium ions is close to :

A. $5:7$

B. $1:2$

C. $2:1$

D. $10:1$

Answer:

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36. Two light waves having the same wavelength λ in vacuum are in phase initially. Then the first ray travels a path of length L_1 through a medium of refractive index μ_1. Then second ray travels a path of length L_2 throug a medium of refractive index μ_2. The two waves are then combined to observed interference effects. The phase difference between the two, when they interfere, is

A. $\frac{2\pi}{\lambda}(n_2L_1 - n_1L_2)$

B. $\frac{2\pi}{\lambda}(n_1L_1 - n_2L_2)$

C. $\frac{2\pi}{\lambda}\left(\frac{L_2}{n_1} - \frac{L_1}{n_2}\right)$

D. $\frac{2\pi}{\lambda}\left(\frac{L_1}{n_1} - \frac{L_2}{n_2}\right)$

Answer:

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37. Which of the following will NOT be obsered when a multimeter (operating in resistance measuring mode) probes connected across a component , are just reversed ?

A. Multimeter shows an equal deflection in both case i.e., before and after reversing the probes if the chosen component is resistor .

B. Multimter showns NO deflection in both cases i.e., before and after reversing the probes if the chosen component is metal wire.

C. Multimeter shows NO deflection in both cases i.e., before and after reversing the probes if the chosen component is capacitor

D. Multimeter shows a deflection , accompanied by a splash of light out of connected compoenent in one direction and NO deflection on reversing the probes if the chosen component is LED.

Answer:

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38. If a semiconductor photodiode can detect a photon with a maximum wavelength of 400 nm, then its band gap energy is :

Planck's constant $h = 6.63 \times 10^{-34} J.\ s$

Speed of light $c = 3 \times 10^{8} m/s$

A. 1.1 eV

B. 2.0 eV

C. 3.1 eV

D. 1.5 eV

Answer:

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39. A block of mass of 1.9 kg is at rest at the edge of a table , of height 1 m . A bullet of mass 0.1 kg collides with block and sticks to it. If the velocity of the bullted is 20 m/ s in the hoizontal direction just befor the combined system strikes the florr , is [Take $g = 10m/s^2$. Assume there is no rotational motion and loss of energy after the collision is negligble.

A. 23 J

B. 20 J

C. 19 J

D. 21 J

Answer:

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40. A calorimeter of water equivalent 20 g contains 180 g of water at $25^\circ C$. 'm' grams of steam at $100^\circ C$ is mixed in it till the temperature of the mixture is $31^\circ C$. The value of m is close to (Laten heat of water = 540 $calg^{-1}$, specific heat of water = 1 cal $g^{-1\circ}C^{-1}$)

A. 2

B. 2.6

C. 4

D. 3.2

Answer:

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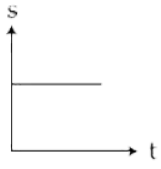
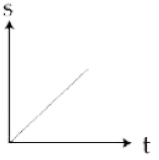
41. A body is moving unidirectionally under the influence of a source of constant power supplying energy. Which of the diagrams shown in figure correctly shows the displacement-time curve for its motion?

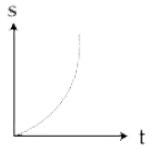
A.



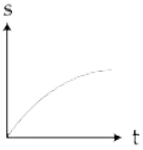
B.



C.



D.



Answer:

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42. A block of mass m attached to a massless spring is performing oscillatory motion of amplitude A on a frictionless horizontal plane. If half of the mass of the block off when it is passing through its mean position, the amplitude of oscillation for the remaining system become fA. The value of f is .

A. $\sqrt{2}$

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

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

D. 1

Answer:

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43. The radius R of a nucleus of mass number A can be estimated by the formula $R = \left(1.3 \times 10^{-15}\right) A^{1/3}$. If follos that the mass density of a nucleus is of the order of : $\left(M_{\text{prot}} \equiv M_{\text{neut}} \approx 1.67 \times 10^{-7} kg\right)$

A. $10^{24} kgm^{-3}$

B. $10^{17} kgm^{-3}$

C. $10^{3} kgm^{-3}$

D. $10^{10} kgm^{-3}$

Answer:

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44. To raise the temperature of a certain mass of gas by $50^{\circ} C$ at a constant pressure , 160 calories of heat is required . When the sam mass of gas is cooled by $100^{\circ} C$ at constant volume 240 calories of heat is released . How many degrees of freedom does each molecule of this gas have (assume gas to be ideal) ?

A. 7

B. 5

C. 6

D. 3

Answer:

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45. The electric field of a plane electromagnetic wave propagating along the x direction in vacuum is $\vec{E} = E_0\hat{j}\cos(\omega t - kx)$. The magnetic field $\vec{B}$, at the moment t=0 is :

A. $\vec{B} = E_0\sqrt{\mu_0 \in_0}\cos(kx)\hat{k}$

B. $\vec{B} = E_0\sqrt{\mu_0 \in_0}\cos(kx)\hat{j}$

C. $\vec{B} = \frac{E_0}{\sqrt{\mu_0 \in_0}}\cos(kx)\hat{k}$

D. $\vec{B} = \frac{E_0}{\sqrt{\mu_0 \in_0}}\cos(kx)\hat{k}$

Answer:

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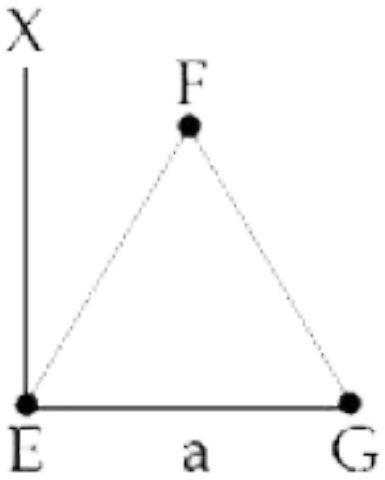
46. An massless equilateral triangle EFG of side 'a' (As shown in figure) has three particles of mass m situated at its vertices . The moment of inertia of the system about the line EX perpendicular to EG in the plane of EFG is $\frac{N}{20}ma^2$ where N is an integer . The value of N is _____



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47. If minimum possible work is done by a refrigenator in converting 100 grams of water at $0^{\circ}C$ to ice, how much heat (in calories) is released to the surroundings at temperature $27^{\circ}C$ (latent heat of ice 80 Cal/gram) to the nearest integer ?

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48. When an object is kept at a distance of 30cm from a concave mirror, the image is formed at a distance of 10 cm. If the object is moved with a speed of $9cms^{-1}$ the speed with which the image moves is

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49. A block starts moving up an inclined plane of inclination 30° with an initial velocity of v_0 . It comes back to its initial position with velocity $\frac{v_0}{2}$. The value of the coefficient of kinetic friction between the block and the inclined plane is close to $\frac{I}{1000}$, The nearest integer to I is _____ .

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50. A current of 0.5 A is passed through the coil of a galvanometer haing 500 turns and each turn has an average area of $3 \times 10^{-4})m^2$. If a torque of 1.5 M-m is required for this coil carriying same current to set is parallel to a magnetic field

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51. A beam of plane polarised light of large cross - sectional area and uniform intensity of $3.3Wm^{-2}$ falls normally on a polariser (cross sectional are $3 \times 10^{-4}m^2$) which rotates about its axis with an angular speed of 31.4 rad/s . The energy of light passing through the polariser per revolution , is close to :

A. $1.5 \times 10^{-4}J$

B. $5.0 \times 10^{-4}J$

C. $1.0 \times 10^{-4}J$

D. $1.0 \times 10^{-5}J$

Answer:

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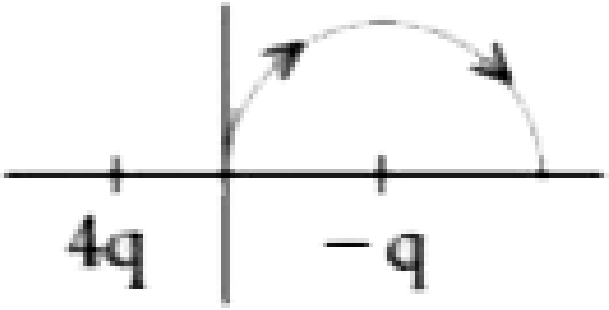
52. A two point charges 4q and -q are fixed on the x - axis $x = -\frac{d}{2}$ and $x = \frac{d}{2}$, respectively. If a third point charge 'q' is taken from the origin to x = d along the semicircle as shown in the figure, the energy of the charge will



A. increase by $\frac{2q^2}{3\pi\varepsilon_0 d}$

B. decrease by $\frac{4q^2}{3\pi\varepsilon_0 d}$

C. increase by $\frac{3q^2}{4\pi\varepsilon_0 d}$

D. decrease by $\frac{q^2}{4\pi\varepsilon_0 d}$

Answer: C

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53. Short bar magnet is place 30degrees with the external magnetic field 0.06T which experiences a torque of 0.018Nm then the minimum work done required to move from its stable equilibrium to unstable equilibrium is

A. $9.2 \times 10^{-3} J$

B. $7.2 \times 10^{-2} J$

C. $6.4 \times 10^{-2} J$

D. $11.7 \times 10^{-3} J$

Answer: B

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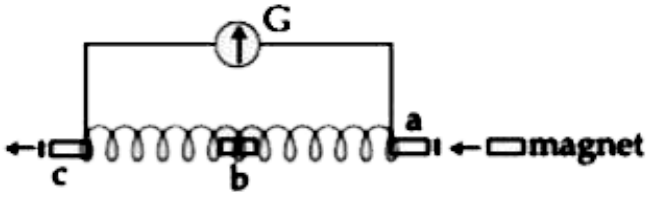
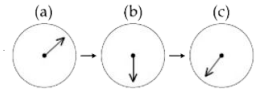
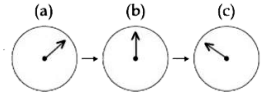
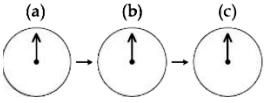
54. A small bar magnet is moved through a coil constant speed from one end to the other. Which of the following series of observations will be seen on the galvanometer G attached across the coil ?

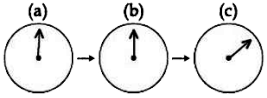


Three positions shown describe : (a) the magnet's entry (b) magnet is completely inside and (c) magnet's exit.

A. 

B. 

C. 

D. 

Answer: B

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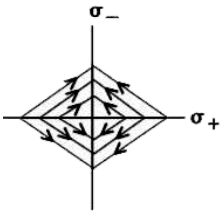
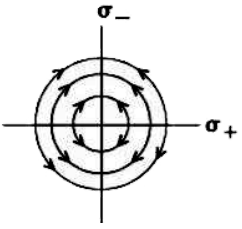
55. Two charged thin infinite plane sheets of uniform surface charge density σ_+ and σ_- where $|\sigma_+| > |\sigma_-|$, intersect right angle Which of the following best represents the electric field lines for this system:

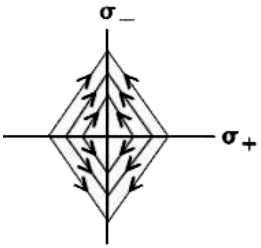
A.



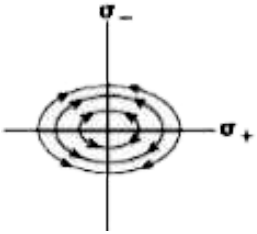
B.



C.



D.



Answer: A

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56. A air bubble of radius 1 cm in water has an upward acceleration $9.8 cm s^{-2}$. The density of water is 1 gm cm^{-3} and water offer negligible drag force on the bubble. The mass of the bubble is $\left(g = 980 cm / s^2\right)$

A. 1.52 gm

B. 4.51 gm

C. 4.15 gm

D. 3.15 gm

Answer:

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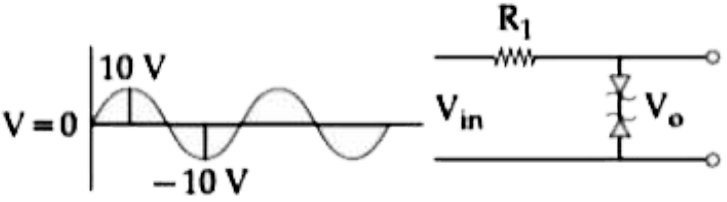
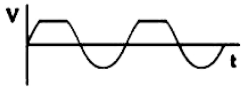
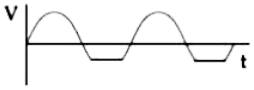
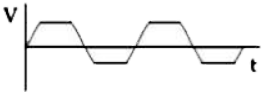
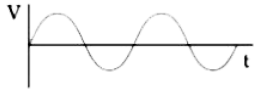
57. Take the breakdown voltage of the zener diode used in the given circuit as 6V. For the input voltage shown in figure below , the time variation of the output voltage is : (Graphs drawn are schematic and not to scale)



A. 

B. 

C. 

D. 

Answer:

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58. Particle A of mass $m_A = \frac{m}{2}$ moving along the x - axis with velocity v_0 collides elastically with another particle B at rest having mass $m_B = \frac{m}{3}$. If both particles move along the x - axis after the collision , the change $\Delta\lambda$ in de - Broglie

wavelength of particle A , in terms of its de - Broglie wavelength (λ_0) before collision is :

A. $\Delta\lambda = \frac{5}{2}\lambda_0$

B. $\Delta\lambda = 4\lambda_0$

C. $\Delta\lambda = 2\lambda_0$

D. $\Delta\lambda = \frac{3}{2}\lambda_0$

Answer:

Watch Video Solution

59. Write the dimensional formula for thermal conductivity.

A. $MLT^{-2}K$

B. $MLT^{-2}K^{-2}$

C. $MLT^{-3}K^{-1}$

D. $MLT^{-3}K$

Answer: C

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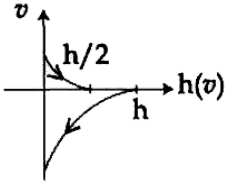
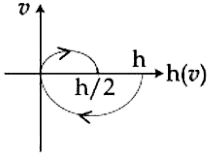
60. A Tennis ball is released from a height h and after freely falling on a wooden floor it rebounds and reaches height $\frac{h}{2}$. The velocity versus height of the ball during its motion may be represented graphically by :

(graph are drawn schematically and on not to scale)

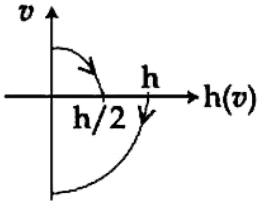
A.



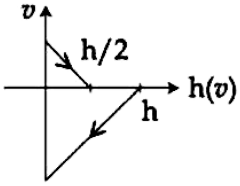
B.



C.



D.



Answer: B

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61. Distance between trough and crest of waves is 1.5m while distance between two trough is 5m. Which of following wavelength is possible

A. $1, 2, 3\ldots\ldots$.

B. $\frac{1}{1}, \frac{1}{3}, \frac{1}{5}, \ldots\ldots$

C. $1, 3, 5\ldots\ldots$

D. $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \ldots\ldots$

Answer:

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62. Consider on object of mass m moving with velocity v_0 and all other masses at rest initially. Find the % loss in energy after final collision. If all collision are perfectly inelastic.

A. 77

B. 87

C. 94

D. 37

Answer: D

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63. Choose the correct option relating wavelengths of different parts of electromagnetic wave spectrum.

A. $\lambda_{\text{x-rays}} < \lambda_{\text{micro waves}} < \lambda_{\text{radio waves}} < \lambda_{\text{visible}}$

B. $\lambda_{\text{visible}} > \lambda_{\text{x-rays}} > \lambda_{\text{radio waves}} > \lambda_{\text{micro waves}}$

C. $\lambda_{\text{radio waves}} < \lambda_{\text{micro waves}} < \lambda_{\text{visible}} < \lambda_{\text{x-rays}}$

D. $\lambda_{\text{visible}} < \lambda_{\text{micro waves}} < \lambda_{\text{radio waves}} < \lambda_{\text{x-rays}}$

Answer: C

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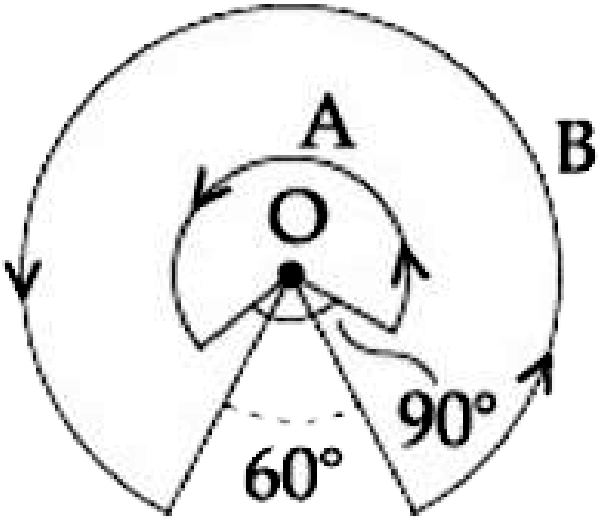
64. A wire A , bent in the shape of an arc of a circle , carrying current of 2 and having radius 2 cm and another wire B, also bent in the shape of arc of a circle , carrying a current of 3 A and having radius of 4 cm , are placed as shown in the figure . The ratio of the magnetic fields due to the wires A and B at the common centre O is :



A. $4:6$

B. $6:4$

C. $6:5$

D. $2:5$

Answer: B

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65. On the x - axis and at a distance x from the origin, the gravitational field due to a mass distribution is given by $\frac{Ax}{(x^2+a^2)^{3/2}}$ in the x - direction. The magnitude of gravitational potential on the x - axis at a distance x, taking its value to be zero at infinity , is :

A. $\frac{A}{(x^2+a^2)^{1/2}}$

B. $A\left(x^2+a^2\right)^{3/2}$

C. $\frac{A}{(x^2+a^2)^{3/2}}$

D. $A(x^2+a^2)^{1/2}$

Answer:

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66. A battery of 3.0 V is connected to a resistor dissipating 0.5 W of power . If the terminal voltage of the battery is 2.5 V , the power dissipated within the internal resistance is :

A. 0.072 W

B. 0.125 W

C. 0.50 W

D. 0.10 W

Answer:

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67.

(1)	Mono atomic molecule	(a)	1.33
(2)	Diatomic molecule (Normal temperature)	(b)	1.67
(3)	Linear triatomic molecule	(c)	1.40
(4)	Non-linear triatomic molecule	(d)	1.28

A. $(A)-(IV),(B)-(I),(C)-(II),(D)-(III)$

B. $(A)-(III),(B)-(IV),(C)-(II),(D)-(I)$

C. $(A)-(II),(B)-(III),(C)-(I),(D)-(IV)$

D. $(A)-(IV),(B)-(II),(C)-(I),(D)-(III)$

Answer:

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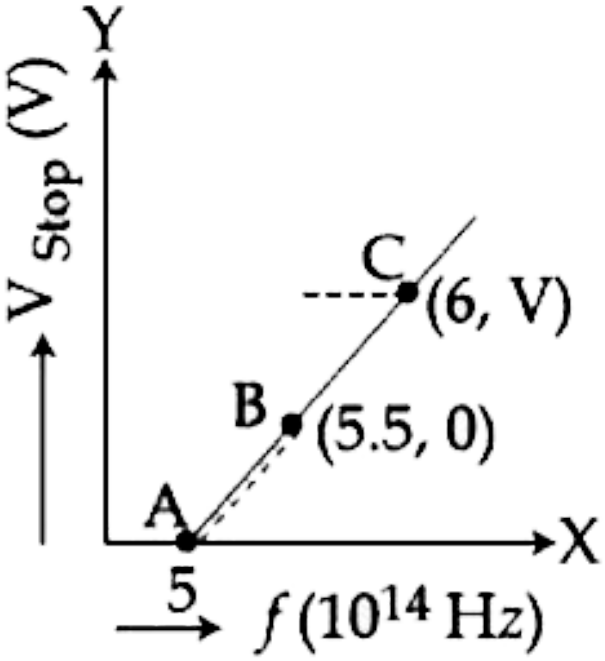
68. Given figure shows few data points in a photo electric effect experiment for a certain metal. The minimum energy for ejection of electron from its surface is ejection of electron from its surface is : (Plancks constant h = $6.62 \times 10^{-34} Js$)



A. 1.93 eV

B. 2.59 eV

C. 2.27 eV

D. 2.10 eV

Answer:

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69. The specific heat of water $4200\mathrm{J\ kg^{-1}K^{-1}}$ and latent heat of ice $= 3.4 \times 10^5 \mathrm{j\ kg^{-1}}$. 100 grams of ice at $0^\circ C$ is placed in 200 g of water at $25^\circ C$. The amount of ice that will melt as the temperature of water reaches $0^\circ C$ is close to (in grams)

A. 63.8

B. 69.3

C. 64.6

D. 61.7

Answer:

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70. Starting from the origin at time t = 0 , with initial velocity $5\hat{j}\mathrm{ms}^{-1}$, a particle moves in the x - y plane with a constant acceleration of $\left(10\hat{i}+4\hat{j}\right)ms^{-2}$. At time t , its coordinates are $(20m, y_0m)$. The value of t and y_0 are , respectively :

A. 2 s and 18 m

B. 5 s and 25 m

C. 2 s and 24 m

D. 4 s and 52 m

Answer: B

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71. A circular disc of mass M and radius R is rotating about its axis with angular speed If about another stationary disc having radius ω_1.

$\frac{R}{2}$ and same mass M is dropped co- axially on to the rotating disc. Gradually both discs attain constant angular speed ω_2. The energy lost in the process is p% of the initial energy . Value of p is .....

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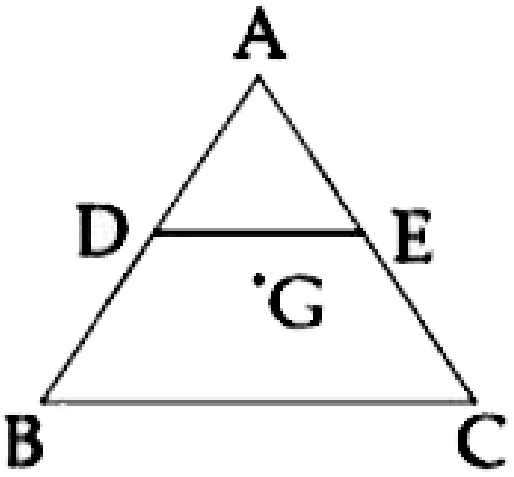
72. ABC is a plane lamina of the shape of an equilateral triangle. D , E are mid points of AB,AC and G is the centroid of the lamina . Moment of inertia of the lamina about an axis passing through G and perpendicular to the plane ABC is I_0 If

part ADE is removed, the moment of inertia of a remaining part about the same axis is $\frac{NI_0}{16}$ where N is an integer . Value of N is



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73. In a compound microscope , the magnificent virtual image is found at a distance of 25 cm from the eye-piece . The focal length of its objective lens is 1 cm. If the microspore is 20 cm , then the focal length of the eye-piece lens (in cm) is .....

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74. A closed vessel contains 0.1 mole of a monatomic ideal gas at 200k . If 0.05 mole of the same gas at 400 K is added to it , the final equilibrium temperature (in K) of the gas in the vessel will be close to .....

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75. In the line spectra of hydrogen atom, difference between the largest and the shortest wavelengths of the Lyman series is 340Å . The corresponding difference of the Paschan series in Å is .....

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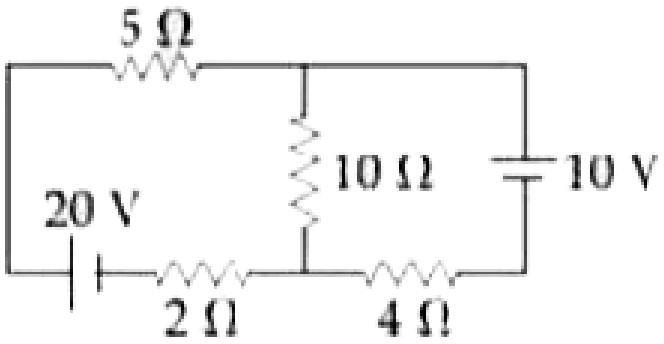

76.

In the figure shown , the current in the 10 V battery is close to :

A. 0.71 A from positivie to negative terminal

B. 0.42 A from positive to negative terminal

C. 0.21 A from positive to negative terminal

D. 0.36 A form negative to positive terminal

Answer:

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77. A charged particle going around in a circle can be considered to be a current loop.A particle of mass m carrying charge q is moving in a plane with speed v , under the influence of magnetic field B. The magnetic momnet of this moving particle :

A. $\frac{mv^2\vec{B}}{2B^2}$

B. $\frac{mv^2\vec{B}}{2\pi B^2}$

C. $\frac{mv^2\vec{B}}{B^2}$

D. $-\frac{mv^2\vec{B}}{2B^2}$

Answer:

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78. Three rods of identical cross - section and length are made of three different material of thermal conductivity k_1, k_2 and k_3 respectively. They are joined together at their ends to make a long rod (See figure). One end of the long rod is maintained at $100^\circ C$ and the other at $0^\circ C$ (See figure). If the joints of the rod are at $70^\circ C$ and $20^\circ C$ in steady state and there is no loss of energy form the surface of the rod, the correct relationship between k_1, k_2 and k_3 is

A. $k_1 : k_3 = 2:3$

$k_2 : k_3 = 2:5$

B. $k_1 < k_2 < k_2$

$k_1 : k_2 = 5:2$

C. $k_1 : k_2 = 5:2$

$k_1 : k_3 = 3:5$

D. $k_1 > k_2 > k_3$

Answer:

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79. Two identical electric point dipoles have dipole moments $\overrightarrow{P_1} = p\hat{i}$ and $\overrightarrow{P_2} = p\hat{i}$ and are held on the x axis at distance 'a' from each other. When released, they move along the x-axis with the direaction of their dipole moments remaining unchanged. If the mass of each dipole is 'm', their speed when they are infinitely for apart is :

A. Option1 $\frac{P}{a}\sqrt{\frac{1}{\pi \in_0 ma}}$

B. Option2 $\frac{P}{a}\sqrt{\frac{1}{2\pi \in_0 ma}}$

C. Option3 $\frac{P}{a}\sqrt{\frac{2}{2\pi \in_0 ma}}$

D. Option4 $\frac{P}{a}\sqrt{\frac{3}{2\pi \in_0 ma}}$

Answer:

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80. For a plane electromagnetic wave, the magnetic field at a point x and time t is

$\vec{B}(x,t) = \left[1.2 \times 10^{-7} \sin\left(0.5 \times 10^3 x + 1.5 \times 10^{11} t\right)\hat{k}\right] T$

The instantaneous electric field $\vec{E}$ corresponding to $\vec{B}$ is :

(spped of light $c = 3 \times 10^8 ms^{-1}$)

A. $\vec{E}(x,t) = \left[-36 \sin\left(0.5 \times 10^3 x + 1.5 \times 10^{11} t\right)\hat{j}\right]\frac{V}{m}$

B. $\vec{E}(x,t) = \left[36 \sin\left(1 \times 10^3 x + 0.5 \times 10^{11} t\right)\hat{j}\right]\frac{V}{m}$

C. $\vec{E}(x,t) = \left[36 \sin\left(0.5 \times 10^3 x + 1.5 \times 10^{11} t\right)\hat{k}\right]\frac{V}{m}$

D. $\vec{F}(x,t) = \left[36 \sin\left(1 \times 10^3 x + 1.5 \times 10^{11} t\right)\hat{i}\right]\frac{V}{m}$

Answer:

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81. Two planets have masses M and 16 M and their radii are a and 2a, respectively. The separation between the centres of the planets is 10a. A body of mass m is fired trom the surface of the larger planet towards the samller planet along the line joining their centres. For the body to be able to reach at the surface of smaller planet, the minimum firing speed needed is :

A. S

B. $4\sqrt{\frac{GM}{a}}$

C. $\sqrt{\frac{GM^2}{ma}}$

D. $\frac{3}{2}\sqrt{\frac{5GM}{a}}$

Answer:

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82. A particle is moving with velocity $\vec{v} = K\left(y\hat{i} + x\hat{j}\right)$, where K is a constant. The general equation for its path is

A. quantity $\vec{v} \times \vec{a}$ is constant in time

B. $\vec{F}$ arises due to a magnetic field

C. kinetic energy of particle is constant in time

D. quantity $\vec{v} . \vec{a}$ is constant in time

Answer:

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83. Particle A of mass m_1 moving with velocity $\left(\sqrt{3}\hat{i}+\hat{j}\right)ms^{-1}$ collides with another particle B of mass m_2 which is at rest initially. Let $\overrightarrow{V_1}$ and $\overrightarrow{V_2}$ be the velocities of particles A and B after collision respectively. If $m_1=2m_2$ and after collision $\overrightarrow{V_1}-\left(\hat{i}+\sqrt{3}\hat{j}\right)ms^{-1}$, the angle between $\overrightarrow{V_1}$ and $\overrightarrow{V_2}$ is :

A. 15°

B. 60°

C. -45°

D. 105°

Answer:

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84. When a car is at rest, its driver sees rain deops falling on it vertically. When driving the car with spped v, he sees that rain drops are coming at an angle 60° from the horizontal. On further increasing the speed of the car to $(1+\beta)v$, this angle changes to45°. The value of β is close to :

A. 0.5

B. 0.41

C. 0.37

D. 0.73

Answer:

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85. M_P denotes the mass of a proton and M_n that of a neutron. A given nucleus, of binding energy B, contains Z protons and N neutrons. The mass M(N, Z) of the nucleus is given by (c is velocity of light)

A. $n + n \rightarrow$ deuterum atom

(electron bound to the nucleus)

B. $p \rightarrow n + e^+ = varv$

C. $n + p \rightarrow d + \gamma$

D. $e^+ + e^- \rightarrow \gamma$

Answer:

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86. A ciruit to verify Ohm's law uses ammeter and voltmeter in series or parallel connected correctly to the resistor. In the circuit :

A. ammeter is always used in parallel and voltmeter is series

B. Both ammeter and voltmeter must be connected in parallel

C. ammeter is always connected in series and voltmeter in parallel

D. Both, ammeter and voltmeter must be connected in series

Answer:

87. Consider the force F on a charge 'q' due to a uniformlycharged spherical shell of radius R carrying charge Q distributed uniformly over it. Which one of the following statements is true for F, if 'q' is placed at distacen r from the centre of the shell?

A. Option1 $F = \frac{1}{4\pi \in_0} \frac{Qq}{R^2}$ for $r < R$

B. Option2 $F = \frac{1}{4\pi \in_0} \frac{qQ}{R^2} > F > 0$ for $r < R$

C. Option3 $F - \frac{1}{4\pi \in_0} \frac{Qq}{r^2}$ for $r > R$

D. Option4 $F = \frac{1}{4\pi \in_0} \frac{Qq}{r^2}$ for all r

Answer:

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88. A student measuring the diameter of a pencil of circular cross-section with the help of a vernier scale records the following four readings 5.50 mm, 5.55 mm, 5.45 mm and 5.65 mm. The average of these four readings is 5.5375 mm and the standard deviation of the data is 0.07395 mm. The average diameter of the pencil should therefore be recorded as :

A. $(5.5375 \pm 0.0739)mm$

B. $(5.5275 \pm 0.0740)mm$

C. $(5.538 \pm 0.074)mm$

D. $(5.54 \pm 0.07)mm$

Answer:

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89. A double convex lens has power P and same radii of curvature R of both the surfaces. The radius of carvature of a surface of plano-convex lens made of the same meterial with power 1.5 P is :

A. 2R

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

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

D. $\frac{R}{3}$

Answer:

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90. A square loop of side 2a, and carrying current I, is kept in XZ plane with its centre at origin. A long wire carrying the

samecurrent I is placed parallel to the z-axis and passing through the point $(0, b, 0)$, (b >> a). The magnitude of the torque on the loop about z-axis is given by :

A. $\frac{2\mu_0 I^2 a^2}{\pi b}$

B. $\frac{2\mu_0 I^2 a^2 b}{\pi(a^2 + b^2)}$

C. $\frac{\mu_0 I^2 a^2 b}{2\pi(a^2 + b^2)}$

D. $\frac{\mu_0 I^2 a^2}{2\pi b}$

Answer:

Watch Video Solution

91. A fluid is flowing through a horizontal pipe of verying cross - section, with speed vms^{-1} at a point where the pressure is P Pascal .

At another point where pressure is $\frac{P}{2}$

Pascal its speed is Vms^{-1}. If the density of the fluid is $\rho \ \text{kg} \ m^{-3}$ and the flow is stremline, then V is equal to :

A. $\sqrt{\frac{P}{\rho}+v}$

B. $\sqrt{\frac{2P}{\rho}+v^2}$

C. $\sqrt{\frac{P}{2\rho}+v^2}$

D. $\sqrt{\frac{P}{\rho}+v^2}$

Answer:

Watch Video Solution

92. When a particle of mass m is attached to a vertical spring of spring constant k and released, its motion is described by

$y(t) = y_0 \sin^2 \omega t$, where 'y' is measured from the lower end of unstretched spring. Then ω is :

A. $\frac{1}{2}\sqrt{\frac{g}{y_0}}$

B. $\sqrt{\frac{g}{y_0}}$

C. $\sqrt{\frac{g}{2y_0}}$

D. $\sqrt{\frac{2g}{y_0}}$

Answer:

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93. In a dilute gas at pressure P and temperature T, the mean time between successive collisions of a molecule varies with T as :

A. T

B. $\frac{1}{\sqrt{T}}$

C. $\frac{1}{T}$

D. $\sqrt{T}$

Answer:

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94. Assuming the nitrogen molecule is moving with r.m.s. velocity at 400K, the de Broglie wavelength of nitrogen molecule is close to :

(Given : nitrogen molecule weight : $4.64 \times 10^{-26} kg$, Boltzman constant : $1.38 \times 10^{-23} j/K$, Planck constant : $6.63 \times 10^{-34} J.s$)

A. 0.24Å

B. 0.20Å

C. 0.34Å

D. 0.44Å

Answer:

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95. The linear mass density of a thin rod AB of length L varies from A to B as $\lambda(x) = \lambda_0\left(1 + \frac{x}{L}\right)$. Where x is the distance from A. If M is the mass of the rod then its moment of inertia about an axis passing through A and perpendicualr to the rod is :

A. $\frac{5}{12}ML^2$

B. $\frac{7}{18}ML^2$

C. $\frac{2}{5}ML^2$

D. $\frac{3}{7}ML^2$

Answer:

Watch Video Solution

96. The output characteristics of a transistor is shown in the figure. When V_{CE} is 10 V and $I_C = 4.0mA$, then value of β_{ac} is

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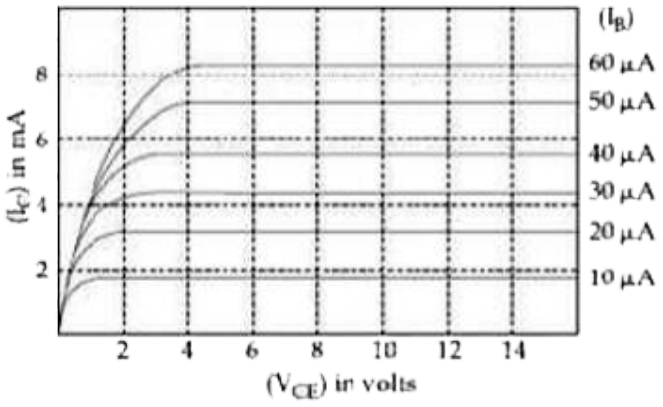

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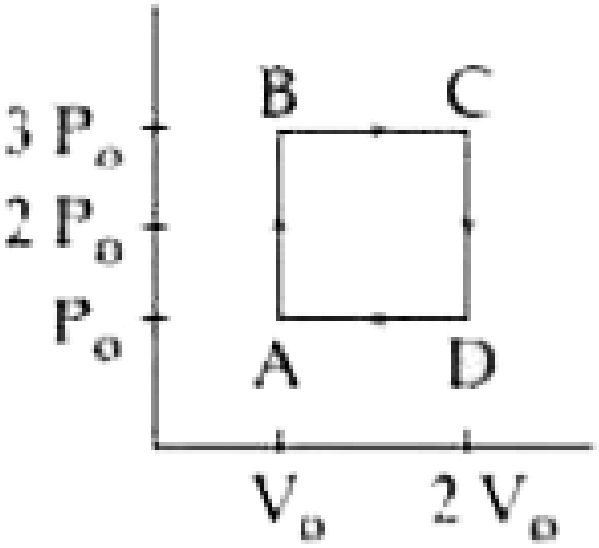
97. Find distance of centre of mass of solid hemisphere of radius 8cm from centre

Watch Video Solution

98. An engine operates by taking a monatomic ideal gas through the cycle shown in the figure. The percentage

efficiency of the engine is close to _____



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99. A Young's double -slit experiment is performed using monochromatic light of wavelength λ. The intensity of light at a point on the screen, where the path difference is λ is K units. The intensity of light at a point where the path difference is $\frac{\lambda}{6}$ is given by $\frac{nK}{12}$, where n is an integer. The value of n is

_____

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100. In a series L.R circuit, power of 400 W is dissipated from a source of 250 V, 50 Hz. The power factor of the circuit is 0.8. In order to bring the power factor to unity, a capactor of value C is added in series to the L and R. Taking the value of C as $\left(\frac{n}{3\pi}\right)\mu F$, then value of n is _____

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101. A small ball of mass m is thrown upward with velocity u from the ground. The ball experiences a resistive force mkv^2 where v is its speed. The maximum height attained by the ball is :

A. $\frac{1}{2k}\tan^{-1}.\frac{ku^2}{g}$

B. $\frac{1}{2k}\ln\left(1+\frac{ku^2}{g}\right)$

C. $\frac{1}{k}\ln\left(1+\frac{ku^2}{2g}\right)$

D. $\frac{1}{k}\tan^{-1}.\frac{ku^2}{2g}$

Answer:

Watch Video Solution

102. If I is moment of inertia, F is force, v is velocity, E is energy and L is length then, dimension of $\left(IF\frac{v^2}{EL^4}\right)$ will be:

A. coefficient of viscosity

B. plank's constant

C. force constant

D. energy density

Answer:

Watch Video Solution

103. A capacitor C is fully charged with voltage V_0. After disconnecting the voltage source, it is connected in parallel with another uncharged capacitor of capacitance $\frac{C}{2}$. The energy loss in the process after the charge is distributed between the two capacitors is :

A. $\frac{1}{2}CV_0^2$

B. $\frac{1}{3}CV_0^2$

C. $\frac{1}{4}CV_0^2$

D. $\frac{1}{6}CV_0^2$

Answer:

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104. A particle of charge q and mass m is subjected to an electric field $E = E_0\left(1 - ax^2\right)$ in the x - direction, where a and E_0 are constants. Initially the particle was at rest at x = 0. Other than the initial position the kinetic energy of the particle becomes zero when the distance of the particle from the origin is :

A. a

B. $\sqrt{\frac{2}{a}}$

C. $\sqrt{\frac{3}{a}}$

D. $\sqrt{\frac{1}{a}}$

Answer:

Watch Video Solution

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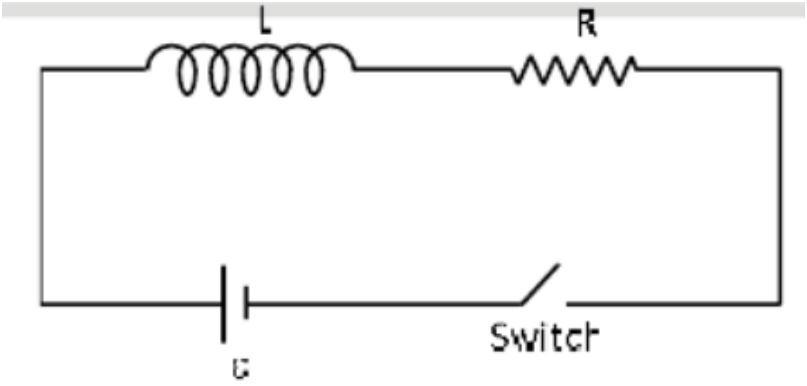
105. The circuit is switched on at $t = 0$, Find the time when energy stored in inductor becomes $\frac{1}{n}$ tiimes of maximum energy stored in it:



A. $\frac{L}{R}\ln\left(\frac{\sqrt{n}-1}{\sqrt{n}}\right)$

B. $\frac{L}{R}\ln\left(\frac{\sqrt{n}+1}{\sqrt{n}-1}\right)$

C. $\frac{L}{R}\ln\left(\frac{\sqrt{n}}{\sqrt{n+1}}\right)$

D. $\frac{L}{R}\ln\left(\frac{\sqrt{n}}{\sqrt{n}-1}\right)$

Answer:

Watch Video Solution

106. Two cyllindrical vessels of equal cross sectional ara A contain water upto heights h_1 and h_2. The vessels are interconnected so that the levels in them become equal. Calculate the work done by the force of gravity during the process. The density of water is ρ

A. $gdS\left(x_2^2 + x_1^2\right)$

B. $\frac{1}{4}gdS(x_2 - x_1)^2$

C. $\frac{3}{4}gdS(x_2 - x_1)^2$

D. $gdS(x_2 + x_1)^2$

Answer:

Watch Video Solution

107. A body is moving in a low circular orbit about a planet of mass M and radius R. The radius of the orbit can be taken to be R itself. Then the ratio of the speed of this body in the orbit to the escape velocity from the planet is :

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

B. 2

C. $\sqrt{2}$

D. 1

Answer: A

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108. A cube of metal is subjected to a hydrostatic pressure of 4 Gpa. The percentage change in the length of the side of the cube is close to :

(Given bulk modulus of metal, $B = 8 \times 10^{10} Pa$)

A. 20

B. 0.6

C. 1.67

D. 5

Answer:

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109. A circular coil has moment of inertia $0.8\ \mathrm{kg\ m^2}$ around any diameter and is carrying current to produce a magnetic

moment of $20Am^2$. The coil is kept initially in a vertical position and it can rotate freely around a horizontal diameter. When a uniform magnetic field of 4 T is applied along the vertical, it starts rotating around its horizontal diameter. The angular speed the coil acquires after rotating by 60° will be :

A. $10\pi \ \text{rad s}^{-1}$

B. $20 \ \text{rad s}^{-1}$

C. $10 \ \text{rad s}^{-1}$

D. $20\pi \ \text{rad s}^{-1}$

Answer:

Watch Video Solution

110. Consider two uniform discs of the same thickness and different radii $R_1 = R$ and $R_2 = \alpha R$ made of the same material. If the ratio of their moments of inertia I_1 and I_2, respectively, about their axes is $I_1 : I_2 = 1 : 16$ then the value of α is :

A. 2

B. $\sqrt{2}$

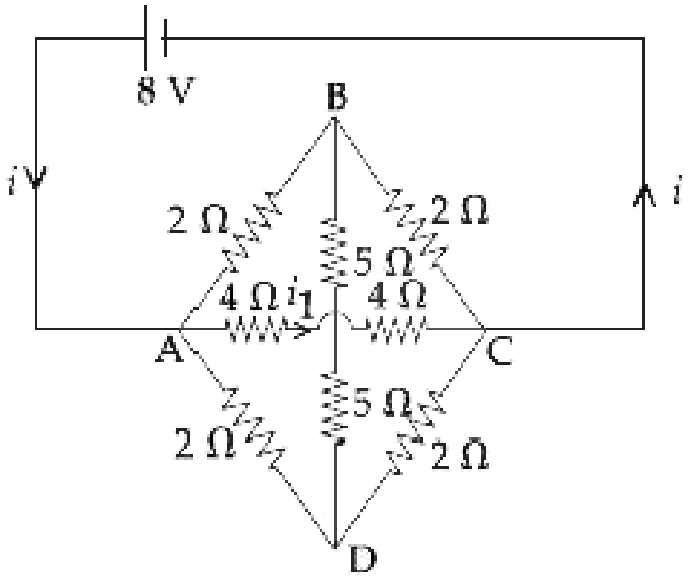
C. $2\sqrt{2}$

D. 4

Answer:

Watch Video Solution

111. The value of current i_1 flowing from A to C in the circuit diagram is :



A. $1A$

B. 2A

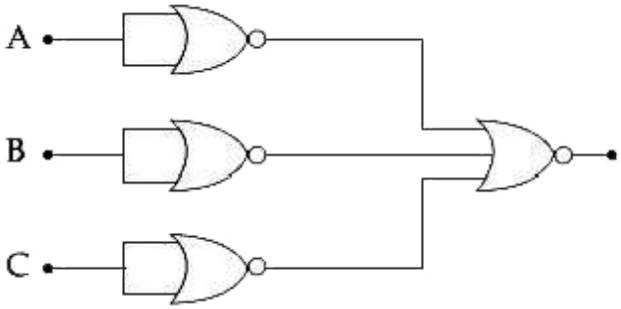
C. 4A

D. 5A

Answer:

Watch Video Solution

112. Identify the operation performed by the circuit given below:



A. OR

B. NOT

C. NAND

D. AND

Answer:

Watch Video Solution

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113. A paramagnetic sample shows a net magnetisationo f 6 A/m when it is placed in an external magnetic field of 0.4 T at a temperature of 4 K. When the sample is placed in an external magnetic field of 0.3 T at a temperature of 24 K, then the magnetisation will be :

A. 0.75 A/m

B. 1 A/m

C. 2.25 A/m

D. 4 A/m

Answer:

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114. Find the Binding energy per neucleon for $^{120}_{50}Sn$Mass of proton $m_p = 1.00783U$, mass of neutron $m_n = 1.00867U$ and mass of tin nucleus $m_{Sn} = 119.902199U$. (take 1 U = 931 MEV)

A. 8.0 MeV

B. 7.5 MeV

C. 8.5 MeV

D. 9.0 MeV

Answer:

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115. The electric field of a plane electromagnetic wave is given by

$\overrightarrow{E} = E_0(\hat{x} + \hat{y})\sin(kz - \omega t)$

Its magnetic field will be given by :

A. $\frac{E_0}{c}(\hat{x} - \hat{y})\sin(kz - \omega t)$

B. $\frac{E_0}{c}(\hat{x} + \hat{y})\sin(kz - \omega t)$

C. $\frac{E_0}{c}(-\hat{x} + \hat{y})\sin(kz - \omega t)$

D. $\frac{E_0}{c}(\hat{x} - \hat{y})\cos(kz - \omega t)$

Answer:

Watch Video Solution

116. The driver of a bus approaching a big wall botices that the frequency of his bus's horn changes from 420 Hz to 490 Hz when he hears it after it gets reflected from the wall. Find the speed of the bus if speed of the sound is $330\ \mathrm{ms}^{-1}$.

A. $71\ \mathrm{kmh}^{-1}$

B. $91\ \mathrm{kmh}^{-1}$

C. $61\ \mathrm{kmh}^{-1}$

D. $81\ \mathrm{kmh}^{-1}$

Answer:

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117. A person pushes a box on a rough horizontal plateform surface.He applies a force of 200 N over a distance of 15 m. Therefore, he gets progressively tired and his applied force reduces linearly with distance to 100 N. The total distance through which the box has been moved is 30 m. What is the work done by the person during the total movement of the box?

A. 3280 J

B. 5250 J

C. 5690 J

D. 2780 J

Answer:

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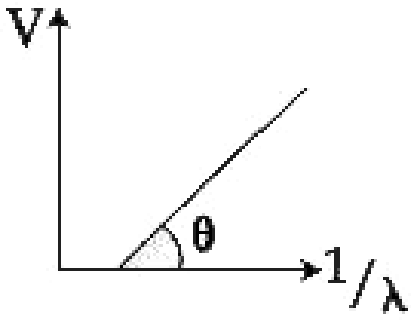
118. In a photoelectric effect experiment, the graph of stopping potential V versus reciprocal of wavelength obtained is shown

in the figure. As the intensity of incident radiation is increased :



A. Straight line shifts of left

B. Straight line shifts to right

C. Slope of the straight line get more steep

D. Graph does not change

Answer:

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119. Match the thermodynamic processes taking place in a system with the correct conditions. In the table : ΔQ is the heat supplied, ΔW is the work done and ΔU is change in internal energy of the system .

	Process		Condition
(I)	Adiabatic	(A)	$\Delta W = 0$
(II)	Isothermal	(B)	$\Delta Q = 0$
(III)	Isochoric	(C)	$\Delta U \neq 0$, $\Delta U \neq 0$, $\Delta Q \neq 0$
(IV)	Isobaric	(D)	$\Delta U = 0$

A. (I) - (B), (II) - (A), (III) - (D), (IV) - (C)

B. (I) - (B), (II) - (D), (III) - (A), (IV) - (C)

C. (I) - (A), (II)- (A), (III) - (B), (IV) - (C)

D. (I) - (A), (II) - (B), (III) - (D), (IV) - (D)

Answer:

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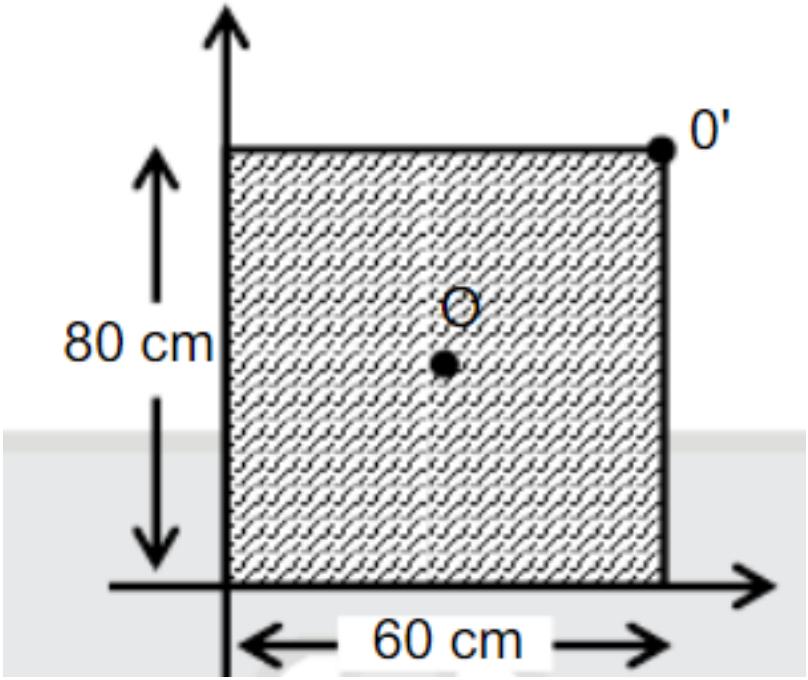
120. Find the ratio of moment of inertia about axis perpendicular to rectangular plate passing through O & O



A. $1/2$

B. $1/8$

C. $1/4$

D. $2/3$

Answer:

Watch Video Solution

121. The change in the magnitude of the volume of an ideal gas when a small additional pressure ΔP is applied at a constant temperature, is the same as the change when the temperature is reduced by a small quantity ΔT at constant pressure. The initial temperature and pressure of the gas were 300 K and 2 atm. respectively. If $|\Delta T| = C|\Delta P|$ then value of C in (K/atm) is _____.

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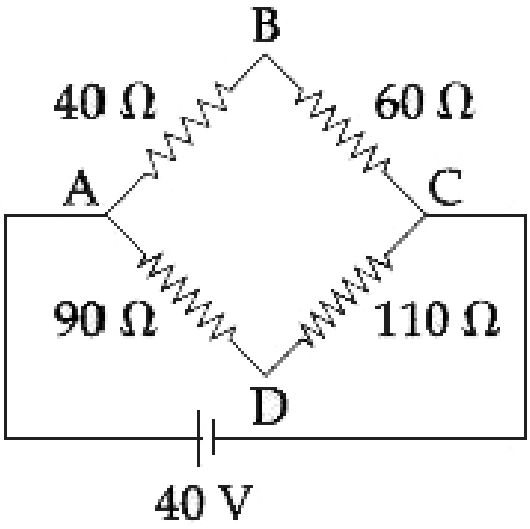

122.

Four resistances 40Ω, 60Ω, 90Ω and 100Ω make the arms of a quadrilateral ABCD. Across AC is a battery of emf 40 V and internal resistance negligible. The potential difference across BD in V is _____.

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123. Orange light of wavelength $6000 \times 10^{-10} m$ illuminates a single slit of width $0.6 \times 10^{-4} m$. The maximum possible

number of diffraction minima produced on both sides of the central maximum is _____.

Watch Video Solution

124. The distance between an object and a screen is 100 cm. A lens can produce real image of the object on the screen for two different position between the screen and the object. The distance between these two positions is 40 cm. If the power of the lens is close to $\left(\frac{N}{100}\right)D$ where N is integer, the value of N is _____.

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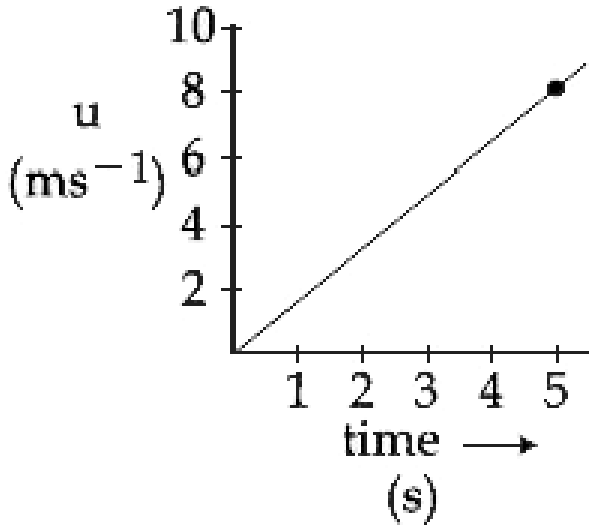
125. The speed verses time graph for a particle is shown in the figure. The distance travelled (in m) by the particle during the

time interval t = 0 to t = 5 s will be _____



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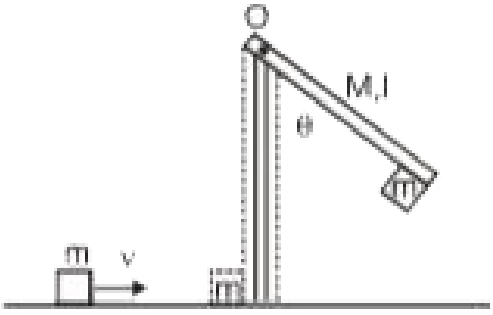
126. A block of mass m = 1 kg slides with velocity $v = 6m/s$ on a frictionless horizontal surface and collides with a uniform vertical rod and sticks to it as shown. The rod is pivoted about O and swings as a result of the collision making angle θ before momentarily coming to rest. If the rod has mass M = 2 kg, and length $l = 1m$, the value of θ is approximately: (take

$g = 10m/s^2$)



A. 49°

B. 63°

C. 69°

D. 55°

Answer: B

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127. A uniform rope of length 12 mm and mass 6 kg hangs vertically from a rigid support. A block of mass 2 kg is attached to the free end of the rope. A transverse pulse of wavelength 0.06 m is produced at the lower end of the rope. What is the wavelength of the pulse when it reaches the top of the rope?

A. 12

B. 3

C. 9

D. 6

Answer: A

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128. When a diode is forward biased, it has a voltage drop of 0.5 V. The safe limit of current through the diode is 10 mA. If a battery of emf 1.5 V is used in the circuit, the value of minimum resistance to be connected in series with the diode so that the current does not exceed the safe limit is :

A. 300Ω

B. 200Ω

C. 50Ω

D. 100Ω

Answer: D

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129. screw gauge of pitch 0.1 cm and 50 divison on circular scale measure thickness of object which of following measurement is possible for thickness

A. 2.125 cm

B. 2.124 cm

C. 2.123 cm

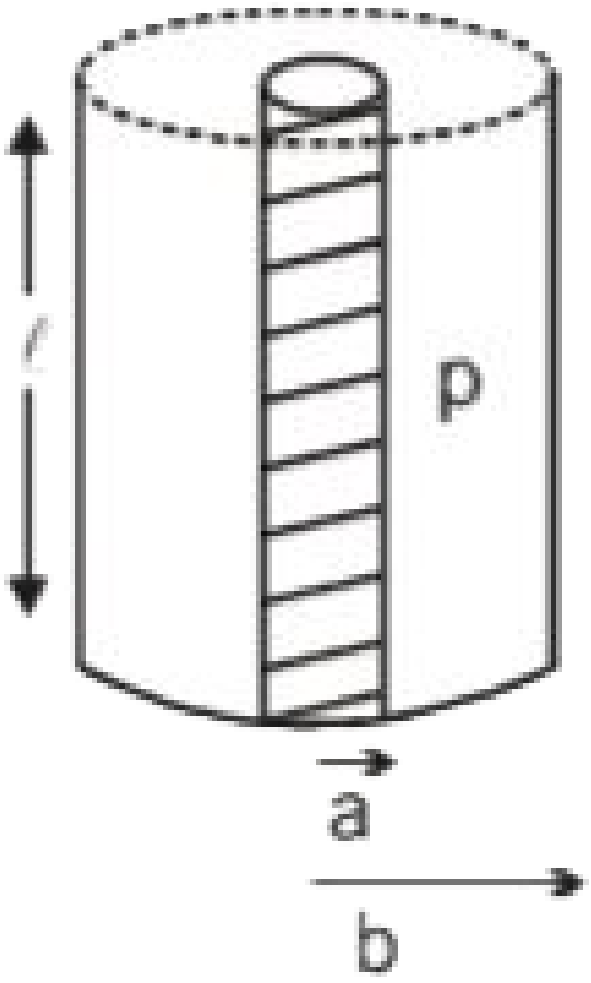
D. 2.121 cm

Answer: B

Watch Video Solution

130. Model a torch battery of length l to be made up of a thin cylindrical bar of radius 'a' and a concentric thin cylindrical

shell of radius 'b' filled in between with an electrolyte of resistivity ρ (see figure). If the battery is connected to a resistance of value R, the maximum Joule heating in R will take place for :



A. Option1 $R = \frac{\rho}{2\pi l}\left(\frac{b}{a}\right)$

B. Option2 $R = \frac{2\rho}{\pi l} In\left(\frac{b}{a}\right)$

C. Option3 $R = \frac{\rho}{\pi l} In\left(\frac{b}{a}\right)$

D. Option4 $R = \frac{\rho}{2\pi l} In\left(\frac{b}{a}\right)$

Answer: D

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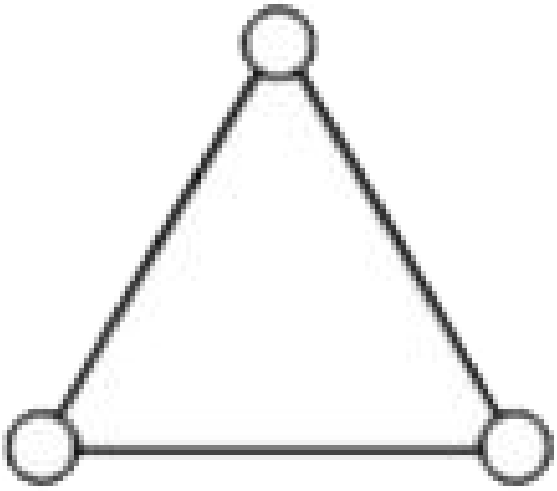

131.

Consider a gas of triatomic molecules. The molecules are assumed to be triangular and made of massless rigid rods whose vertices are occupied by atoms. The internal energy of a mole of the gas at temperature T is:

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

B. 3RT

C. $\frac{5}{2}$RT

D. $\frac{9}{2}$RT

Answer: B

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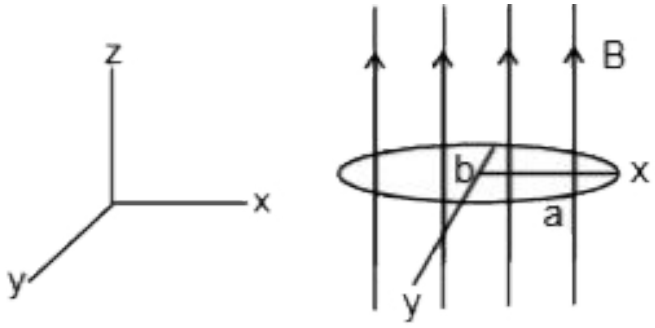
132. An elliptical loop having resistance R, of semi major axis a, and semi minor axis b is placed in a magnetic field as shown in the figure. If the loop is rotated about the x-axis with angular frequency ω, the average power loss in the loop due to Joule heating is :



A. $\frac{\pi abB\omega}{R}$

B. $\frac{\pi^2 a^2 b^2 B^2 \omega^2}{R}$

C. $\frac{\pi^2 a^2 b^2 B^2 \omega^2}{2R}$

D. zero

Answer: C

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133. A balloon filled with helium $(32^\circ C \text{ and } 1.7 atm)$ bursts. Immediately afterwards the expansion of helium can be considered as:

A. reversible isothermal

B. irreversible isothermal

C. reversible adiabatic

D. irreversible adibatic

Answer: D

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134. When the wavelength of radiation falling on a metal is changed from 500 nm to 200 nm, the maximum kinetic energy of the photo electrons becomes three times larger. The work function of the metal is close to :

A. 1.02 eV

B. 0.61 eV

C. 0.52 eV

D. 0.81 eV

Answer: B

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135. Two isolated conducting spheres S_1 and S_2 of radius $\frac{2}{3}R$ and $\frac{1}{3}R$ have $12\mu C$ and $-3\mu C$ charges, respectively, and are at a large distance from each other. They are now connected by a conducting wire . A long time after this is done the charges on S_1 and S_2 are respectively :

A. $6\mu C$ and $3\mu C$

B. $4.5\mu C$ on both

C. $+4.5\mu C$ and $-4.5\mu C$

D. $1\mu C$ and $6\mu C$

Answer: A

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136. The fraction of a radioactive material which remains active after time t is $9/16$. The fraction which remains active after time $t/2$ will be .

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

B. $\frac{7}{8}$

C. $\frac{4}{5}$

D. $\frac{3}{5}$

Answer: A

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137. Moment of inertia of a cylinder of mass M, length L and radius R about an axis passing through its centre and perpendicular to the axis of the cylinder is

$I = M\left(\frac{R^2}{4} + \frac{L^2}{12}\right)$. If such a cylinder is to be made for a given mass of a material, the ratio L/R for it to have minimum possible I is :

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

B. $\frac{3}{2}$

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

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

Answer: D

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138. A satellite is moving in a low nearly circular orbit around the earth. Its radius is roughly equal to that of earth's radius R_e. By firing rockets attached to it, its speed is instantaneously

increased in the direction of its motion so that it becomes $\sqrt{\frac{3}{2}}$ times larger. Due to this the farthest distance from the centre of the earth that the satellite reaches is R. Value of R is :

A. $2R_e$

B. $3R_e$

C. $4R_e$

D. $2.5R_e$

Answer: B

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139. The pressure inside two soap bubbles is 1.01 and 1.02 atmosphere. The ration of their respective volumes is

A. $4:1$

B. $2:1$

C. $0.8:1$

D. $8:1$

Answer: D

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140. In a Young's double slit experiment, light of 500 nm is used to produce an interference pattern. When the distance between the slits is 0.05 mm, the angular width (in degree) of the fringes formed on the distance screen is close to:

A. 0.17°

B. 0.07°

C. 0.57°

D. 1.7°

Answer: C

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141. A $750Hz, 20V$ source is connected to as resistance of 100Ω an inductance of $0.1803H$ and a capacitance of $10\mu F$ all in sereis.Calculate the time in which the resistance (thermalcapacity $2J/.^\circ C$) wil get heated by $10^\circ C$.

A. 245s

B. 365 s

C. 418 s

D. 348 s

Answer: D

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142. Magnitude of magnetic field (in SI units) at the centre of a hexagonal shape coil of side 10cm , 50 turns and carrying current I (Ampere) in units of $\frac{\mu_0 I}{\pi}$ is :

A. $250\sqrt{3}$

B. $50\sqrt{3}$

C. $500\sqrt{3}$

D. $5\sqrt{3}$

Answer: C

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143. The magnetic field in plane electromagnetic wave is given by $= 2 \times 10^{-7} \sin\left(0.5 \times 10^{3} \times 10^{11} t\right)$ This electro magnetic wave is

A. $\vec{E} = -9 \sin[200\pi(y - ct)]\hat{k}V/m$

B. $\vec{E} = 9 \sin[200\pi(y - ct)]\hat{k}V/m$

C. $\vec{E} = -10^{-6} \sin[200\pi(y - ct)]\hat{k}V/m$

D. $\vec{E} = 3 \times 10^{-8} \sin[200\pi(y - ct)]\hat{k}V/m$

Answer: A

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144. A charged particle carrying charge $1\mu C$ is moving with velocity $\left(2\hat{i} + 3\hat{i} + 4\hat{k}\right) ms^{-1}$. If an external magnetic field of

$\left(5\hat{i}+3\hat{j}-6\hat{k}\right)\times 10^{-3}T$ exists in the region where the particle is moving then the force on the particle is $\overrightarrow{F}\times 10^{-9}N$. The vector $\overrightarrow{F}$ is :

A. $-0.30\hat{i}+0.32\hat{j}-0.9\hat{k}$

B. $-3.0\hat{i}+3.2\hat{j}-0.9\hat{k}$

C. $-30\hat{i}+32\hat{j}-9\hat{k}$

D. $-300\hat{i}+320\hat{j}-90\hat{k}$

Answer: C

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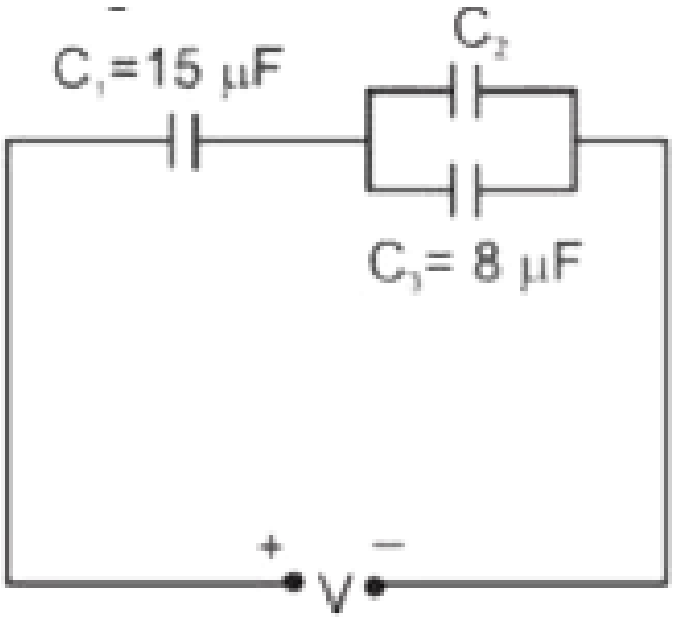
145. In the circuit shown in the figure, the total charge is $750\mu C$ and the voltage across capacitor C_2 is 20 V. Then the

charge on capacitor C_2 is:



A. $650\mu C$

B. $450\mu C$

C. $590\mu C$

D. $160\mu C$

Answer: C

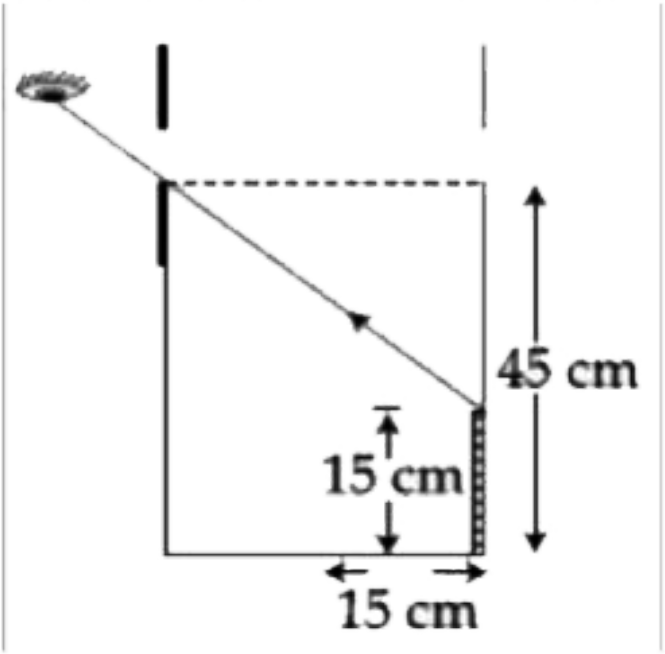
Watch Video Solution

146. A person of 80 kg mass is standing on the rim of a circular platform of mass 200 kg rotating about its axis at 5 revolutions per minute (rpm). The person now starts moving towards the centre of the platform. What will be the rotational speed (in rpm) of the platform when the person reaches its centre_____.

Watch Video Solution

147. An observer can see through a small hole on the side of a jar (radius 15 cm) at a point at height of 15 cm from the bottom (see figure). The hole is at a height of 45 cm. When the jar is filled with a liquid up to a height of 30 cm the same observer can see the edge at the bottom of the jar. If the refractive index of the liquid is $N/100$, where N is an integer, the value of N is

_____.



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148. A cricket ball of mass 0.15 kg is thrown vertically up by a bowling machine so that it rises to a maximum height of 20 m after leaving the machine. If the part pushing the ball applies a constant force F on the ball and moves horizontally a distance

of 0.2 m while launching the ball, the value of F (in N) is $(g = 10ms^{-2})$ _____.

Watch Video Solution

149. When a long capillary tube of radius 0.015 cm is dipped in a liquid, the liquid rises to a height of 15 cm within it. If the contact angle between the liquid and glass to close to 0°, the surface tension of the liquid, in milliNewton m^{-1}, is $\left[\rho_{\text{liquid}} = 900kgm^{-3}, g = 10ms^{-2}\right]$ (give anwer is closet integer)

Watch Video Solution

150. A bakelite beacker has volume capacity of $500ccat30^{\circ}C$. When it is partially filled with V_m volumne (at $30^{\circ}C$) of

mercury, it is found that the unfilled volume of the beaker remains constant as temperature is varied. If $\gamma_{\text{beaker}} = 6 \times 10^{-6}.^{\circ} C^{-1}$ and $\gamma_{\text{mercury}} = 1.5 \times 10^{-4}.^{\circ} C^{-1}$, where γ is the coefficient of volume expansion , then V_m (in cc) is close to _____.

Watch Video Solution

151. Assume that the displacement (s) of air is proportional to the pressure difference (Δp) created by a sound wave. Displacement (s) further depends on the speed of sound (v), density of air (ρ) and the frequency (f). If $\Delta p \sim 10Pa, v \sim 300m/s, p \sim 1kg/m^3$ and $f \sim 1000Hz$, then s will be of the order of (take the multiplicative constant to be 1)

A. $\frac{3}{100}mm$

B. $10mm$

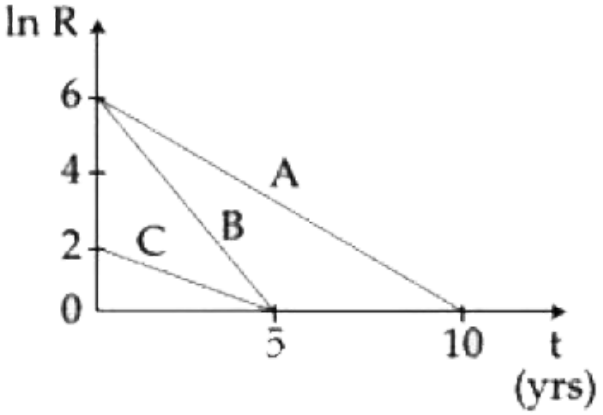
C. $\frac{1}{10}mm$

D. $1mm$

Answer:

Watch Video Solution

152. Activities of three radioactive substances A, B and C are represented by the curves A, B and C, in the figure. Then their half- lives $T_{\frac{1}{2}}(A) : T_{\frac{1}{2}}(B) : T_{\frac{1}{2}}(C)$ are in the ratio :



A. $2:1:1$

B. $3:2:1$

C. $2:1:3$

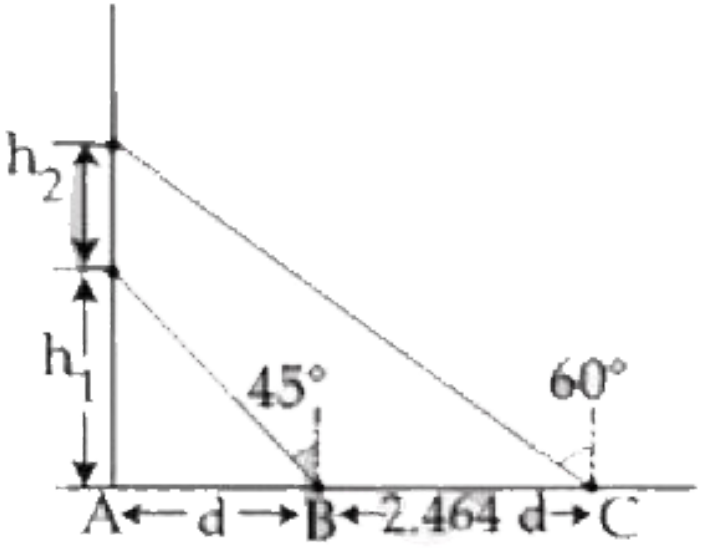
D. $4:3:1$

Answer:

Watch Video Solution

153. A balloon is moving up in air vertically above a point A on the ground. When it is at a height h_1, a girl standing at a distance (point B) from A (see figure) sees it at an angle 45° with respect to the vertical. When the balloon climbs up a further height h_2, it is seen at an angle 60° with respect to the vertical if the girl moves further by a distance 2.464d (point C).

Then the height h_2 is (give $\tan 30^\circ = 0.5774$)



A. 1.464 d

B. 0.732d

C. 0.464d

D. d

Answer:

Watch Video Solution

154. An electron is constrained to move along the y- axis with a speed of 0.1 c (c is the speed of light) in the presence of electromagnetic wave, whose electric field is $\overrightarrow{E} = 30\hat{j}\sin\left(1.5 \times 10^7 t - 5 \times 10^2 x\right) V/m.$

The maximum magnetic force experienced by the electron will be :

(given $c = 3 \times 10^8 ms^{-1}$ and electron charge $= 1.6 \times 10^{-19} C$)

A. $3.2 \times 10^{-18} N$

B. $2.4 \times 10^{-18} N$

C. $4.8 \times 10^{-19} N$

D. $1.6 \times 10^{-19} N$

Answer:

Watch Video Solution

155. A helicopter rises from rest on the ground vertically upwards with a constant acceleration g. A food packet is dropped from the helicopter when is at a height h. The time taken by the packet to reach the ground is close to [g is the acceeration due to gravity] :

A. $t = \frac{2}{3}\sqrt{\left(\frac{h}{g}\right)}$

B. $t = 1.8\sqrt{\frac{h}{g}}$

C. $t = 3.4\sqrt{\left(\frac{h}{g}\right)}$

D. $t = \sqrt{\frac{2h}{3g}}$

Answer:

Watch Video Solution

156. A galvanmeter of resistance G is converted into a voltmeter of range 0 -1V by connecting resistance R_1 in series with it. The additional resistance that should be connected in series with R_1 to increase the range of the voltmeter to 0-2 V will be :

A. G

B. R_1

C. $R_1 - G$

D. $R_1 + G$

Answer:

Watch Video Solution

157. If capacitor with capacitance C,2C are initially at potential v, 2v resp. Now they are connected in parallel combination such that end of charge of $(\cap aci \to r)_1$ & -ve charge of $(\cap aci \to r)_2$ are on same side. Find energy loss

A. $\frac{25}{6}CV^2$

B. $\frac{3}{2}CV^2$

C. zero

D. $\frac{9}{2}CV^2$

Answer:

Watch Video Solution

158. With increasing biasing voltage of a photodiode,thephotocurrent magnitude :

A. remains constant

B. increases initially and after attaining certain value, it decreases

C. increases linearly

D. increases initially and saturates finally

Answer:

Watch Video Solution

159. Acceleration due to gravity is same when an object is at height $\frac{R}{2}$ from surface of earth and at depth 'd' below surface

of earth. Find $\frac{d}{R}$

A. $\frac{4}{9}$

B. $\frac{5}{9}$

C. $\frac{1}{3}$

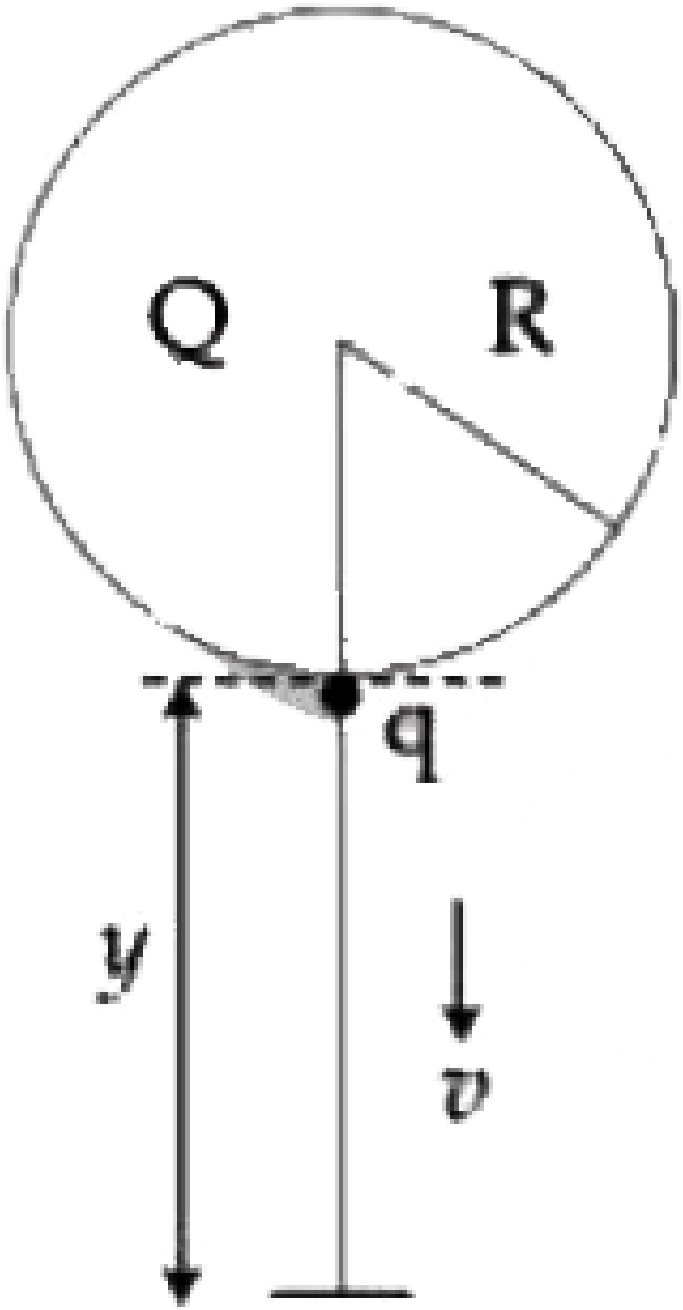
D. $\frac{7}{9}$

Answer:

Watch Video Solution

160. A solid shere of radius R carries a charge Q distributed uniformly over its valume. A very small point like piece of it of mass m gets detached from the bottom of the sphere and falls down vertically under gravity. This piece carries charge q. If it acquires a speed v when it has fallen through a vertical height

y (seefigure), then :(assume the remaining protion to be spherical).


Q
R
q
y
v

A. $v^2 = y\left[\frac{qQ}{4\pi \in_0 R^2 ym} + g\right]$

B. $v^2 = y\left[\frac{qQ}{4\pi \in_0 R(R+y)m} + g\right]$

C. $v^2 = 2y\left[\frac{qQR}{4\pi \in_0 (R+y)^3 m} + g\right]$

D. $v^2 = 2y\left[\frac{qQ}{4\pi \in_9 R(R+y)m} + g\right]$

Answer:

Watch Video Solution

161. A disc with moment of inertial I is rotating with some angular speed. Second disc is initially at rest. Now second disc with moment of inertia 3I is placed on first disc and starts rotating. Find loss of kinetic energy in fraction

A. $\frac{5}{6}$

B. $\frac{1}{4}$

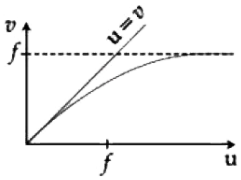
C. 0

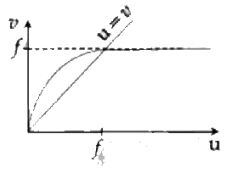
D. $\frac{3}{4}$

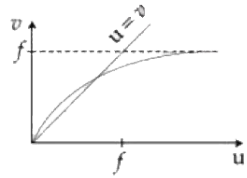
Answer:

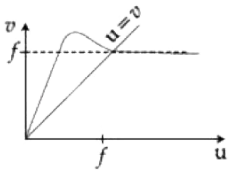
Watch Video Solution

162. For a concave mirror

A. 

B. 

C. 

D. 

Answer:

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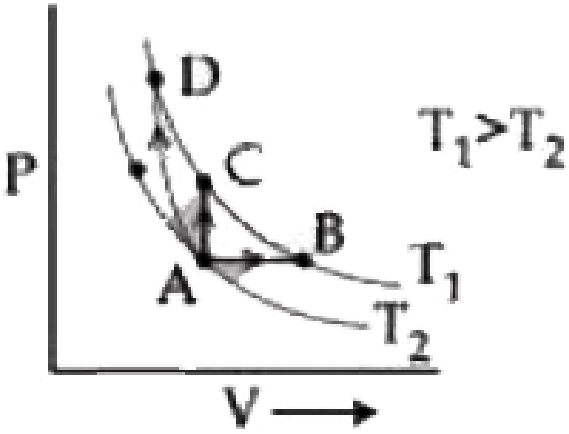
163. Three different processes that can occur in an ideal monoatomic gas are shown in the P vs V diagram. The paths are labelled as $A \to B, A \to C$ and $A \to D$. The change in internal energies during these process are taken as E_{AB}, E_{AC} and E_{AD} and the work done as W_{AB}, W_{AC} and W_{AD}.

The correct relation between these parameters are :



A. $E_{AB} = E_{AC} < E_{AD}, W_{AB} > 0, W_{AC} = 0, W_{AD} < 0$

B. $E_{AB} = E_{AC} = E_{AD}, W_{AB} > 0, W_{AC} = 0, W_{AD} > 0$

C. $E_{AB} < E_{AC} < E_{AD}, W_{AB} > 0, W_{AC} > W_{AD}$

D. $E_{AB} > E_{AC} > E_{AD}, W_{AB} < W_{AC} < W_{AD}$

Answer:

Watch Video Solution

164. Number of molecules in a volume of $4cm^3$ of a perfect monoatomic gas at same temperature T and at a pressure of 2 cm of mercury is close to ? (Given,mean kinetic energy of a molecule (at T) is 4×10^{-14} erg, $g = 980cm/s^2$, density of mercury $= 13.6g/cm^3$)

A. 4.0×10^{18}

B. 4.0×10^{16}

C. 5.8×10^{16}

D. 5.8×10^{18}

Answer:

Watch Video Solution

165. A square loop of side 2a and carrying current I is kept in xz plane with its centre at origin. A long wire carrying the same cruurent I is placed parallel to z - axis and passing through point (0,b,0), (b >>a). The magnitude of troque on the loop about z - axis will be :

A. $\frac{\mu_0 I^2 a^2}{2\pi b}$

B. $\frac{\mu_0 I^2 a^3}{2\pi b^2}$

C. $\frac{2\mu_0 I^2 a^2}{\pi b}$

D. $\frac{2\mu_0 I^2 a^3}{\pi b^2}$

Answer:

Watch Video Solution

166. A physical quantity z depends on four observables a, b, c and d, as $z = \frac{a^2 b^{\frac{2}{3}}}{\sqrt{c} d^3}$. The percentages of error in the measurement of a, b, c and d are 2%, 1.5%, 4% and 2.5% respectively. The percentage of error in z is :

A. 0.1225

B. 0.165

C. 0.135

D. 0.145

Answer:

Watch Video Solution

167. A shell of relative density $\frac{27}{9}$ w.r.t water is just submerged in water. If its inner & outer radius is r and R then r is

A. $\frac{8}{9}R$

B. $\frac{4}{9}R$

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

D. $\frac{1}{3}R$

Answer:

Watch Video Solution

168. In a resonance tube experiment when the tube is filled with water up to a height of 17.0 cm from bottom, it resonates with a givben tunign fork. When the water level is raised the

next resonance with the same tuning fork occurs at a height of 24.5 cm. If the velocity of sound in air is 330m/s,the tunign fork frequency is :

A. 2200 Hz

B. 550 Hz

C. 1100 Hz

D. 3300 Hz

Answer:

Watch Video Solution

169. An electrical power line, having a total resistance of 2Ω, delivers 1kW at 220 V. The efficiency of the transmission line is approximately :

A. 0.72

B. 0.91

C. 0.85

D. 0.96

Answer:

Watch Video Solution

170. A bullet of mass 5 g travelling with a speed of 210 m/s, strikes a fixed wooden target. One half of its kinetic energy is converted into heat in the bullet while the other half is converted into heat in the wood. The rise of temperature of the bullet if the specific heat of its material is 0.030 cal/ $(g-^{\circ}C)\left(1cal=4.2\times10^{7}\ \text{ergs}\right)$ close to :

A. $87.5^\circ C$

B. $83.3^\circ C$

C. $119^\circ C$

D. $38.4^\circ C$

Answer:

Watch Video Solution

171. A force $\vec{F} = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right)N$ acts at a point $\left(4\hat{i} + 3\hat{j} - \hat{k}\right)m$. Then the magnitude of torque about the point $\left(\hat{i} + 2\hat{j} + \hat{k}\right)m$ will be $\sqrt{x}$ N-m. The value of x is

---

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172. A beam of electrons of energy E scatters from a target having atomic specing of 1Å. The first maximum intensity occurs at $\theta = 60^\circ$. The E (in eV) is _____

(Planck constant $h = 6.64 \times 10^{-34} Js$,

$1eV = 1.6 \times 10^{19} J$,

electron mass $m = 9.1 \times 10^{-31} kg$)

Watch Video Solution

173. A particle of mass $220meV/c^2$ collides with a hydrogen tom at rest. Soon after the collisionthe particle comes to rest, and the atom recoils and goes to its first excited state. The initial kinetic energy of the particle (in eV) is $\frac{N}{4}$. The value of N is :

(Given the mass of the hydrogen atom to be $1GeV/c^2$)_____

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174. A compound microscope consists of an objective lens of focal length 1 cm and an eye piece of focal length 5 cm with a separation of 10 cm.

The distance between an object and the objective lens, at which the strain on the eye is minimum is $\frac{n}{40}cm$. The value of n is _____

Watch Video Solution

175. Two concentric circular coils, C_1 and C_2, are ploced in the XY plane. C_1 has 500 turns, and a radius of 1 cm. C_2 has 200 turns and radius of 20 cm. C_2 carries a time dependent current $I(t) = \left(5t^2 - 2t + 3\right)A$ where t is in s.The emf induced in C_1

(in mV), at the instant $t = 1s$ is $\frac{4}{x}$. The value of x is

---

A. Option1 2

B. Option2 3

C. Option3 4

D. Option4 5

Answer:

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176. A screw gauge has 50 divisions on its circular scale. The circular scale is 4 units ahead of the pitch scale marking , prior to use. Upon one complete ratation of the circular scale, a displacement of 0.5 mm is noticed on the pitch scale . The

nautre of zero error involved , and the least count of the screw gauge, are respectively.

A. Negative , 2 μm

B. Positive , 10 μ m

C. Positive , $0.1mm$

D. Positive , 0.1 μ m

Answer:

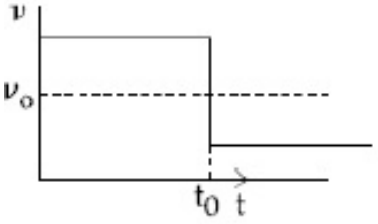
Watch Video Solution

177. A sound source S is moving along a straight track with speed v, and is emitting sound of frequency v_0 (see figure). An observer is standing at a finite distance at the point O, from the track . The time variation of frequency heard by the

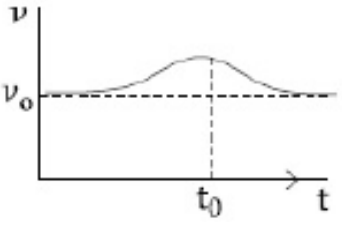
observer is best respresent by :

(t_0 represents the instant when the distance between the source and observer is minimum)

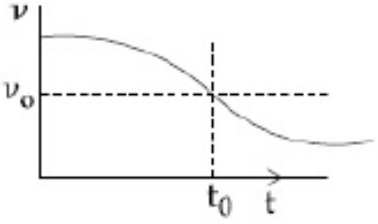
A. Option1



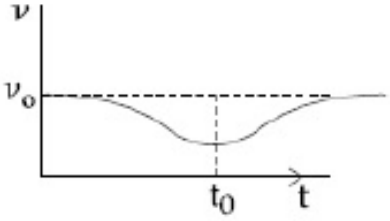
B. Option2



C. Option3



D. Option4



Answer:

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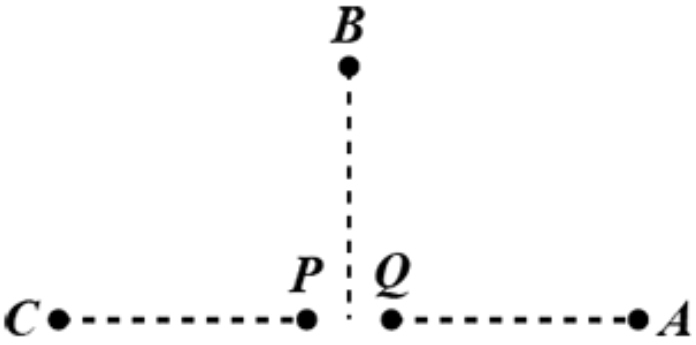
178. Fig, here shows P and Q as two equally intense coherent sources emitting radiations of wavelength 20m. The separation PQ si 5m, and phase of P is ahead of the phase Q by 90°. A, B and C are three distant points of observation equidistant from the mid - point of PQ. The intensity of radiations of A, B, C will be in the ratio



A. Option1 $0:1:4$

B. Option2 $2:1:0$

C. Option3 $0:1:2$

D. Option4 $4:1:0$

Answer:

Watch Video Solution

179. If the potential energy between two molecules is given by $U = -\frac{A}{r^6} + \frac{B}{r^{12}}$, then at equilibrium , separation between molecules , and the potential energy are :

A. $\left(\frac{B}{2A}\right)^{\frac{1}{6}}, -\frac{A^2}{2B}$

B. $\left(\frac{B}{2A}\right)^{\frac{1}{6}}, 0$

C. $\left(\frac{2B}{A}\right)^{\frac{1}{6}}, -\frac{A^2}{4B}$

D. $\left(\frac{2B}{A}\right)^{\frac{1}{6}}, -\frac{A^2}{2B}$

Answer:

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180. An AC circuit has R= 100Ω , C= 2μ and L= 80 mH, connected in series. The quality factor of the circuit is :

A. 2

B. 0.5

C. 20

D. 400

Answer:

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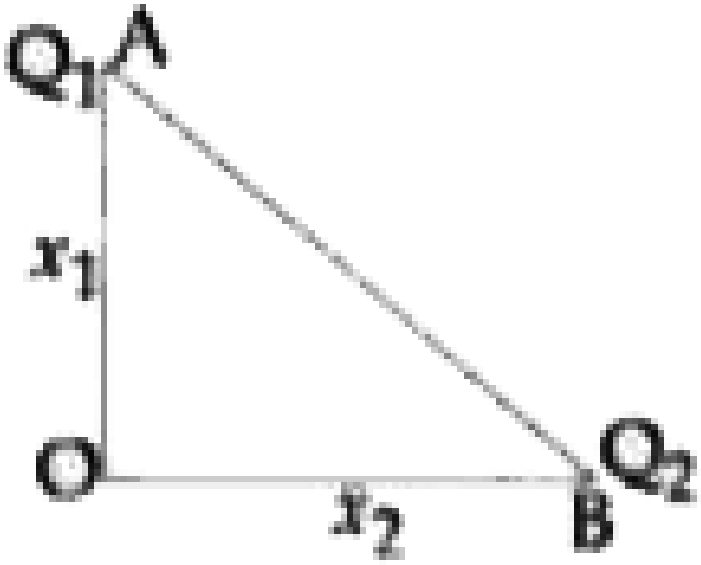
181. Charges Q_1 and Q_2 are at points A and B of a right angle triangle OAB (see figure) . The resultant electric field at point O is perpendicular to the hypotenuse, then Q_1/Q_2 is proportional to :



A. $\frac{x_1^3}{x_2^3}$

B. $\frac{x_2}{x_1}$

C. $\frac{x_1}{x_2}$

D. $\frac{x_2^2}{x_1^2}$

Answer:

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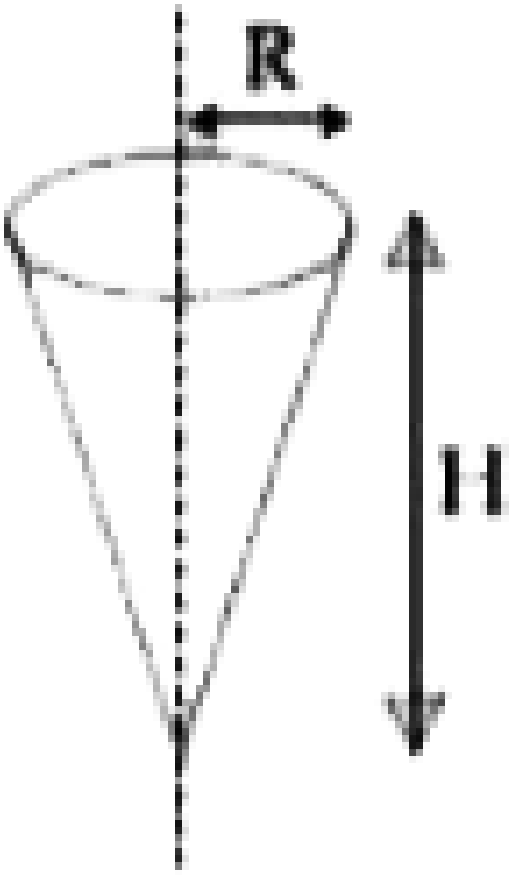
182. Shown in the figure is a hollow ice-cream cone (it is open at the top). If its mass is M, radius of its top , R and height , H,

then its moment of inertia its axis is :



A. $\frac{MR^2}{2}$

B. $\frac{M\left(R^2+H^2\right)}{4}$

C. $\frac{MH^2}{3}$

D. $\frac{MR^2}{3}$

Answer:

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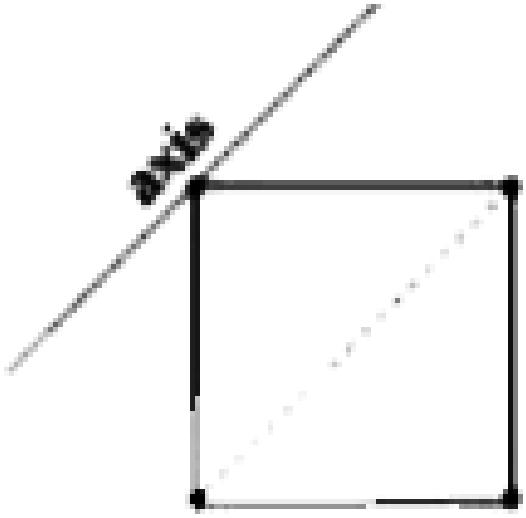
183. Four point masses, each of mass m, are fixed at the corners of a square of side l. The square is rotating with angular frequency ω, about an axis passing through one of the corners of the square and parallel to its diagonal , as shown. Angular momentum about this axis is :



A. $ml^2\omega$

B. $ml^2\omega$

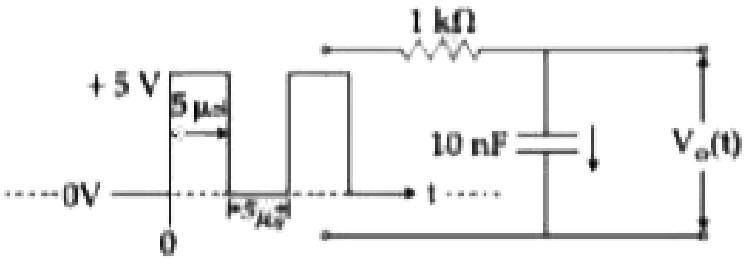
C. $3ml^2\omega$

D. $2ml^2\omega$

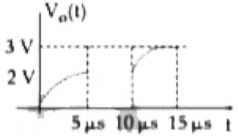
Answer:

Watch Video Solution

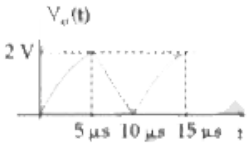
184. For the given input voltage wavelength $V_{\text{in}}(t)$, the output voltage waveform $(V_0)(t)$, across the capacitor is correctly depicted by :



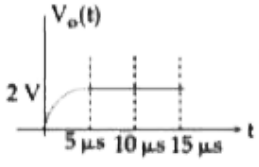
A. Option1



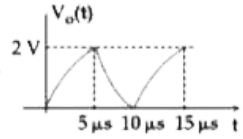
B. Option2



C. Option3



D. Option4



Answer:

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185. A particle of charge q and mass m is moving with a velocity $-v\hat{i}(v \neq 0)$ towards a large screen placed in the Y-Z plane at a

distance d. If there is a magnetic field $\overrightarrow{B} = B_0\hat{k}$, the minimum value of v for which the particle will not hit the screen is :

A. $\frac{qdB_0}{3m}$

B. $\frac{2qdB_0}{m}$

C. $\frac{qdB_0}{m}$

D. $\frac{qdB_0}{2m}$

Answer:

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186. An insect is at the bottom of a hemispherical ditch of radius 1 m. It crawls up the ditch but starts slipping after it is at height h from the bottom . If the coefficient of friction

between the ground and the insect is 0.75 , then h is : $(g = 10ms^{-2})$

A. 0.20 m

B. 0.45 m

C. 0.60 m

D. 0.80 m

Answer:

Watch Video Solution

187. A satellite is in an elliptical orbit around a planet P. It is observed that the velocity of the satellite when it is farthest from the planet is 6 times less than that when it is closest to

the planet . The ratio of distances between the statellite and the planet at closest and farthest points is :

A. $1:6$

B. $1:3$

C. $1:2$

D. $3:4$

Answer:

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188. An electron, a doubly ionized helium ion $\left(He^{++}\right)$ and a proton are having the same kinetic energy . The relation between their respectively de-Broglie wavelengths λ_e, λ_{He^+} + and λ_p is :

A. $\lambda_e > \lambda_{He^+} + > \lambda_P$

B. $\lambda_e < \lambda_{He^+} + = \lambda_P$

C. $\lambda_e > \lambda_P > \lambda_{He^+} +$

D. $\lambda_e < \lambda_P < \lambda_{He^+} +$

Answer:

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189. A clock has a continuously moving second's hand of 0.1 m length. The average acceleration of the tip of the hand (in units of ms^{-2}) is of the order of :

A. 10^{-3}

B. 10^{-4}

C. 10^{-2}

D. 10^{-1}

Answer:

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190. You are given that mass of ${}_{3}^{7}Li = 7.0160u$,

Mass of ${}_{2}^{4}He = 4.0026u$

and Mass of ${}_{1}^{1}H = 1.0079u$

When 20 g of ${}_{3}^{7}Li$ is converted into ${}_{2}^{4}He$ by proton capture ,

the energy liberated , (in kWh) , is :

[Mass of nucleon = $1GeV/c^2$)]

A. 4.5×10^5

B. 8×10^6

C. 6.82×10^5

D. 1.33×10^6

Answer:

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191. A point like object is placed at a distance of 1 m in front of a convex lens of focal length 0.5 m . A plane mirror is placed at a distance of 2 m behind the lens. The position and nature of the final image formed by the system is :

A. 2.6 m from the mirror , real

B. 1 m from the mirror , virtual

C. 1 m from the mirror , real

D. 2.6 m from the mirror, virtual

Answer:

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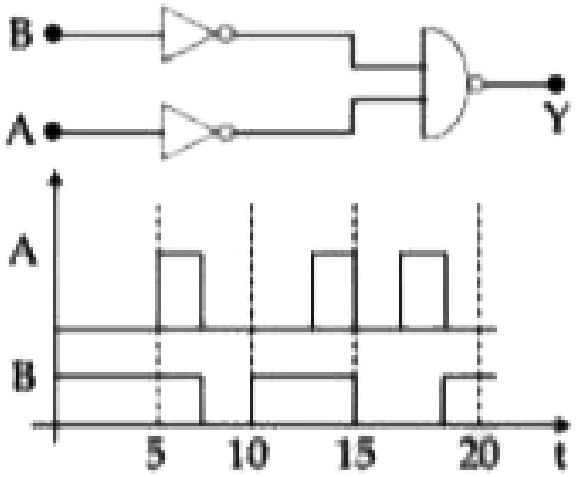
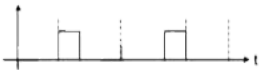
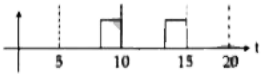
192. Identify the correct output signal Y in the given combination of gates (as shown) for the given input A and B.



A. 

B. 

C. 

D. 

Answer:

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193. Molecules of an ideal gas are known to have three translational degrees of freedom and two rotational degrees of freedom . The gas is maintained at a temperature of T. The total internal energy , U of a mole of this gas, and the value of $\gamma\left(=\frac{C_P}{C_v}\right)$ are given, respectively , by :

A. $U=\frac{5}{2}RT$ and $\gamma=\frac{6}{5}$

B. $U=5RT$ and $\gamma=\frac{7}{5}$

C. $U=\frac{5}{2}RT$ and $\gamma=\frac{7}{5}$

D. $U=5RT$ and $\gamma=\frac{6}{5}$

Answer:

Watch Video Solution

194. An object of mass m is suspended at the end of a massless wire of length L and area of cross -section A. Young modulus of the material of the wire is Y. If the mass is pulled down slightly its frequency of oscillation along the vertical direction is :

A. $f = \frac{1}{2\pi}\sqrt{\frac{mL}{YA}}$

B. $f = \frac{1}{2\pi}\sqrt{\frac{YA}{mL}}$

C. $f = \frac{1}{2\pi}\sqrt{\frac{mA}{YL}}$

D. $f = \frac{1}{2\pi}\sqrt{\frac{YL}{mA}}$

Answer:

Watch Video Solution

195. An electron is moving along +x direction with a velocity of $6 \times 10^6 ms^{-1}$. It enters a region of uniform electric field of 300 V/cm pointing along + y direction. The magnitude and direction of the magnetic field set up in this region such that the electron keeps moving along the x direction will be :

A. $3 \times 10^{-4} T$, along + z direction

B. $5 \times 10^{-3} T$, along - z direction

C. $5 \times 10^{-3} T$, along + z direction

D. $3 \times 10^{-4} T$, along -z direction

Answer:

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196. The density of a solid metal sphere is determined by measuring its mass and its diameter. The maximum error in the density of the sphere is $\left(\frac{x}{100}\right)\%$. If the relative errors in measuring the mass and the diameter are 6.0 % and 1.5% respectively , the value of x is _____.

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197. After a totally inelastic collision, two objects of the same mass and same initial speeds are found to move together at half of their initial speeds. The angle between the initial velocities of the objects is

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198. Suppose that intensity of a laser is $\left(\frac{315}{\pi}\right) W/m^2$. The rms electric field, in units of V/m associated with this source is close to the nearest integer is _____ .

$\left(\in_0 = 8.86 \times 10^{-12} C^2 N m^{-2}, c = 3 \times 10^8 m s^{-1} \right)$

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199. Initially a gas of diatomic molecules is contained in a cylinder of volume V_1 at a pressure P_1 and temperature 250 K. Assuming that 25% of the molecules get dissociated causing a change in number of moles. The pressure of the resulting gas, at temperature 2000 K, when contained in a volume $2V_1$ is given by P_2. The ratio P_2/P_1 is _____.

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200. A part of a complete circuit is shown in the figure . At some instant the value of current I is 1 A and it is decreasing at a rate of $10^2 As^{-1}$. The value of the potential difference $V_P - V_Q$, (in volts) at that instant , is _____.

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201. If momentum (p), area (A) and time$(t)$are taken to be fundamental quantities then energy has the dimensional formula

A. $\left[P^{1/2}\mathrm{AT}^{-1}\right]$

B. $\left[PA^{1/2}T^{-1}\right]$

C. $\left[PA^{1/2}T^{-1}\right]$

D. $\left[P^2AT^{-2}\right]$

Answer: B

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202. Two uniform circular discs are rotating independently in the same direction around their common axis passing through their centres. The moment of inertia and angular velocity of the first disc are 0.1 kg $-m^2$ and 10 rad s^{-1} respectively while those for the second one are0.2 kg $-m^2$ and 5rad s^{-1} respectively. At some instant they get stuck together and start rotating as a single system about their common axis with some angular speed. The Kinetic energy of the combined system is:

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

B. $\frac{10}{3}$ J

C. $\frac{5}{3}$ J

D. $\frac{20}{3}$ J

Answer: D

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203. A particle is moving 5 times as fast as an electron. The ratio of the de-Broglie wavelength of the particle to that of the electron is 1.878×10^{-4} . The mass of the particle is close to :

A. 4.8×10^{-27} kg

B. 9.1×10^{-31} kg

C. 9.7×10^{-28} kg

D. 1.2×10^{-28} kg

Answer: C

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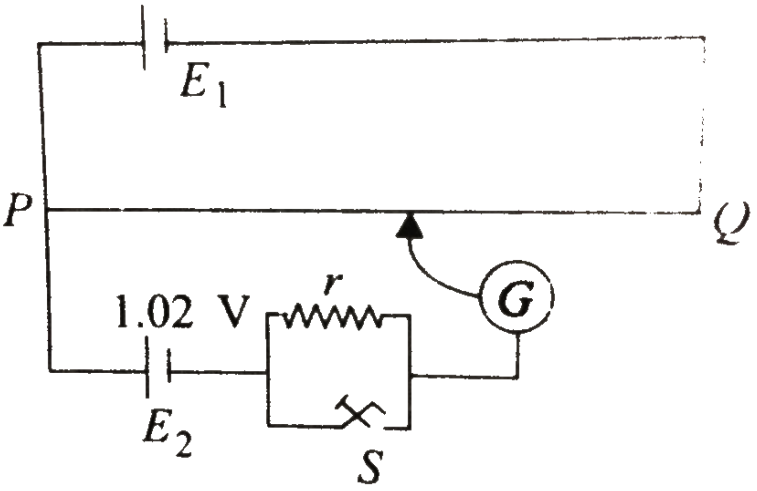
204. Potentiometer wire PQ of $1m$ length is connected to a standard cell E_1. Another cell E_2 of emf $1.02V$ is connected with a resistance r and a switch S as shown in the circuit diagram. With switch S open, the null position is obtained at a distance of $51cm$ from P.

(i) Calculate the potential gradient of the potentiometer wire.

(ii) Find the emf of cell E_1.

(iii) When switch S is closed, will the null point move toward P

or toward Q? Give reason for your answer.



A. 0.03 V/cm

B. 0.02 V/cm

C. 0.04V/cm

D. 0.01 V/cm

Answer: B

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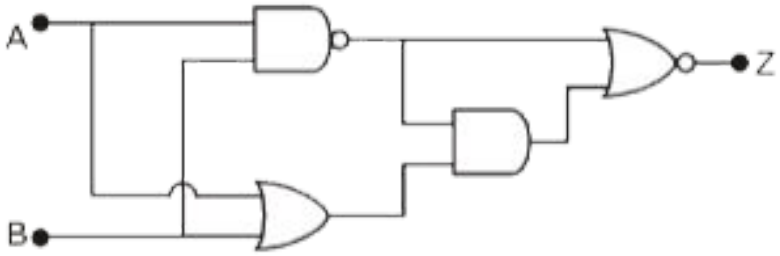
205. In the following digital circuit, what will be the output at 'Z', when the input (A,B) are (1,0) , (0,0), (1,1),(0,1) :



A. 0,1,0,0

B. 1,1,0,1

C. 0,0,1,0

D. 1,0,1,1

Answer: C

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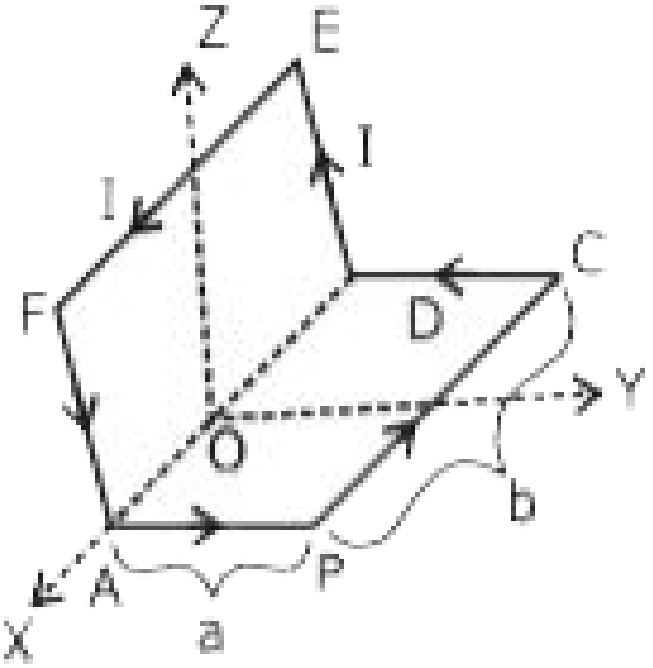
206. A wire carrying current I is bent in the shape ABCDEFA as shown, where rectangle ABCDA and ADEFA are perpendicular to each other. If the sides of the rectangles are of lengths a and b, then the magnitude and direction of magnetic moment of the loop ABCDEFA is:



A. $\sqrt{2}$ abl,along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{2\hat{k}}{\sqrt{5}}\right)$

B. abl,along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{2\hat{k}}{\sqrt{5}}\right)$

C. $\sqrt{2}$ abl,along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$

D. abl, along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\sqrt{k}}{\sqrt{2}}\right)$

Answer: C

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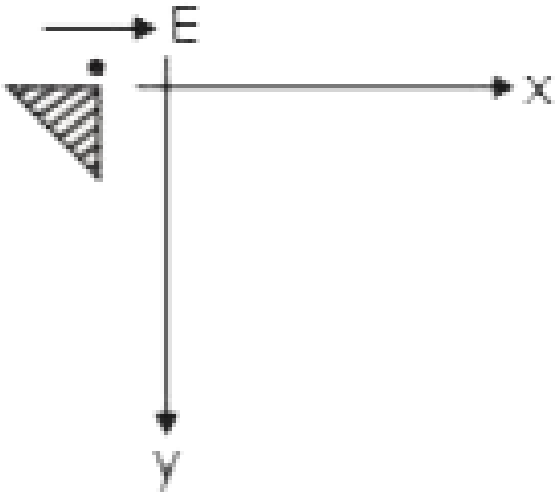
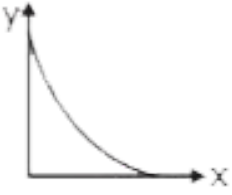
207. A small point mass carrying some positive charge on it, is released from the edge of a table. There is a uniform electric field in this region in the horizontal direction. Which of the following options then correctly describe the trajectory of the

mass? (Curves are drawn schematically and are not to scale).



A.

B.



C.

D. 

Answer: C

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208. In a plane electromagnetic wave, the directions of electric field and magnetic field are represented by k and $2\hat{i} - 2\hat{j}$, respectively. What is the unit vector along direction of propagation of the wave.

A. $\frac{1}{\sqrt{2}}\left(\hat{i} + \hat{j}\right)$

B. $\frac{1}{\sqrt{5}}\left(2\hat{i} + \hat{j}\right)$

C. $\frac{1}{\sqrt{5}}\left(2\hat{i} + 2\hat{j}\right)$

D. $\frac{1}{\sqrt{2}}\left(\hat{j}+\hat{k}\right)$

Answer: A

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209. An inductive coil has a reactance of 100Ω. When an AC signal of frequency 1000 Hz is applied to the coil, the voltage leads the current by 45°. What is the inductance of the coil?

A. 6.7×10^{-7} H

B. 5.5×10^{-5}H

C. 1.1×10^{-1} H

D. 1.1×10^{-2} H

Answer: D

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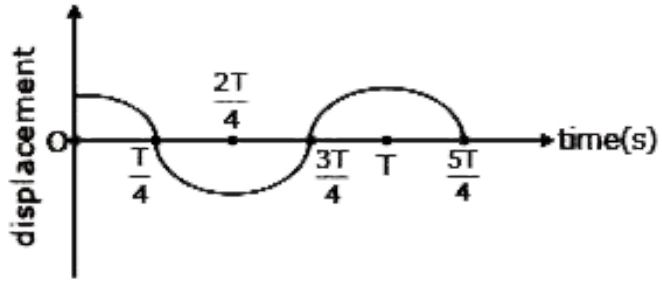
210. The displacement time graph of a particle executing S.H.M. is given in figure : (sketch is schematic and not to scale).



Which of the following statements is/are true for this motion?

(A) The force is zero at t = $\frac{3T}{4}$

(B)The acceleration is maximum at t=T

(C)The speed is maximum at t = $\frac{T}{4}$

(D) The P.E. is equal to K.E. of the oscillation at t = $\frac{T}{2}$

A. (B), (C) and (D)

B. (A) ,(B) and (D)

C. (A) and (D)

D. (A),(B) and (C)

Answer: A::B::C

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211. In a Young's double slit experiment, 16 fringes are observed in a certain segment of the screen when light of wavelength 700 nm is used. If the wavelength of light is changed to 400 nm, the number of fringes observed in the same segment of the screen would be:

A. 28

B. 24

C. 30

D. 18

Answer: A

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212. A heat engine is involved with exchange of heat of 1915 J , -40 J , + 125 J and -QJ , during one cycle achieving an efficiency of 50.0% The value of Q is:

A. 980 J

B. 640 J

C. 40 J

D. 400 J

Answer: A

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213. In a hydrogen atom the electron makes a transition from $(n+1)^{th}$ level to thenth level .If $n > > 1$ the frequency of radiation emitted is proportional to :

A. $\frac{1}{n^2}$

B. $\frac{1}{n}$

C. $\frac{1}{n^3}$

D. $\frac{1}{n^4}$

Answer: C

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214. A rod is heated from 0° to 10°, its length is changed by $0.02\,\%$. By what $\%$ mass density is changed?

A. 0.06

B. 0.008

C. 2.3

D. 0.8

Answer: A

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215. A charge Q is distributed over two concentric hollow spheres of radii r and $R(>r)$ such that the surface charge densities are equal. Find the potential at the common centre.

A. $\frac{1}{4\pi\varepsilon_0}\frac{(2R+r)}{(R^2+r^2)}Q$

B. $\frac{1}{4\pi\varepsilon_0}\frac{(R+r)}{(R^2+r^2)}Q$

C. $\frac{1}{4\pi\varepsilon_0}\frac{(R+r)}{2(R^2+r^2)}Q$

D. $\frac{1}{4\pi\varepsilon_0}\frac{(R+2r)Q}{2(R^2+r^2)}$

Answer: B

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216. A $10\mu F$ capacitor is charged to a potential difference of $50V$ and is connected to another uncharged capacitor in parallel. Now the common potential difference becomes 20 volt. The capacitance of second capacitor is

A. 15μF

B. $20\mu F$

C. 10μ F

D. 30μ F

Answer: A

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217. An ideal gas in a closed container is slowly heated. As its temperature increases, which of the following statements are true?

(A) the mean free path of the molecules decreases.

(B)the mean collision time between the molecules decreases.

(C) the mean free path remains unchanged.

(D) the mean collision time remains unchanged.

A. (B) and (C)

B. (A) and (C)

C. (C) and (D)

D. (A) and (D)

Answer: B::C

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218. A capillary tube made of glass of radius 0.15 mm is dipped vertically in a beaker filled with methylene iodide (surface tension = $0.05\mathrm{Nm}^{-1}$ density = 667 kg m^{-3}) which rises to height h in the tube. It is observed that the two tangents drawn from liquid-glass interfaces (from opp. sides of the capillary) make an angle of 60° with one another. Then h is close to $\left(g=10\mathrm{ms}^{-2}\right)$

A. 0.172m

B. 0.049m

C. 0.087m

D. 0.137 m

Answer: C

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219. At what height, the weight of the body is same as that at same depth from the earth's surface (take, earth's radius = R)

A. $\frac{\sqrt{3}R - R}{2}$

B. $\frac{\sqrt{5}}{2}R - R$

C. $\frac{\sqrt{5}R - R}{2}$

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

Answer: C

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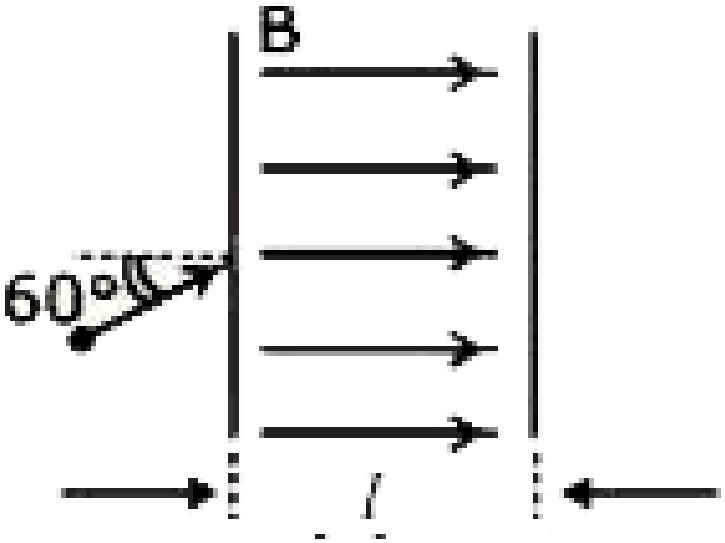
220. The figure shows a region of length 'l' with a uniform magnetic field of 0.3 T in it and a proton entering the region with velocity $4 \times 10^5 \ \mathrm{ms}^{-1}$ making an angle 60° with the field. If the proton completes 10 revolution by the time it cross the region shown, 'l' is close to (mass of proton $=1.67 \times 10^{-27}$

kg , charge of the proton $= 1.6 \times 10^{-19}$ C)



A. 0.11 m

B. 0.22m

C. 0.44m

D. 0.88m

Answer: C

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221. A ray incident at an angle of incidence 60° enters a glass sphere of $\mu = \sqrt{3}$ and it is reflected and refracted at the farther surface of the sphere. The angle between reflacted and refracted rays at this surface is

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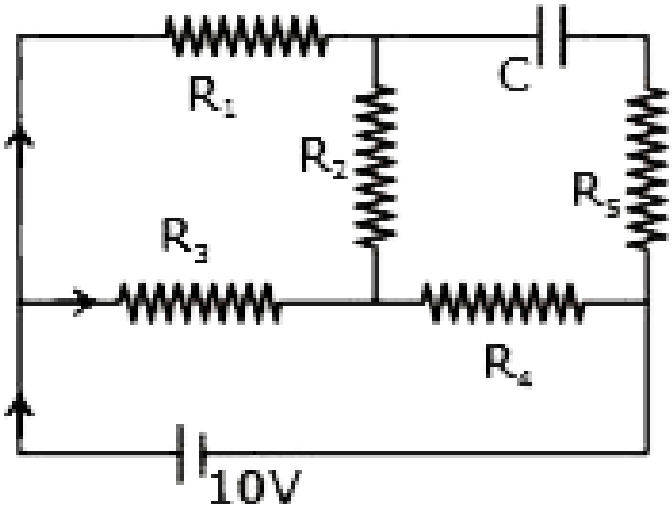
222. An ideal cell of emf 10 V is connected in circuit shown in figure. Each resistance is 2Ω . The potential difference (in V)

across the capacitor when it is fully charged is _____.



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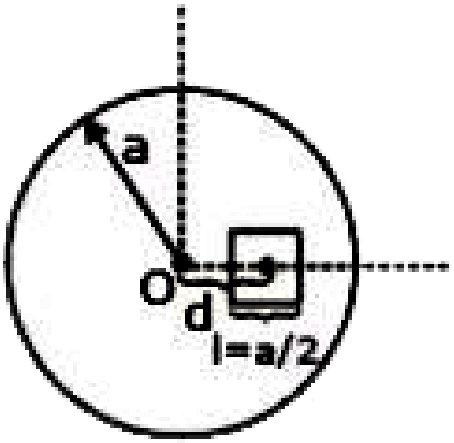
223. A square shaped hole of side $l = \frac{a}{2}$ is carved out at a distance $d = \frac{a}{2}$ from the centre 'O' of a uniform circular disk of radius a. If the distance of the centre of mass of the remaining portion from O is $-\frac{a}{x}$ value of X (to the nearest

integer) is _____.



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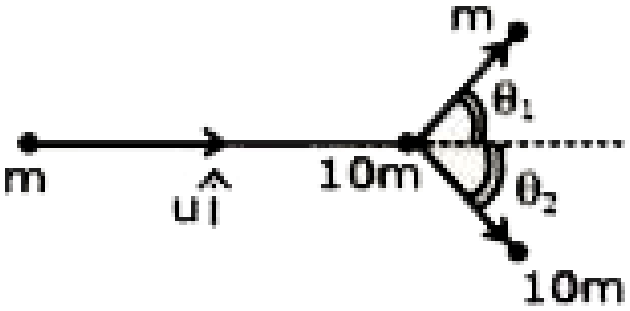
224. A particle of mass m is moving along the x-axis with initial velocity ui . It collides elastically with a particle of mass 10 m at rest and then moves with half its initial kinetic energy (see

figure).If $\sin\theta_1 = \sqrt{n}\sin\theta_2$ then value of n is



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225. A wire of density $9 \times 10^3 kg/m^3$ is stretched between two clamps 1 m apart and is subjected to an extension of $4.9 \times 10^{-4} m$. The lowest frequency of transverse vibration in the wire is $\left(Y = 9 \times 10^{10} N/m^2\right)$

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226. A spaceship in space sweeps stationary interplanetary dust . As a result , its mass increase at a rate $\frac{dM(t)}{dt} = bv^2(t)$, where v(t) is its instantaneous velocity . The instantaneous acceleration of the satellite is :

A. $-bv^3(t)$

B. $-\frac{bv^3}{M(t)}$

C. $-\frac{2bv^3}{M(t)}$

D. $-\frac{bv^3}{2M(t)}$

Answer:

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227. Ten charges are placed on the circumference of a circle of radius R with constant angular separation between successive charges. Alternate charges 1,3,5,7,9 have charge (+q) each , while 2,4,6, 8, 10 have charge (-q) each. The potential V and the electric field E at the centre of the circle are respectively . (Take V =0 at infinity).

A. $V = \frac{10Q}{4\pi \in_0 R}, E = 0$

B. $V = 0, E = \frac{10q}{4\pi \in_0 R^2}$

C. $V = 0, E = 0$

D. $V = \frac{10q}{4\pi \in_0 R}, E = \frac{10q}{4\pi \in_0 R^2}$

Answer:

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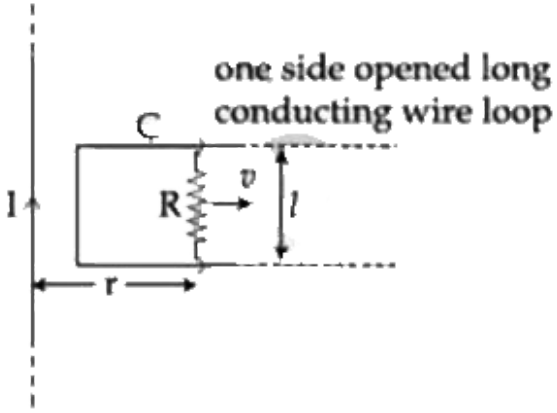
228. An infinitely long straight wire carrying current I , one side opened rectangular loop and a conductor C with a sliding connector are located in the same plane , as shown in the figure. The connector has length l and resistance R . It slides of the right with a velocity v. The resistance of the conductor and the self inductance of the loop are negligible . The induced current in the loop , as function of separation r between the conductor and the straight wire is :



A. $\frac{\mu_0}{4\pi}\frac{Ivl}{Rr}$

B. $\frac{\mu_0}{\pi}\frac{Ivl}{Rr}$

C. $\frac{2\mu_0}{\pi}\frac{Ivl}{Rr}$

D. $\frac{\mu_0}{2\pi}\frac{Ivl}{Rr}$

Answer:

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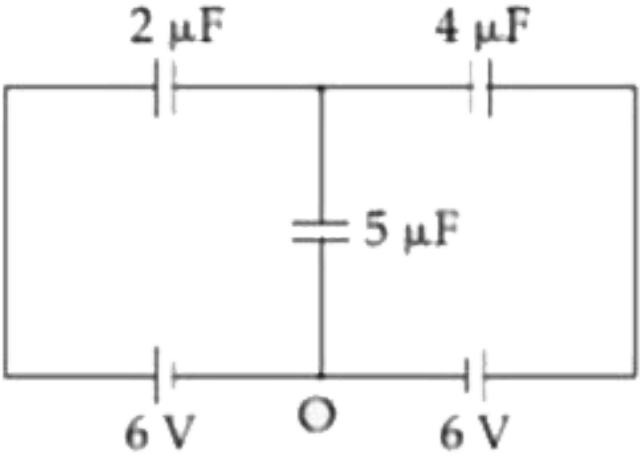
229. In the circuit shown , charge on the $5\mu F$ capacitor is :



A. $18.00\mu C$

B. $10.90\mu C$

C. $16.36\mu C$

D. $5.45\mu C$

Answer:

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230. A galvanometer is used in laboratory for detecting the null point in electrical experiments . If , on passing a current of $6mA$, it produces a deflection of 2° , its figure of merit is close to :

A. 333° A/div

B. 6×10^{-3} A/div

C. 666° A/div

D. 3×10^{-3} A / div

Answer:

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231. The correct match between the entries in column I and column II are :

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

B. (a) - (i) , (b) - (iii) , C - (iv) ,(d) - (ii)

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

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

Answer:

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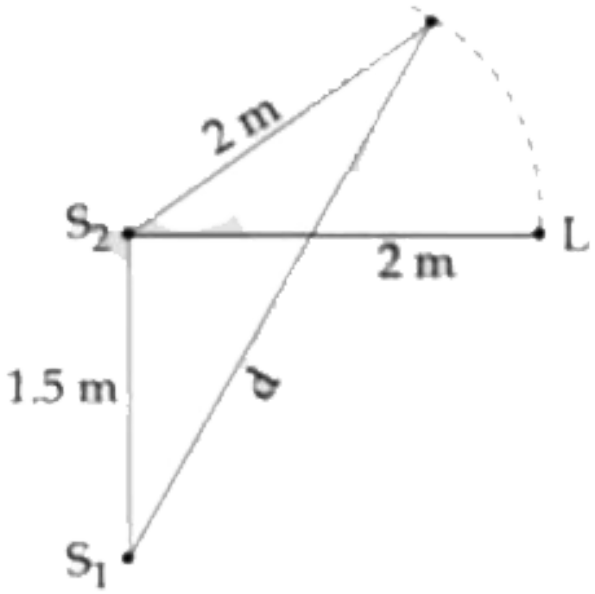
232. Two coherenet source of sound S_1 and S_2 produce sound waves of the same wavelength $\lambda = 1$ m , in phase , S_1 and S_2 are placed 1.5 m a part (see fig). A listener , loacted at L , directly in fornt of S_2 finds that the intensity is at a minimum when he is 2 m away form S_2. The listener moves aways form S_1 keeping his distance for S_2 fixed . The adjacent maximum of inesity is observed when the listener is at a distane d from S_1 . Then d is



A. 12m

B. 5m

C. 2m

D. 3m

Answer:

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233. Two different wires having lengths L_1 and L_2 and respective temperature coefficient of linear expansion α_1 and α_2 are joined end - to - end . Then the effective temperature coefficient of linear expansion is :

A. $\frac{\alpha_1 L_1 + \alpha_2 L_2}{L_1 + L_2}$

B. $2\sqrt{\alpha_1 \alpha}$

C. $\frac{\alpha_1 + \alpha_2}{2}$

D. $4\frac{\alpha_1\alpha_2}{\alpha_1 + \alpha_2}\frac{L_2L_1}{(L_2 + L_1)^2}$

Answer:

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234. The velocity (v) and time (t) graph of a body in a straight line motion is shown in the figure . The point S is at 4.333 seconds . The total distance covered by the body in 6s is :

- $\frac{37}{3}m$
- 12 m
- 11m
- $\frac{49}{4}m$

Answer:

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235. In an experiment to verify Stokes law , a small spherical ball of radius r and density ρ falls under gravity through a distance h in air before entering a tank of water. If the terminal velocity of the ball inside water is same as its velocity just before entering the water surface , then the value of h is proportional to : (ignore viscosity of air) .

A. r^4

B. r

C. r^3

D. r^2

Answer:

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236. A parallel plate capacitor has plate of length 'l' width 'w' and separation of plates is 'd' . It is connected to a battery of emf V . A dielectric slab of the same thickness 'd' and of dielectric constant k=4 is being inserted between the plates of the capacitor . At what lenght of the slab inside plates , will the energy stored in the capacitor be two time the initial energy stored ?

A. $2l/3$

B. $l/3$

C. $l/4$

D. $l/2$

Answer:

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237. A driver in a car , approaching a vertical wall notices that the frequency of his car horn , has changed form 440 Hz to 480 Hz , when it gets reflected form the wall . If the speed of the sound in are 345 m/s , then the speed of the car is :

A. 54 km/hr

B. 36 km/hr

C. 18 km/ hr

D. 24 km/ hr

Answer:

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238. A ring is hung on a nail. It can oscillate without slipping or sliding (i) in its plane with a time period T_1 and (ii) , back and forth in a direction perpendicular to its plane , with a period T_2 . The ratio $\frac{T_1}{T_2}$ will be :

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

B. $\frac{2}{3}$

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

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

Answer:

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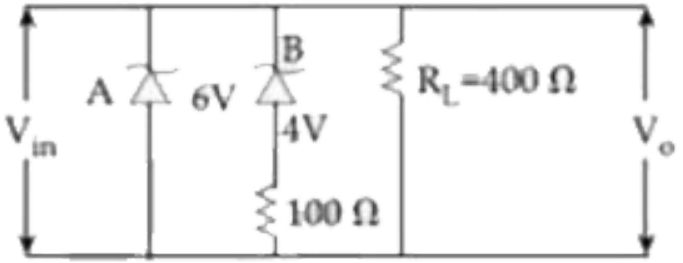
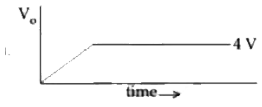
239. Two Zener diodes (A and B) having breakdown voltage of 6 V and 4 V respecitvely , are connected as shown in the circuit below . The output voltage V_0 variation with input voltage linearly increasing with time is given by :

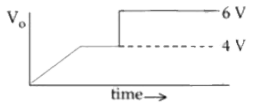
$(V_{\text{imput}} = 0 V att = 0)$ (figure are qualitative)



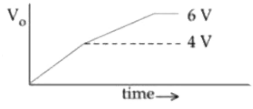
A.

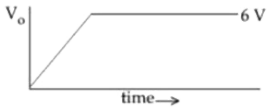


B.



C.



D. 

Answer:

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240. A radioactive nucleus decays by two different processes. The half life for the first process is 10 s and that for the second is 100 s. The effective half life of the nucleus is close to :

A. 9 sec

B. 6 sec

C. 55 sec

D. 12 sec

Answer:

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241. Consider three quantities: $x = \frac{E}{B}, y = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$, and $z = \frac{l}{CR}$.

Here , l is the length of a wire , C is the capacitance , and R is a resistance. All other symbols have usual meanings. Then

A. x, y and z have the same dimension

B. only x and z have the same dimension

C. only x and y have the same dimension

D. Only y and z have the same dimension

Answer:

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242. In an adiabatic process, the density of a diatomic gas becomes 32 times its initial value . The final pressure fo the gas is found to be n time the initial pressure . The value of n is :

A. 32

B. 326

C. 128

D. $\frac{1}{32}$

Answer:

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243. The angular velocity of the earth's rotation about its axis is ω. An object weighed by a spring balance gives the same

reading at the equator as at height h above the poles. The value of h will be

A. $\frac{R^2\omega^2}{2g}$

B. $\frac{R^2\omega^2}{g}$

C. $\frac{R^2\omega^2}{4g}$

D. $\frac{R^2\omega^2}{8g}$

Answer:

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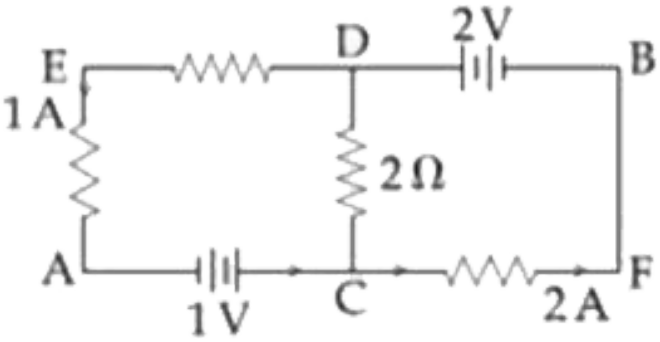
244. In the circuit , gives in the figure currents in different branches and value of one resistor are shown . Then potential

at point B with respect to the point A is :



A. $+2$

B. $-2V$

C. $-1V$

D. $+1V$

Answer:

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245. An iron rod of volume $10^{-4}m^3$ and relative permeability 1000 is placed inside a long solenoid wound with 5 $turns/cm$. If a current of $0.5A$ is passed through the solenoid, then the magnetic moment of the rod is

A. $10Am^2$

B. $15Am^2$

C. $20Am^2$

D. $25Am^2$

Answer:

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246. A body of mass 2 kg is driven by an engine delivering a constant power of 1 J /s. The body starts from rest and moves in a straight line. After 9 seconds, the body has moved a distance (in m) ..... .

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247. Nitrogen gas is at $300^\circ C$ temperature . The temperature (in K) at which the rms speed of a H_2 molecule would be equal to the rms speed of a nitrogen molecule is ,_____ .

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248. A prism of angle $A = 1^\circ$ has a refractive index $\mu = 1.5$. A good estimate for the minimum angle of deviation (in degrees

) is close to N/10 value of N is _____ .

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249. The surface of a metal is illuminated alternately with photons of energies $E_1 = 4eV$ and $E_2 = 2.5eV$ respectively. The ratio of maximum speeds of the photoelectrons emitted in the two cases is 2. The work function of the metal in (eV) is _____.

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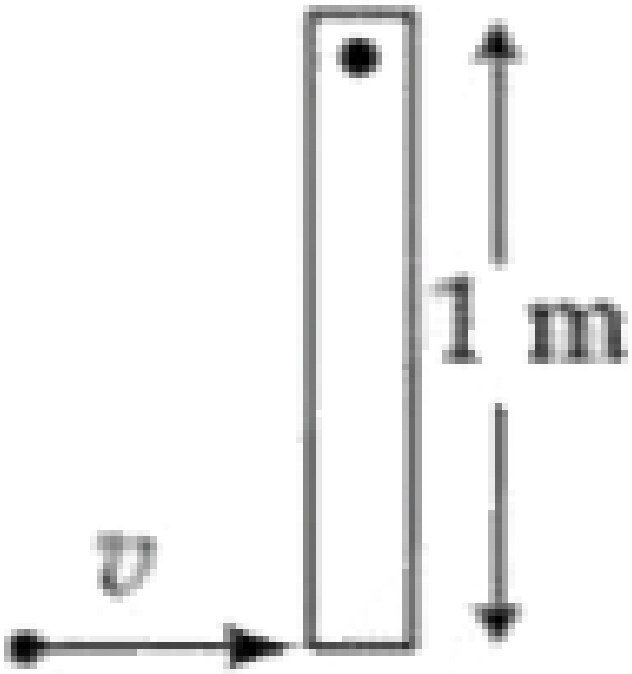
250. A thin rod of mass 0.9 kg and length 1 m is suspended, at rest, from one end so that it can freely oscillate in the vertical plane. A particle of mass 0.1 kg moving in a straight line with velocity 80 m/s hits the rod at is bottom most point and sticks

to it (see figure) . The angular speed (in rad/s) of the rod immediately after the collision will be .



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