PHYSICS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 1

Physics

1. In Young's double slit experiment, how many maxima can be obtained on a screen (including central maxima). If $d = \frac{5\lambda}{2}$ (where λ is the wavelength of light)?

A. 5

B. 4

C. 7

D. 1

Answer: A

Watch Video Solution

2. A magnet makes 40 oscillations per minute at a place having magnetic field intensity of $0.1 \times 10^{-5} T$. At another place, it takes 2.5 sec to complete one vibrating. The value of earth's horizontal field at that place is

A. $0.25 \times 10^{-6} T$

B. $0.36 \times 10^{-6} T$

C. $0.66 \times 10^{-8} T$

D. $1.2 \times 10^{-6} T$

Answer: B

Watch Video Solution

3. Half life of radioactive substance is 3.20 h. What is the time taken for $75\ \%$ substance to be used?

A. 6.4h

B. 12 h

C. 4.18 day

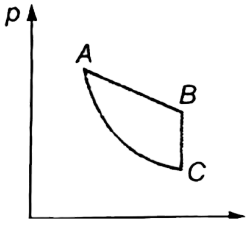
D. 1.2 day

Answer: A

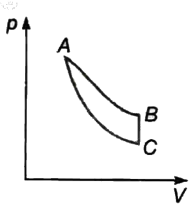
Watch Video Solution

4. If AB is an isothermal BC is an isochoric and AC is an adiabatic, which of the graphs correctly represents given in figure.

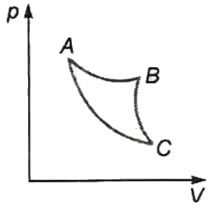
A.



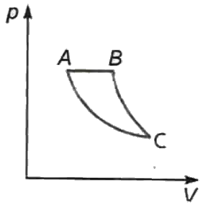
B.



C.



D.



Answer: B

Watch Video Solution

5. A particle executes simple harmonic motion and is located at $x = a, b$ and c at times t_0, $2t_0$ and $3t_0$ respectively. The frequency of the oscillation is :

A. $\frac{1}{2\pi t_0}\cos^{-1}\left(\frac{a+c}{2b}\right)$

B. $\frac{1}{2\pi t_0}\cos^{-1}\left(\frac{a+2b}{3c}\right)$

C. $\frac{1}{2\pi t_0}\cos^{-1}\left(\frac{a+b}{2c}\right)$

D. $\frac{1}{2\pi t_0}\cos^{-1}\left(\frac{2a+3c}{b}\right)$

Answer: A

Watch Video Solution

6. The shortest wavelength of the Brackett series of a hydrogen-like atom (atomic number of Z) is the same as the shortest wavelength of the Balmer series of hydrogen atom. The value of z is

A. 2

B. 3

C. 4

D. 6

Answer: B

Watch Video Solution

7. A partition wall has two layers of different materials A and B in contact with each other. They have the same thickness but the thermal conductivity of layer A is twice that of layer B. At steady state the temperature difference across the layer B is 50 K, then the corresponding difference across the layer A is

A. 50K

B. 12.5K

C. 25K

D. 60 K

Answer: C

Watch Video Solution

8. A particle is released from a height S. At certain height its kinetic energy is three times its potential energy. The height and speed of the particle at that instant are respectively

A. $\frac{S}{4}, \frac{3gS}{2}$

B. $\frac{S}{4}, \frac{\sqrt{3gS}}{2}$

C. $\frac{S}{2}, \frac{\sqrt{3gS}}{g}$

D. $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$

Answer: D

Watch Video Solution

9. A coil of inductive reactance 31Ω has a resistance of 8Ω. It is placed in series with a condenser of capacitive reactance 25Ω. The combination is connected to an AC source of $110V$. The power factor of the circuit is

A. 0.33

B. 0.56

C. 0.64

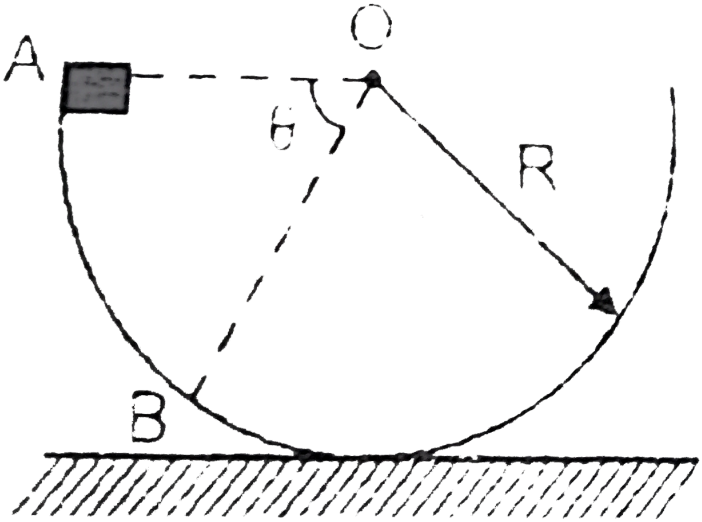
D. 0.8

Answer: D

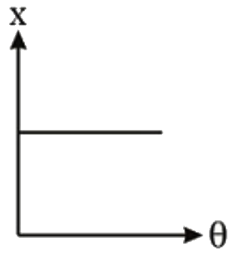
Watch Video Solution

10. A small block of mass m is released from rest from point A inside a smooth hemisphere bowl of radius R, which is fixed on group such that OA is horizontal. The ratio (x) of magnitude of centripetal force and

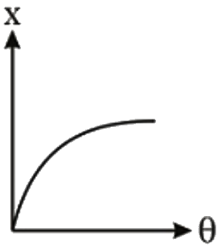
normal reaction on the block at any point B varies with θ as :



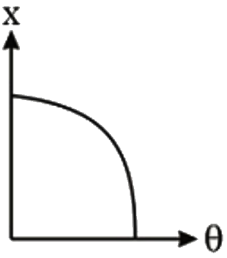
A.



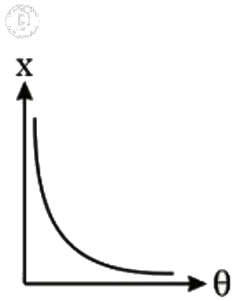
B.



C.



D.

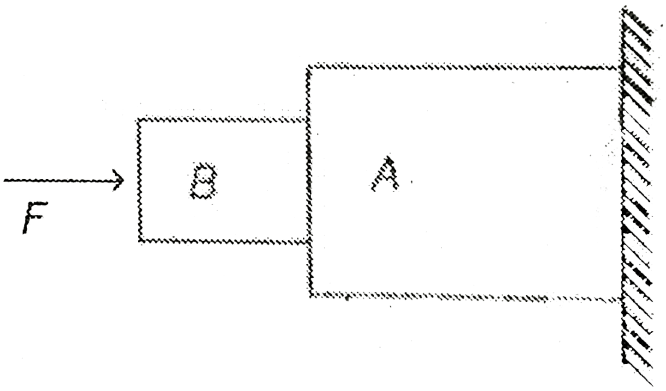


Answer: A

Watch Video Solution

11. Consider the system shown in the figure. The wall is smooth, but the surfaces of blocks A and B in contact are rough. The friction on B due to A

in equilibrium is



A. upward

B. Downward

C. zero

D. The system cannot remain in equilibrium

Answer: D

Watch Video Solution

12. A large temple has a depression in one wall. On the floor plan it appears as a indentation having spherical shape of radius $2.50m$ A

worshiper stands on the center line of the depression, 2.00 m out from its deepest point,and whispers a prayers. Where is the sound concentrated after reflection from the back wall of the depression?

A. $\frac{-10}{3}m$

B. $\frac{-10}{7}m$

C. $\frac{-3}{10}m$

D. $\frac{-7}{10}m$

Answer: A

Watch Video Solution

13. The resultant of two vectors is perpendicular to first vector of magnitude 6N. If the resultant has magnitude $6\sqrt{3}N$, then magnitude of second vector is

A. $6\sqrt{2}N$

B. $12N$

C. $9\sqrt{3}N$

D. $6\sqrt{3}N$

Answer: B

Watch Video Solution

14. If the unit of mass , length and the time are doubled then unit of angular momentum will be

A. Doubled

B. Tripled

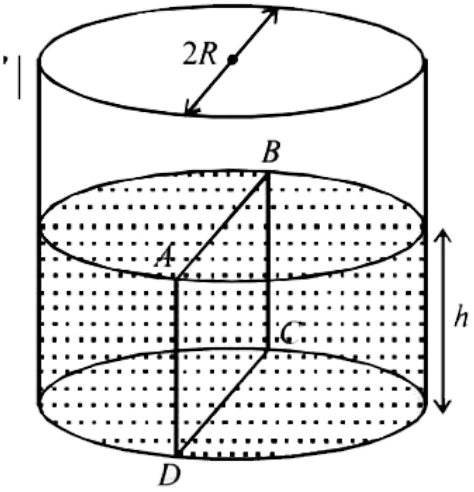
C. Quadrupled

D. Eight times

Answer: C

Watch Video Solution

15. Water is filled up to a height h in a beaker of radius R as shown in the figure. The density of water is ρ, the surface tension of water is T and the atmospheric pressure is P_0. Consider a vertical section ABCD of the water column through a diameter of the beaker. The force on water on one side of this section by water on the other side of this section has magnitude



A. $\left|2p_0Rh + \pi R^2\rho gh - 2RT\right|$

B. $\left|2p_0Rh + R\rho gh^2 - 2RT\right|$

C. $\left|p_0\pi R^2 + R\rho gh^2 - 2RT\right|$

D. $\left|p_0\pi R^2 + R\rho gh^2 + 2RT\right|$

Answer: B

Watch Video Solution

16. When a mass is rotating in a plane about a fixed point, its angular momentum is directed along.

A. radius

B. tangent to orbit

C. axis of rotation

D. incline at an angle of 45° to plane of rotation

Answer: C

Watch Video Solution

17. The voltage of clouds is $4 \times 10^6 V$ with respect to ground. In a lighting strike lasting $100ms$, a charge of $4C$ is delivered to the ground. The

power of lighting strike is

A. 160MW

B. 80MW

C. 20MW

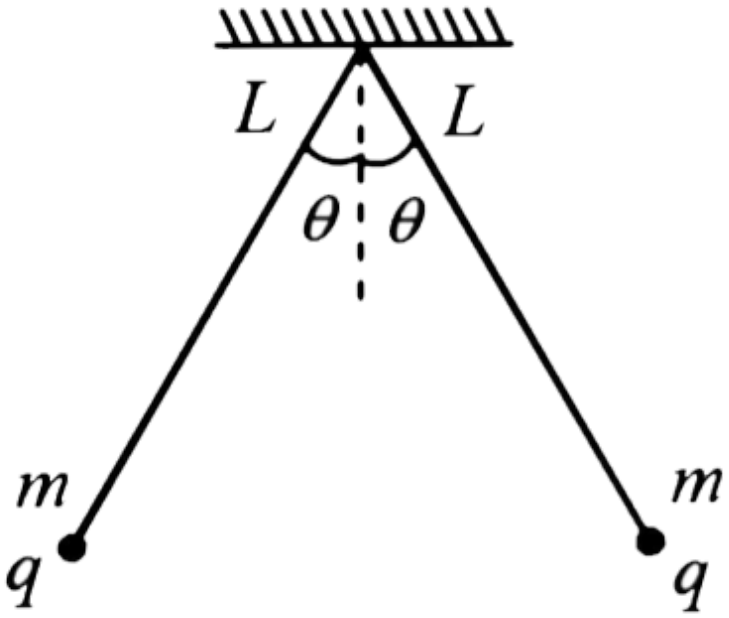
D. 500KW

Answer: B

Watch Video Solution

18. Two small spheres each of mass m and charge q are tied from the same rigid support with the help of silk threads of length L. They make angle θ with the vertical as shown in the fig. If length L is decreased, then

angle θ with the vertical.



A. increases

B. decreases

C. unaffected

D. cannot say

Answer: A

Watch Video Solution

19. A 1-L flask contains some mercury. It is found that at different temperature the volume of air inside the flask remains the same. What is the volume of mercury in this flask, if coefficient of linear expansion of glass $= 9 \times 10^{-6}/^{\circ} C$ and the coefficient of volume expansion of mercury is $1.8 \times 10^{-4}/^{\circ} C$?

A. 50 cc

B. 100 cc

C. 150 cc

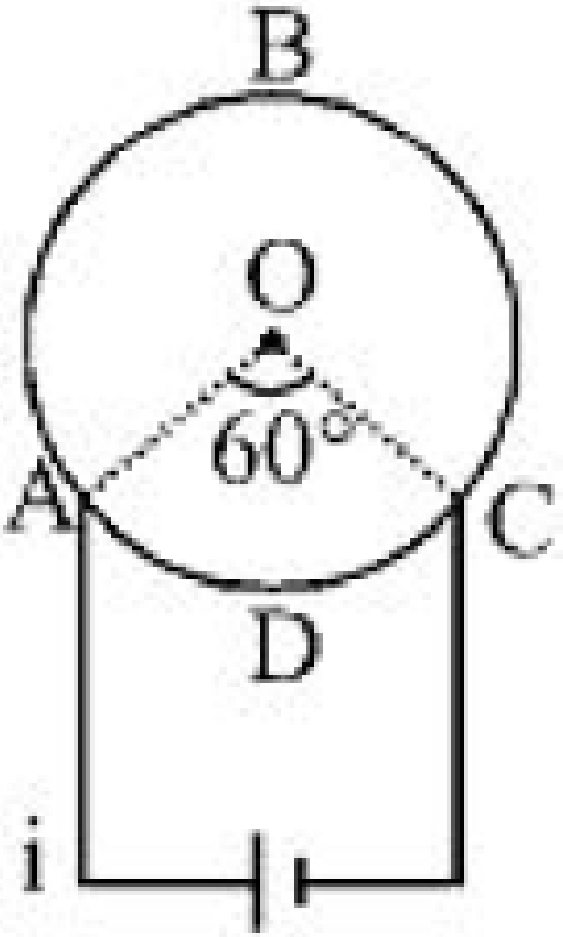
D. 200 cc

Answer: C

Watch Video Solution

20. A cell is connected between the points A and C of a circular conductor ABCD of centre O .$\angle AOC = 60^{\circ}$. IfB_1 and B_2 are the magnitudes of the magnetic fields at O due to the currents in ABC and ADC respectively,

the ratio $\frac{B_1}{B_2}$, is



A. 1

B. 2

C. 5

D. 6

Answer: A

Watch Video Solution

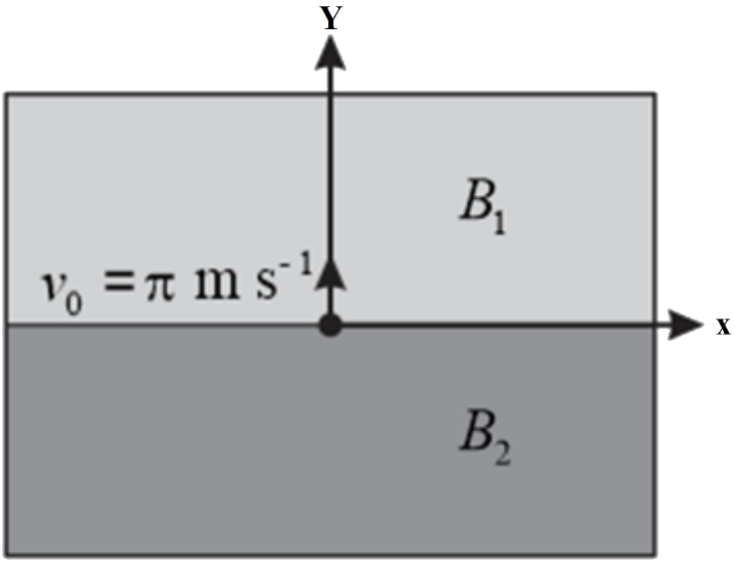
21. A ball of mass m moving horizontally at a speed v collides with the bob of a simple pendulum at rest. The mass of the bob is also m. If the collision is perfectly inelastic and both balls sticks, the height to which the two balls rise after the collision will be given by:

Watch Video Solution

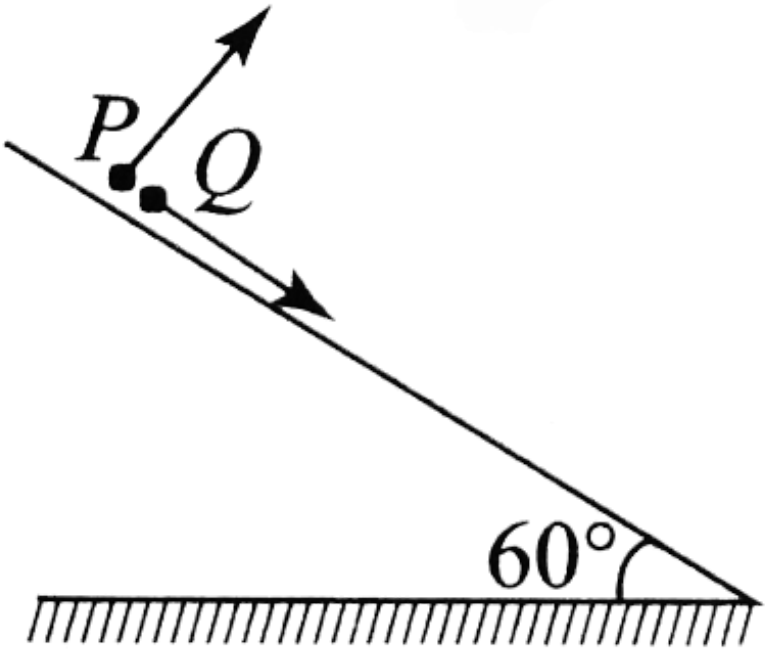
22. A stationary source is emitting sound at a fixed frequency f_0, which is reflected by two cars approaching the source. The difference between the frequencies of sound reflected from the cars is $1.2\,\%$ of f_0. What is the difference in the speeds of the cars (in km per hour) to the nearest integer ? The cars are moving at constant speeds much smaller than the speed of sound which is $330ms^{-1}$.

Watch Video Solution

23. In the XY- plane , the region $y > 0$ has a uniform magnetic field $B_1\hat{k}$ and the region $y < 0$has another uniform magnetic field $B_2\hat{k}$. A positively charged particle is projected from the origin along the positive y- axis with speed $v_0 = \pi ms^{-1}$ at t=0 , as shown in the figure . Neglect gravity in this problem . Let t=T be the time when the particle crosses the X- axis from below for the first time . If $B_2 = 4B_1$, the average speed to the particle , in ms^{-1}, along the x- axis in the time interval T is _____ .



Watch Video Solution



24.

A particle P is projected from a point on the surface of smooth inclined plane (see figure). Simultaneously another particle Q is released on the smooth inclined plane from the same position. P and Q collide after$t = 4$. The speed of projection of P is

Watch Video Solution

25. A mass (M) attached to a spring, oscillates with a period of (2 sec). If the mass in increased by (2 kg) the period increases by one sec. Find the initial mass (M) assuming that Hook's Law is obeyed.

Watch Video Solution

26. If a galvanometer has full scale deflection current I_g and resistance G. A shunt resistance R_A is used to convert it into an ammeter of range I_o and a resistance R_V is connected in series to convert it into a voltmeter of range V_0 such that $V_0 = I_0 G$ then $R_A R_V$ and $\frac{R_A}{R_V}$ respectively are:

A. $R_A R_V = G^2 \left(\frac{I_0 - I_g}{I_g} \right)$ and $\frac{R_A}{R_V} = \left(\frac{I_g}{I_0 - I_g} \right)^2$

B. $R_A R_V = G^2$ and $\frac{R_A}{R_v} = \frac{I_g}{(I_0 - I_g)}$

C. $R_A R_v = G^2$ and $\frac{R_A}{R_v} = \left(\frac{I_g}{I_0 - I_g} \right)^2$

D. $R_A R_V = G^2 \left(\frac{I_g}{I_0 - I_g} \right)$ and $\frac{R_A}{R_V} = \left(\frac{I_0 - I_g}{I_g} \right)^2$

Answer: C

Watch Video Solution

27. A resistance R whose value is varied from 1Ω to 5Ω is connected to a cell of internal resistance 3Ω. The power consumed by R.

A. increases continuously

B. decreases continuously

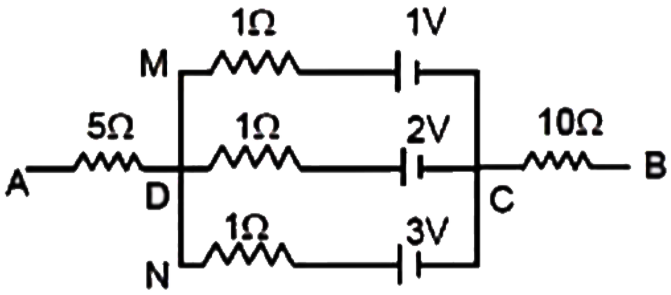
C. first decreases then increases

D. first increases then decreases

Answer: D

Watch Video Solution

28. The potential difference between the points A and B in the given circuit is



A. 1V

B. 3V

C. 6V

D. 2V

Answer: D

Watch Video Solution

29. An $L-C-R$ series circuit with 100Ω resistance is connected to an AC source of $200V$ and angular frequency $300rad/s$. When only the capacitance is removed, the current lags behind the voltage by 60°. When only the inductance is removed the current leads the voltage by

60°. Calculate the current and the power dissipated in the $L-C-R$ circuit

A. 3A, 300 W

B. 5A, 100 W

C. 4A, 200 W

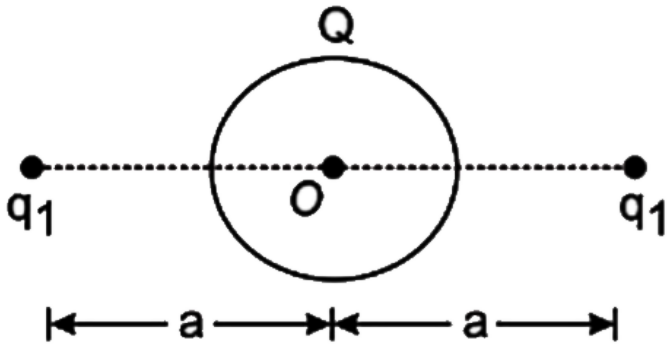
D. 2A, 400 W

Answer: D

Watch Video Solution

30. In between two point charges a conducting spherical shell having charge Q is placed as shown in the diagram. Assuming all charges to be

positive, mark out the correct statement.



A. the charge on outer surface of shell is uniformly distributed

B. the charge on outer surface of shell is non - uniformly distributed

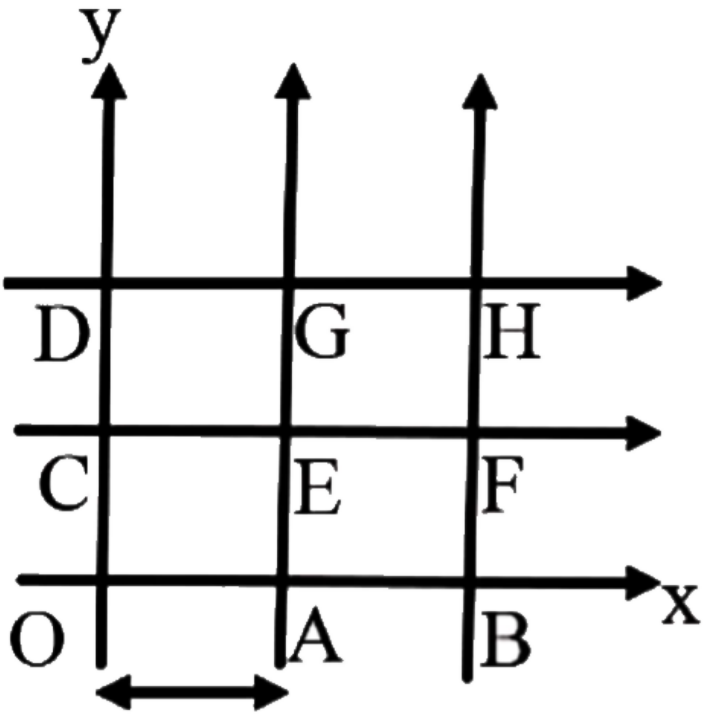
C. the information is insufficient to find the nature of charge distribution on the outer surface

D. none of these

Answer: B

Watch Video Solution

31. The grid represents a region in space containing a uniform electric field (each square of size $1m \times 1m$). If potentials at point O, A, B, C, D, E, F, G, H are respectively $0, -1, -2, 1, 2, 0, -1, 1$ and 0 volts find the electric field intensity.



A. $\left(\hat{i}+\hat{j}\right)V/m$

B. $\left(\hat{i}-\hat{j}\right)V/m$

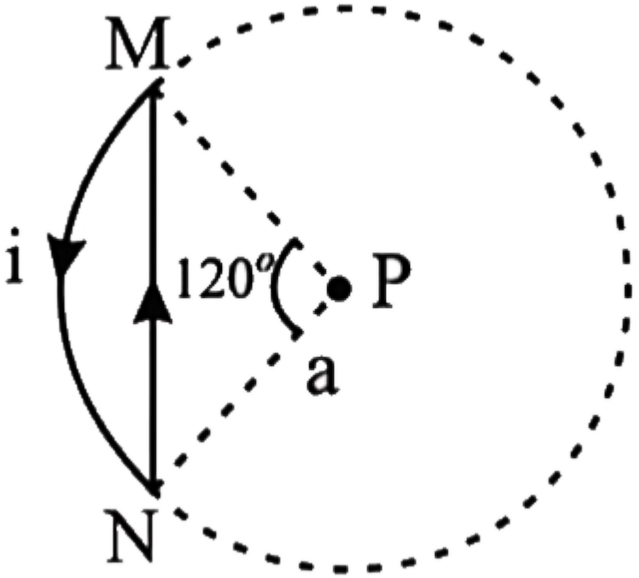
C. $\left(-\hat{i}+\hat{j}\right)V/m$

D. $\left(-\hat{i}-\hat{j}\right)V/m$

Answer: B

Watch Video Solution

32. A wire loop carrying current I is placed in the $x-y$ plane as shown in the figure. If an external uniform magnetic field $\overrightarrow{B}=B\hat{i}$ is switched on, then the torque acting on the loop is



A. $iBa^2\left(\frac{\pi}{3}-\frac{\sqrt{3}}{4}\right)\hat{j}$

B. $iBa^2\left(\frac{3}{\pi}-\frac{\sqrt{3}}{4}\right)\hat{j}$

C. $iBa^2\left(\frac{\pi}{3}-\frac{\sqrt{3}}{2}\right)\hat{j}$

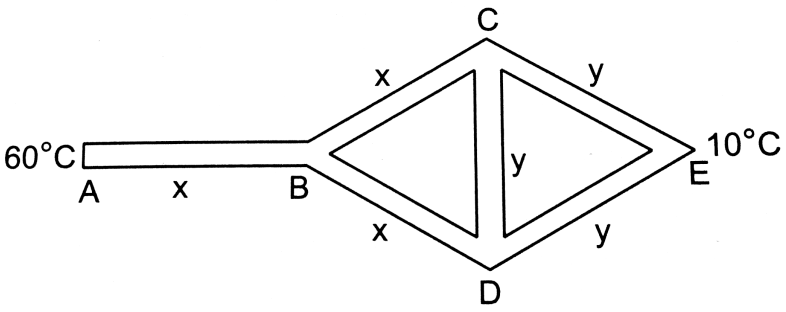
D. $iBa^2\left(\frac{3}{\pi}-\frac{\sqrt{3}}{2}\right)\hat{j}$

Answer: A

Watch Video Solution

33. Three rods of material x and three of material y are connected as shown in figure. All the rods are identical in length and cross sectional area. If the end A is maintained at $60^\circ C$ and the junction E at $10^\circ C$, calculate the temperature of the junction B. The thermal conductivity of

x is $800Wm^{-1}.^{\circ}C^{-1}$ and that of y is $400Wm^{-1}.^{\circ}C^{-1}$.



A. $10^{\circ}C$

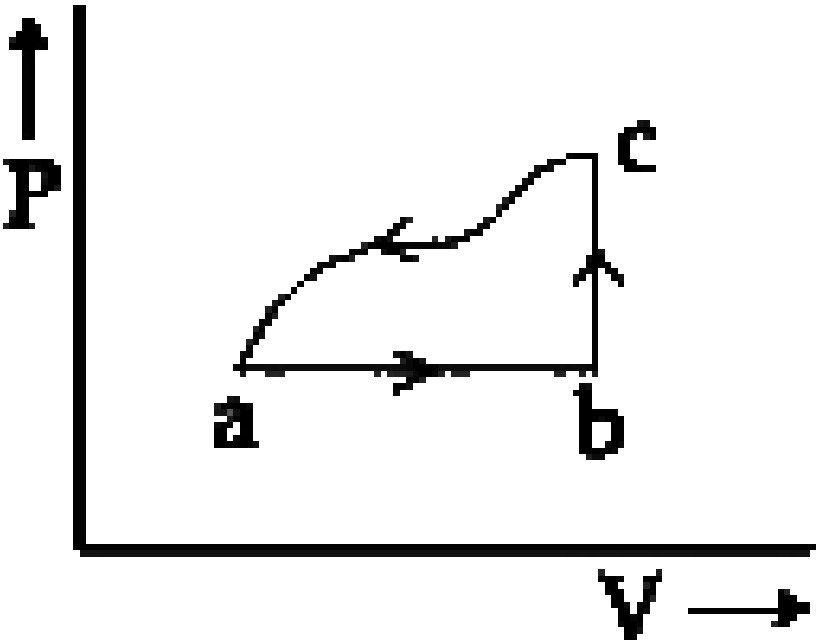
B. $20^{\circ}C$

C. $30^{\circ}C$

D. $40^{\circ}C$

Answer: B

Watch Video Solution



34.

A sample of an ideal gas is taken through the cyclic process abca and shown in the figure. The change in the internal energy of the gas along the path ca is $-180J$. The gas aborbs 250J of heat along the path ab and 60 J along the path bc. the work done by the along the path abc is:

A. 130 J

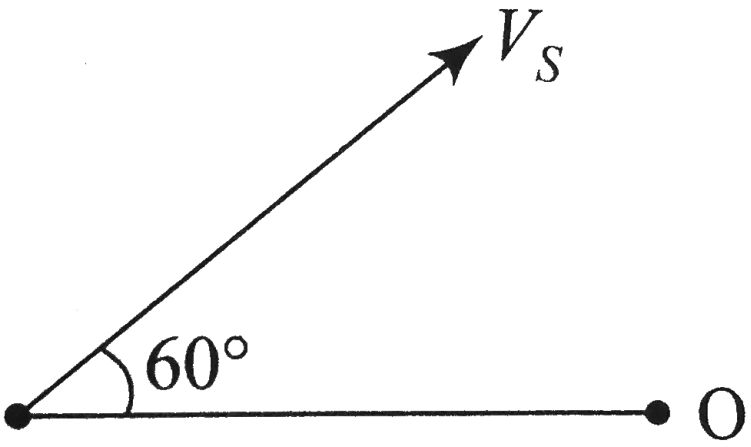
B. 140 J

C. 120 J

D. 100 J

Answer: A

Watch Video Solution



35.

A source of sound S emitting waves of frequency $100Hz$ and an observer O are located at some distance from each other. The source is moving with a speed of $19.4ms^{-1}$ at an angle of 60° with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer (velocity of sound in air $330ms^{-1}$) is

A. 103 Hz

B. 106 Hz

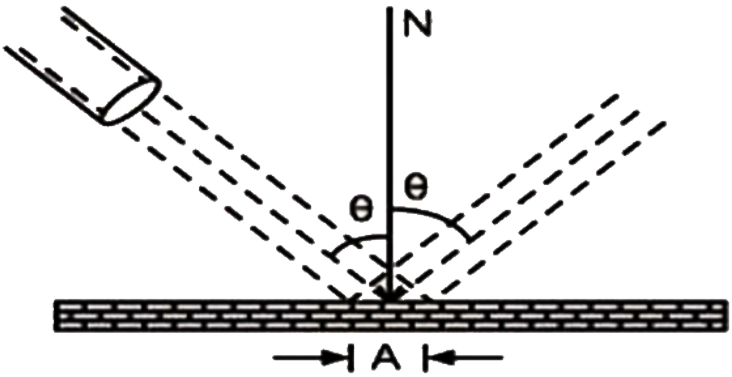
C. 96 Hz

D. 100 Hz

Answer: A

36. A nozzle throws a stream of gas against a wall with a velocity v much larger than the thermal agitation of the molecules. After collision of the molecules with wall the magnitude of their velocity remains same. Also assume that the force exerted on the wall by the molecule is perpendicular to wall. (This is not strictly true for a rough wall.) Find the pressure exerted on the wall. (n = number of molecules per unit volume,

m = mass of a gas molecule)



A. $2nmv^2 \cos^2 \theta$

B. $3nmv^2 \cos^2 \theta$

C. $nmv^2 \cos^2 \theta$

D. $2nmv^2 \sin^2 \theta$

Answer: A

Watch Video Solution

37. If the velocity of light (c) , gravitational constant (G) and Planck's constant (h) are chosen as fundamental units, then the dimensions of mass in new system is

A. $h^{-\frac{1}{2}}G^{\frac{1}{2}}C^{\circ}$

B. $h^{\frac{1}{2}}C^{\frac{1}{2}}G^{-\frac{1}{2}}$

C. $h^{-\frac{1}{2}}C^{\frac{1}{2}}G^{-\frac{1}{2}}$

D. $h^{-\frac{1}{2}}C^{-\frac{1}{2}}G^{-\frac{1}{2}}$

Answer: B

Watch Video Solution

38. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2rt^2$, where k is a constant. The power delivered to the particle by the forces acting on it is :

A. $2\pi mk^2r^2$

B. mk^2r^2t

C. $\frac{\left(mK^4r^2t^5\right)}{3}$

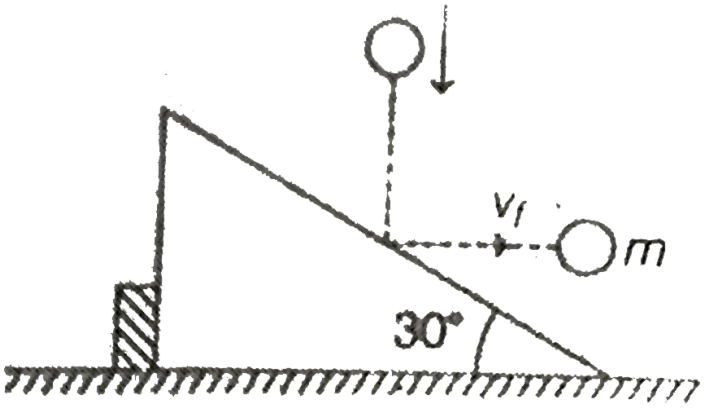
D. Zero

Answer: B

Watch Video Solution

39. As shown in the figure a body of mass m moving vertically with speed 3 m/s hits a smooth fixed inclined plane and rebounds with a velocity v_f in the horizontal direction . If angle of plane with horizontal is 30° , the

velocity v_f will be



A. 3 m/s

B. $\sqrt{3}m/s$

C. $1/\sqrt{3}m/s$

D. This is not possible

Answer: B

Watch Video Solution

40. A planet revolves about the sun in an elliptical orbit of semi-major axis $2 \times 10^{12}m$. The areal velocity of the planet when it is nearest to the

sun is $4.4 \times 10^{16} m/s$. The least distance between the planet and the sun is $1.8 \times 10^{12} m/s$. The minimum speed of the planet in km/s is $10K$. determine the value of K.

A. 4

B. 3

C. 1

D. 2

Answer: A

Watch Video Solution

41. A simple pendulum of length l is suspended from the celing of a cart which is sliding without friction on as inclined plane of inclination theta . What will be the time period of the pendulum?

A. $2\pi\sqrt{\frac{l}{g\cos\theta}}$

B. $2\pi\sqrt{\frac{3l}{g\cos\theta}}$

C. $4\pi\sqrt{\frac{2l}{g\cos\theta}}$

D. $3\pi\sqrt{\frac{4l}{2g\cos\theta}}$

Answer: A

Watch Video Solution

42. A concrete sphere of radius R has cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are respectively 2.4 and 0.3 for this sphere to float with its entire volume submerged under water. Ratio of mass of concrete to mass of swadust will be

A. 8

B. 4

C. 3

D. Zero

Answer: B

Watch Video Solution

43. K_α wavelength emitted by an atom of atomic number Z=11 is λ. Find the atomic number for an atom that emits K_α radiation with wavelength 4λ.

(a) Z=6 (b) Z=4

(c) Z=11 (d) Z=44.

A. Z = 6

B. Z = 4

C. Z = 11

D. Z = 44

Answer: A

Watch Video Solution

44. ATV tower has a height of 100m. How much population is covered by TV broadcast. If the average population density around the tower is $1000km^{-2}$? (radius of earth =$6.4 \times 10^6 m$)

A. 6×10^6

B. 2×10^6

C. 12×10^6

D. 4×10^6

Answer: D

Watch Video Solution

45. For a common-emitter transistor amplifier, the current gain is 60. If the emitter current is 6.6 mA then its base current is

A. 6.492 mA

B. 0.108 mA

C. 0.11 mA

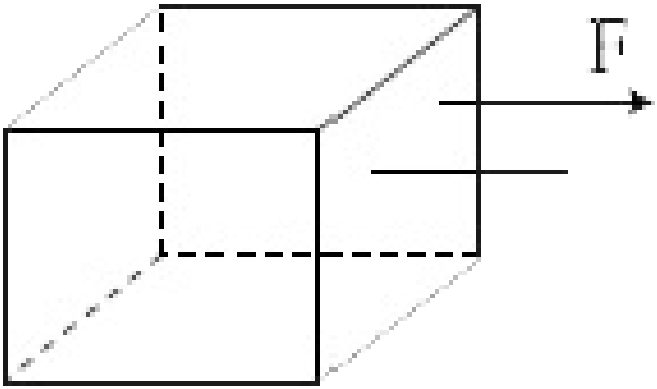
D. 0.343 mA

Answer: B

Watch Video Solution

46. A tube A of radius r is connected to two other tubes B and C with the help of a junction valve. The tubes B and C have radii $\frac{r}{2}$ and $\frac{r}{3}$ and the flow velocity in each is v and 3v respectively. If the flow velocity in tube A is $\frac{n}{m}v$, when n and m are integers, then what is the value of $n+m$?

Watch Video Solution



47.

Consider a uniform cubical box of side a on a rough floor that is to be moved by applying minimum possible force F at a point b above its centre of mass (see figure). It the coefficient of friction is $\mu = 0.4$, the maximum possible value of $100 \times \frac{b}{a}$ for box not to topple before moving is _____.

Watch Video Solution

48. A metal has a work function ϕ_0 and its corresponding threshold wavelength is λ_0. If the threshold wavelength for a metal whose work function is $\frac{\phi_0}{3}$ is $n\lambda_0$, then what is the value of n ?

Watch Video Solution

49. A plano convex lens of radius of curvature 30 cm and refractive index 1.5 is kept in air. Find its focal length (in cm).

Watch Video Solution

50. YDSE is conducted using light of wavelength 6000Å to observe an interference pattern. When a film of some material 3.0×10^{-3} cm thick was placed over one of the slits, the fringe pattern shifted by a distance equal to 10 fringe widths. What is the refractive index of the material of the film ?

Watch Video Solution

51. The magnetic moment of a magnet is $3.6 \times 10^{-3} A.m^2$. Its pole strength is 120mili amp.M`. Its magnetic length is

A. 3cm

B. 0.3 cm

C. 3.3 cm

D. 33 cm

Answer: A

Watch Video Solution

52. An isolated soap bubble is kept in a container in which the pressure is maintained at P_0 . The bubble is given some charge due to which its radius increases to R_0 . If the surface tension of the soap bubble is T, then the charge given to the bubble is

A. $Q = 8\pi r\sqrt{rT\varepsilon_0}$

B. $Q = 8\pi r\sqrt{2rT\varepsilon_0}$

C. $Q = 4\pi r\sqrt{2rT\varepsilon_0}$

D. $Q = 4\pi r\sqrt{rT\varepsilon_0}$

Answer: B

Watch Video Solution

53. A 200 Ω resistance has a certain colour code as per standard colour coding. If one replaces the red colour by green in the code, the new resistance will be

A. 500Ω

B. 400Ω

C. 300Ω

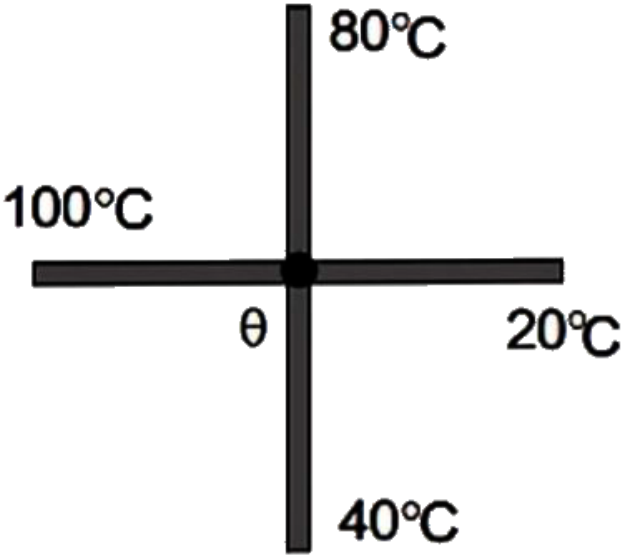
D. 100Ω

Answer: A

Watch Video Solution

54. Four identical heat conductors are connected as shown in the figure.

The temperature θ of the junction is [rods are insulated from the sides]



A. $30^\circ C$

B. $15^\circ C$

C. $60^\circ C$

D. $70^\circ C$

Answer: C

Watch Video Solution

55. A block starts moving up a fixed inclined plane of inclination $60^\circ C$ with a velocityof $20ms^{-1}$ and stops after 2s. The approximate value of the coefficient of friction is $[g = 10ms^{-2}]$

A. 3

B. 3.3

C. 0.27

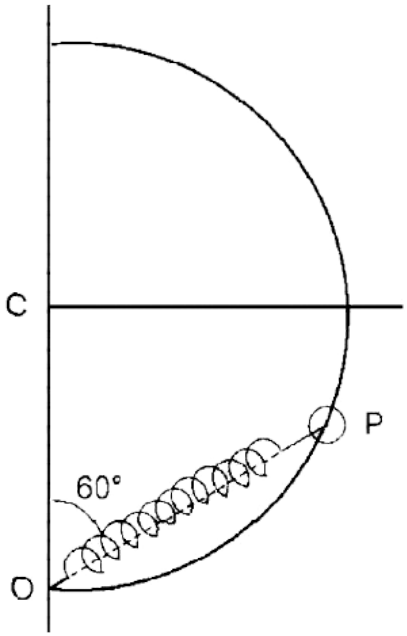
D. 0.33

Answer: C

Watch Video Solution

56. A smooth semicircular wire-track of radius R is fixed in a vertical plane. One end of a massless spring of natural length $3R/4$ is attached to the lowest point O of the wire-track. A small ring of mass m, which can slide

on the track, is attached to the other end of the spring. The ring is held stationary at point P such that the spring makes an angle of 60° with the vertical. The spring constant $K = mg/R$. Consider the instant when the ring is released, and (i) draw the free body diagram of the ring, (ii) determine the tangential acceleration of the ring and the normal reaction.



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

B. mg

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

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

Answer: A

Watch Video Solution

57. One slit of a double slit experiment is covered by a thin glass plate of refractive index 1.4, and the other by a thin glass plate of the refractive index 1.7. The point on the screen where the central maximum fall before the glass plate was inserted, is now occupied by what had been the fifth bright fringe was seen before. Assume the plate have the same thickness t and wavelength of light 480 nm. Then find the value of t in μm.

A. $2.4\mu m$

B. $4.8\mu m$

C. $8\mu m$

D. $16\mu m$

Answer: C

Watch Video Solution

58. A small satellite of mass m is revolving around earth in a circular orbit of radius r_0 with speed v_0 . At certain point of its orbit, the direction of motion of satellite is suddenly changed by angle $\theta = \cos^{-1}(3/5)$ by turning its velocity vector , such that speed remains constant. The satellite consequently goes to elliptical orbit around earth. the ratio of speed at perigee to speed at apogee is

A. 3

B. 9

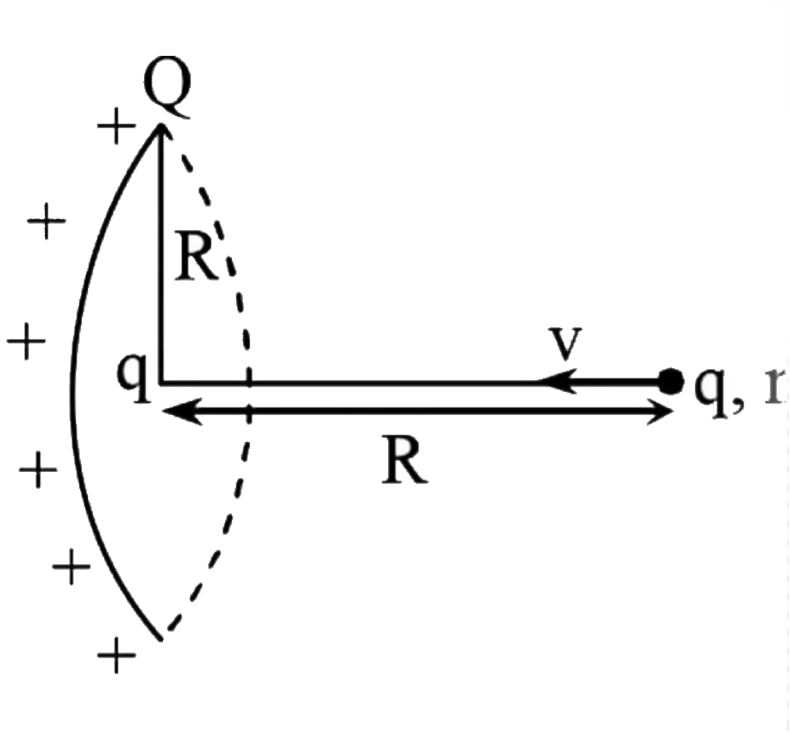
C. $1/3$

D. $1/9$

Answer: B

Watch Video Solution

59. The minimum velocity v with which charge q should be projected so that it manages to reach the centre of the ring starting from the position shown in figure is



A. $v = \sqrt{\frac{kQq}{mR}(2-\sqrt{2})}$

B. $v = \sqrt{\frac{kQq}{2mR}(2-\sqrt{2})}$

C. $v = \sqrt{\frac{kQq}{mR}}$

D. $v = \sqrt{\frac{kQq}{\sqrt{2}mR}(1-\sqrt{2})}$

Answer: A

Watch Video Solution

60. An AC is given by the equation $i = i_1 \cos \omega t + i_2 \sin \omega t$. The r.m.s. current is given by

A. $\frac{i_1 + i_2}{\sqrt{2}}$

B. $\frac{|i_1 + i_2|}{\sqrt{2}}$

C. $\sqrt{\frac{i_1^2 + i_2^2}{2}}$

D. $\sqrt{\frac{i_1^2 + i_2^2}{\sqrt{2}}}$

Answer: C

Watch Video Solution

61. Two particles of masses m and 3m approach each other with different velocities. After collision, the particle of mass m has velocity $\vec{v}$ in their

centre of mass frame. Velocity of particle of mass 3m in the centre of mass frame is

A. $-2\vec{v}$

B. $-\frac{\vec{v}}{2}$

C. $-\frac{\vec{v}}{3}$

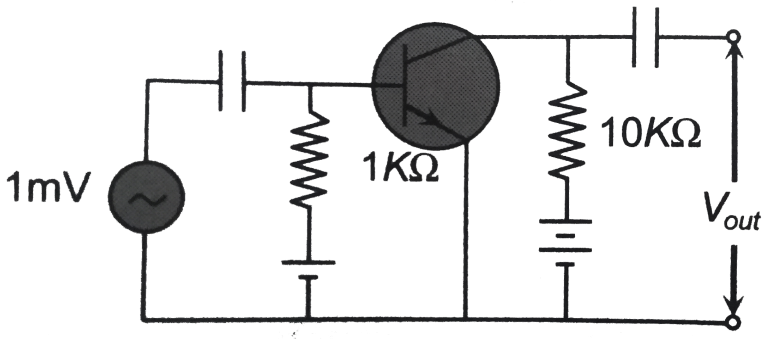
D. $\frac{\vec{v}}{4}$

Answer: C

Watch Video Solution

62. In the following common emitter configuration an NPN transistor with current gain $\beta = 100$ is used. The output voltage of the amlifier will

be



A. 10mV

B. 0.1V

C. 1.0 V

D. 10V

Answer: C

Watch Video Solution

63. After 280 days, the activity of a radioactive sample is 6000 dps. The activity reduces to 3000 dps after another 140 days. The initial activity of the sample in dps is

A. 6000

B. 9000

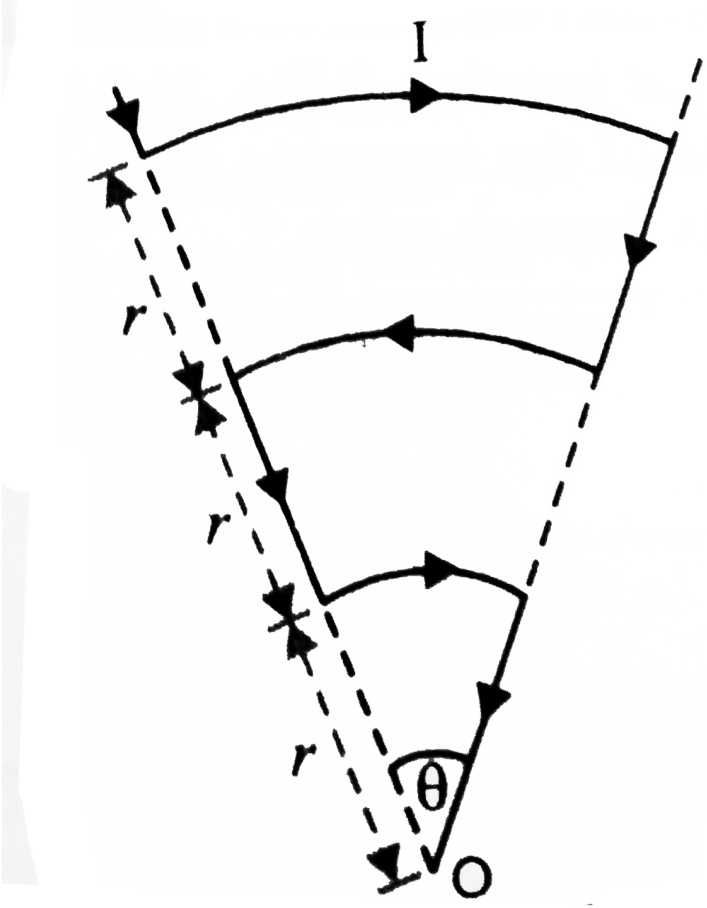
C. 3000

D. 24000

Answer: D

Watch Video Solution

64. A conductor carrying current I is of the type as shown in figure. Find the magnetic field induction at the common centre O of all the three arcs.



A. $\frac{5\mu i\theta}{24\pi R}$

B. $\frac{m_0 i\theta}{24\pi R}$

C. $\frac{11\mu_0 i\theta}{24\pi R}$

D. zero

Answer: A

Watch Video Solution

65. An electron of mass $'m'$ is accelerated through a potential difference of V and then it enters a magnetic field of induction$B$. Normal to the lines of force. Then the radius of the circular path is

A. $\sqrt{2eV/m}$

B. $\sqrt{2Vm/eB^2}$

C. $\sqrt{2Vm/eB}$

D. $\sqrt{2Vm/e^2B}$

Answer: B

Watch Video Solution

66. A pipe of length 1.5 m closed at one end is filled with a gas and it resonates at $30^\circ C$ in its fundamental with a tuning fork. Another pipe of the same length but open at both ends and filled with air and it

resonates in its fundamental with the same tuning fork. Calculate the velocity of sound at $0^\circ C$ in the gas, given that the velocity of sound in air is $360ms^{-1}$ at 30°.

A. $580m/s$

B. $683m/s$

C. $880m/s$

D. $743m/s$

Answer: B

Watch Video Solution

67. If the unit of force is 100 N, unit of length is 10m and unit of time is 100 s, what is the unit of mass in this system of units ?

A. 10^5 kg

B. 10^6 kg

C. $10^2 kg$

D. $10^3 kg$

Answer: A

Watch Video Solution

68. In a photoelectric effect experiment, stopping potential changes by 30 volt if we change frequency of the radiation. Then the magnitude of change in the frequency is : $\left(h = 6 \times 10^{-34} J - s\right)$

A. $4 \times 10^{-15} s^{-1}$

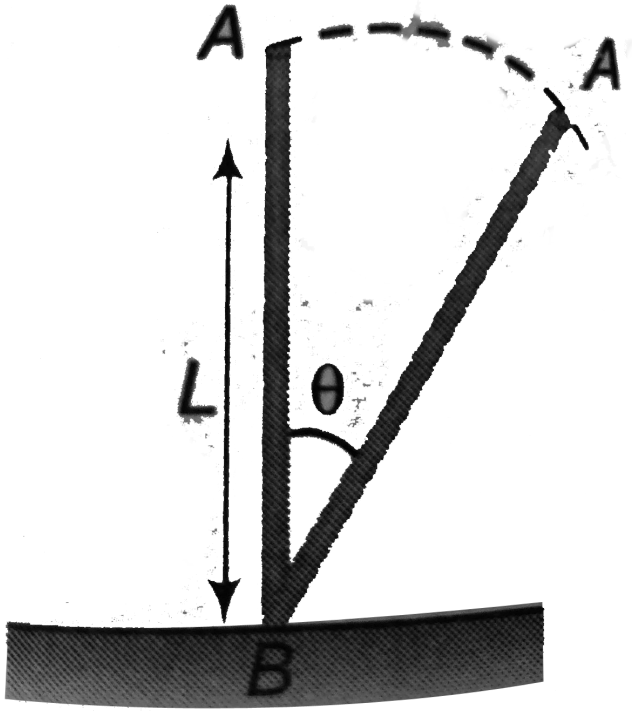
B. $8 \times 10^{15} s^{-1}$

C. $10^{16} s^{-1}$

D. $18 \times 10^{15} s^{-1}$

Answer: B

Watch Video Solution



69.

A uniform rod of length L is free to rotate in a vertical plane about a fixed horizontal axis through B. The rod begins rotating from rest. The angular velocity ω at angle θ is given as

A. $\sqrt{\frac{6g}{L}}\sin\theta$

B. $\sqrt{\frac{6g}{L}}\sin\frac{\theta}{2}$

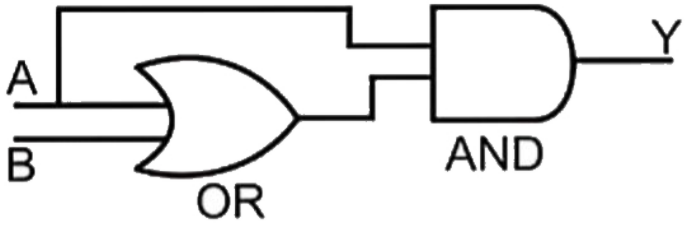
C. $\sqrt{\frac{6g}{L}}\cos\frac{\theta}{2}$

D. $\sqrt{\frac{6g}{L}}\cos\theta$

Answer: B

Watch Video Solution

70. The output Y of the combination of logic gates shown is equal to



A. A

B. $\overline{A}$

C. $A + B$

D. AB

Answer: A

Watch Video Solution

71. A liquid having a coefficient of volume expansion γ is filled in a cylindrical vessel made out of glass having coefficient of lienar expansion $\alpha = \frac{\gamma}{5}$. At room temperature , the level of liquid in the vessel isl_0 and when the temperature is increased by ΔT, the level of liquid in the vessel becomes $l \approx l_0 = (1 + n\alpha\Delta T)$. What is the value of n ? [Given , $\alpha\Delta T < < 1$]

Watch Video Solution

72. A point object is placed at a distance of 10 cm and its real image is formed at a distance of 20 cm from a concave mirror. If the object is moved by 0.1 cm towards the mirror. The image will shift by about

Watch Video Solution

73. A cylindrical vessel of height 500mm has an orifice (small hole) at its bottom. The orifice is initially closed and water is filled in it up to height H. Now the top is completely sealed with a cap and the orifice at the

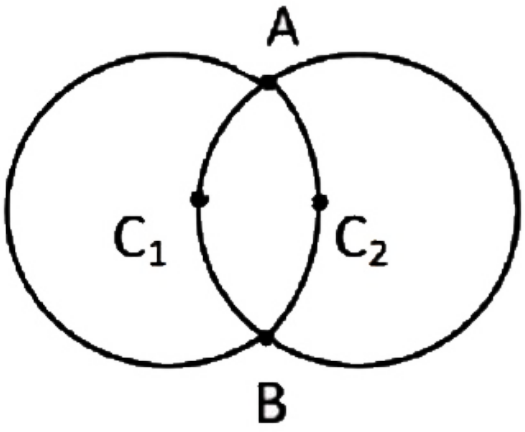
bottom is opened. Some water comes out from the orifice and the water level in the vessel becomes steady with height of water column being 200mm. Find the fall in height(in mm) of water level due to opening of the orifice.

[Take atmospheric pressure $= 1.0 \times 10^5 N/m^2$, density of water= $1000 kg/m^3$ and $g = 10 m/s^2$. Neglect any effect of surface tension.]

Watch Video Solution

74. Two circular rings of identical radii and resistance 36Ω are placed as shown the figure. Conducting joints are made at points A and B and a cell of emf 20V is connected between these two points.What is the power (in

W) delivered by the cell ?[C_1 and C_2 are the centres of the two rings]



Watch Video Solution

75. A wooden cylinder of mass 20 g and area of cross-section $1cm^2$, having a piece of lead of mass 60g attached to its bottom, floats in water. The cylinder is depressed and then released. The frequency of oscillation is $\frac{N}{\pi}S^{-1}$. Find the value of N. [Neglect the volume of water displaced by the lead piece, take $g = 9.8m/s^2$,density of water $\rho_w = 1gcm^{-3}$]

Watch Video Solution

76. A beam of ultraviolet radius hacking wavelength between $100nm \text{ and } 200nm$ is inclined on a sample of atomic hydrogen gas. Assuming that the atoms are in ground state which wavelength will have low intensity in the transmitted beam? If the energy of a photon is equal to the ground state it has large probability of being observed by an atom in the ground state

A. 104nm

B. 103nm

C. 105 nm

D. 100 nm

Answer: B

Watch Video Solution

77. A particle of mass m is dropped from a height h above the ground. Simultaneously another particle of the same mass is thrown vertically

upwards from the ground with a speed of $\sqrt{2gh}$. If they collide head-on completely inelastically, then the time taken for the combined mass to reach the ground is

A. $\sqrt{\frac{3h}{4g}}$

B. $\sqrt{\frac{3h}{2g}}$

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

D. $\sqrt{\frac{h}{4g}}$

Answer: B

Watch Video Solution

78. Two identical short bar magnets, each having magnetic moment M, are placed a distance of $2d$ apart with axes perpendicular to each other in a horizontal plane. The magnetic induction at a point midway between them is

A. $\frac{\sqrt{2}\mu_0 M}{4\pi d^3}$

B. $\frac{\sqrt{3}\mu_0 M}{4\pi d^3}$

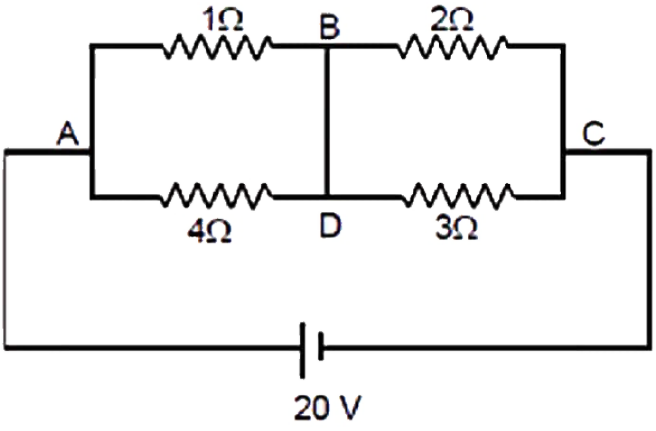
C. $\frac{\mu_0 M}{2\pi d^3}$

D. $\frac{\sqrt{5}\mu_0 M}{4\pi d^3}$

Answer: D

Watch Video Solution

79. In the given circuit diagram , a connecting wire of negligible resistance is joining the points B and D, the current in the connecting wire is



A. zero

B. 2A

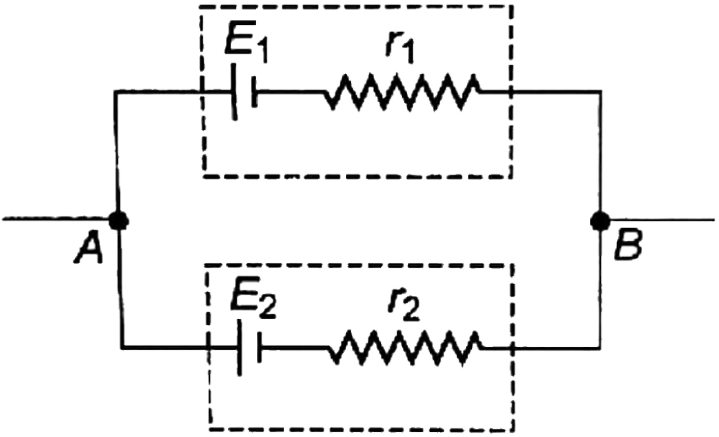
C. 0.4 A

D. 4A

Answer: B

Watch Video Solution

80. Two batteries of emf E_1 and $E_2(E_2 > E_1)$ and internal resistance r_1 and r_2 respectively are connected in parallel as shown in the figure. Then, which of the followings statements is correct ?



A. The equivalent emf E is smaller than E_1

B. The equivalent emf $E = E_1 + E_2$

C. The equivalent emf E is greater than E_2

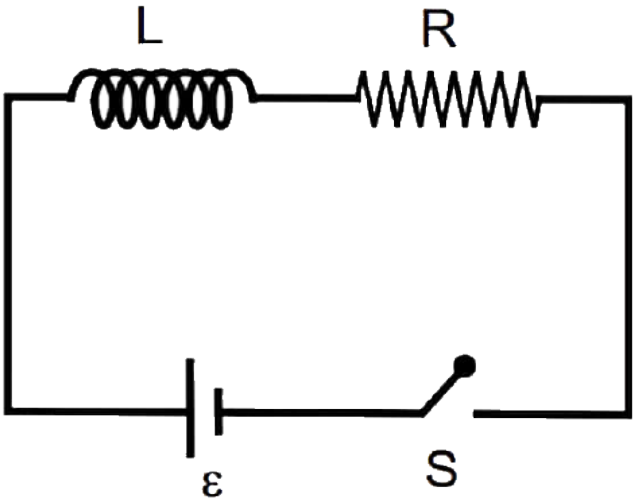
D. The equivalent emf E of two cells is between E_1 and E_2 always.

Answer: D

Watch Video Solution

81. The figure below shows a battery of emf ε connected to an inductor L and resistance R in series. If the switch is closed at t=0, then the total

charge that flows from the battery in time constant of the circuit is



A. $\frac{\varepsilon L}{R^2}\left(1-\frac{1}{e}\right)$

B. $\frac{\varepsilon L}{2eR^2}$

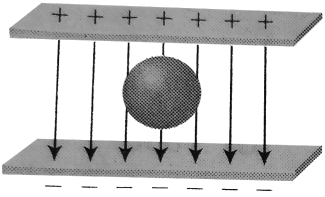
C. $\frac{\varepsilon L}{4eR^2}$

D. $\frac{\varepsilon L}{eR^2}$

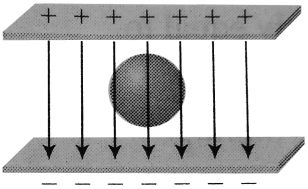
Answer: D

Watch Video Solution

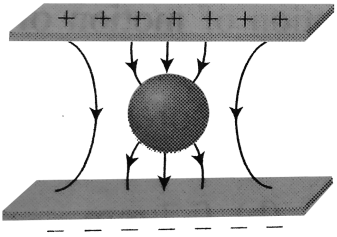
82. An uncharged sphere of metal is placed in between two charged plates as shown. The lines of force look like



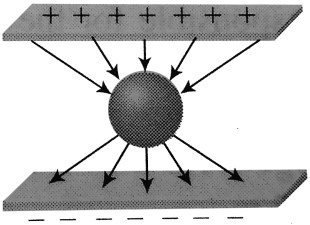
A



B

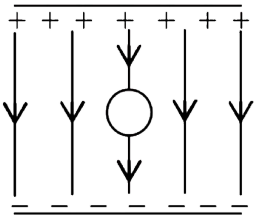


C

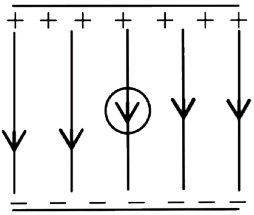


D

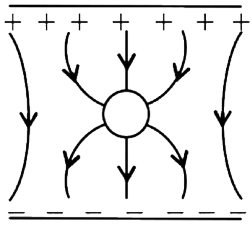
A.



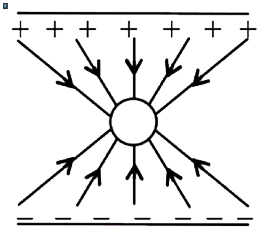
B.



C.



D.



Answer: C

Watch Video Solution

83. A small charged ball is hovering in the state of equilibrium at a height h over a very large horizontal uniformly charged sheet. If a disc of radius r $(r << h)$, is removed from the plate directly underneath the ball, then the acceleration of the ball will be

A. $\frac{g}{2}\left(\frac{r}{h}\right)^2$

B. $\frac{g}{2}\left(\frac{h}{r}\right)^2$

C. $\frac{g}{4}\left(\frac{r}{h}\right)^2$

D. $\frac{g}{4}\left(\frac{h}{r}\right)^2$

Answer: A

Watch Video Solution

84. A planet of small mass m moves around the sun of mass M along an elliptrical orbit such that its minimum and maximum distance from sun are r and R respectively. Its period of revolution will be:

A. $T = \pi\sqrt{\frac{(r+R)^3}{2GM_s}}$

B. $T = \pi\sqrt{\frac{(r+R)^3}{3GM_s}}$

C. $T = \pi\sqrt{\frac{(r+R)^3}{GM_s}}$

D. $T = \pi\sqrt{\frac{2(r+R)^3}{GM_s}}$

Answer: A

Watch Video Solution

85. A body takes 5 minutes for cooling from $50^\circ C$ to $40^\circ C$ Its temperature comes down to $33.33^\circ C$ in next 5 minutes. Temperature of surroundings is

A. $15^\circ C$

B. $20^\circ C$

C. $25^\circ C$

D. $10^\circ C$

Answer: B

Watch Video Solution

86. Pressure P, Volume V and temperature T of a certain material are related by the $P = \frac{\alpha T^2}{V}$. Here α is constant. Work done by the material when temparature changes from T_0 to $2T_0$ while pressure remains constant is :

A. $3\alpha T_0^2$

B. $5\alpha T_0^2$

C. $\frac{2}{3}\alpha T_0^2$

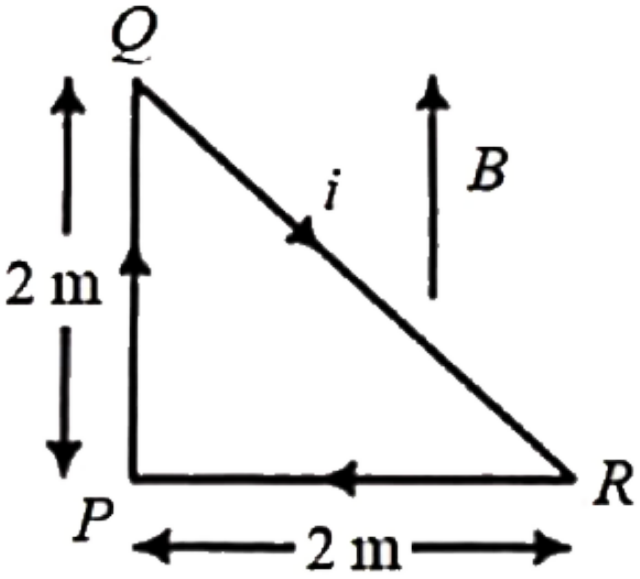
D. $7\alpha T_0^2$

Answer: A

Watch Video Solution

87. A loop PQR carries a current $i = 2A$ as shown in the figure. A uniform magnetic field B = 2T exists in space parallel to the plane of the loop . The

magnetic torque on the loop is



A. 16Nm

B. 8 Nm

C. zero

D. 4 Nm

Answer: B

Watch Video Solution

88. An object of mass 10kg is connected to the lower end of a massless string of length 4m hanging from the ceiling. If a force F is applied horizontally at the mid-point of the string, the top half of the string makes an angle of 45° with the vertical , then the magnitude of F is

A. 75N

B. 90N

C. 100N

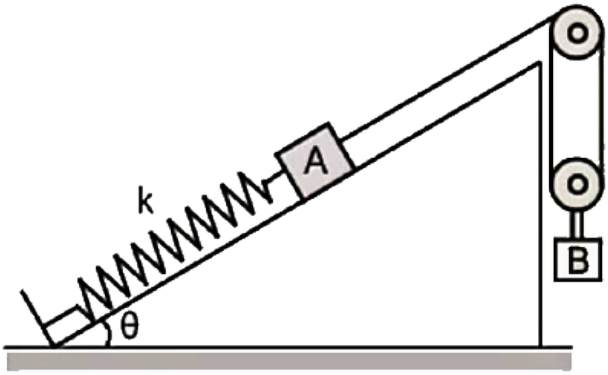
D. 70 N

Answer: C

Watch Video Solution

89. Friction is absent everywhere and the threads, spring and pulleys are massless. If $m_A = m_B = M$, then the angular frequency of the system

for small oscillations will be



A. $\sqrt{\frac{2k}{4m}}$

B. $\sqrt{\frac{4k}{5m}}$

C. $\sqrt{\frac{6k}{7m}}$

D. $\sqrt{\frac{8k}{5m}}$

Answer: B

Watch Video Solution

90. The work done by the force $\vec{F} = 6\hat{i} + 2\hat{j}$ N in displacing an object from $\vec{r_1} = 3\hat{i} + 8\hat{j}$ to $\vec{r_2} = 5\hat{i} - 4\hat{j}$ m , is

A. 12 J

B. $-36J$

C. 36J

D. $-12J$

Answer: D

Watch Video Solution

91. Two bodies are in equilibrium when suspended in water from the arms of balance. The mass of one body is 36 g and its density is $9g/cm^3$ If the mass of the other is 46 g, its density in g/cm^3 is

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

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

C. 3

D. 5

Answer: C

Watch Video Solution

92. A sound wave of frequency f propagating through air with a velocity C, is reflected from a surface which is moving away from the source with a constant speed V. Find the frequency of the reflected wave, measured by the observer at the position of the source.

A. $\frac{f(c+2v)}{c+v}$

B. $\frac{f(c+v)}{c-v}$

C. $\frac{f(c-v)}{c+v}$

D. $\frac{f(c-v)}{c-2v}$

Answer: C

Watch Video Solution

93. In CGS system of units, the density of a material is $4gcm^{-3}$. What will be the value of the density of the material in a system of units in which unit of length is 10 cm and unit of mass is 100 g ?

A. 0.04

B. 0.4

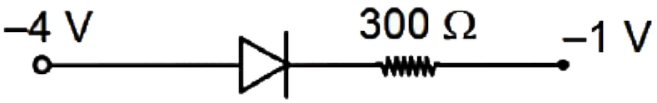
C. 40

D. 400

Answer: C

Watch Video Solution

94. The current in the branch of a circuit shown below is



A. 0A

B. $10^{-2}A$

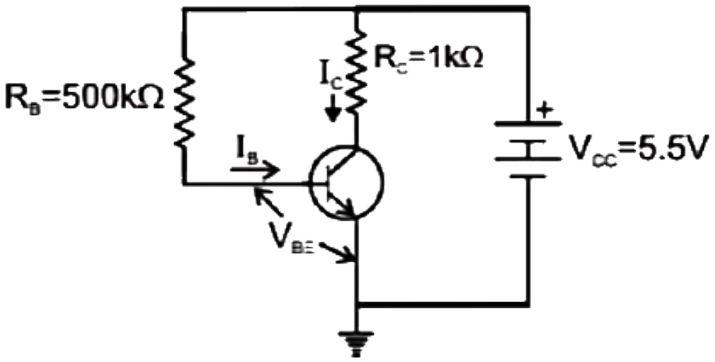
C. $1A$

D. 0.10A

Answer: A

Watch Video Solution

95. In the circuit shown in figure,the base current I_B is $10\mu A$ and the collector current is 5.2 mA . The voltage (V_{BE}) across the base and emitter is



A. 0.1V

B. 0.5V

C. 0.25V

D. 0.7V

Answer: B

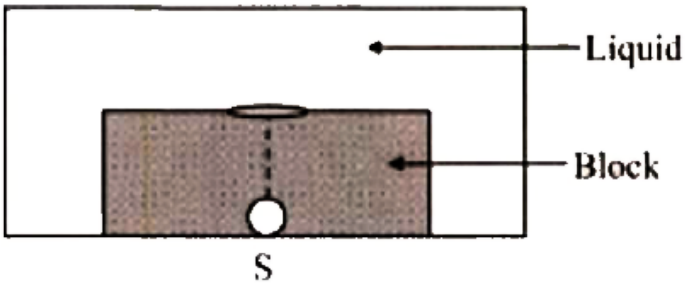
Watch Video Solution

96. A motor generates an output power of 220 W at an angular velocity of 2100 rpm. Calculate the torque (in Nm) produced by the motor ? [Take $\pi = \frac{22}{7}$]

Watch Video Solution

97. A point source S is placed at the bottom of a 12 mm high transparent block of diamond (refractive index = 2.4) . The block is immersed in an optically rarer liquid as shown in the figure. It is found that the light

emerging from the block to the liquid forms a circular bright spot of diameter 18 mm on the top of the block. What is the refractive index of the liquid ?



Watch Video Solution

98. The ratio of amplitudes of two coherent waves in Young's double-slit experiemnt is $\frac{A_1}{A_2} = \frac{1}{3}$. What is the ratio of maximum and minimum intensities of fringes ?

Watch Video Solution

99. A pendulum clock (fitted with a small heavy bob that is connected with a metal rod) is 3 seconds fast each day at a temperature of $15^\circ C$

and 2 seconds slow at a temperature of $30^{\circ}C$. Find the temperature (in $^{\circ}C$) at which will show the correct time.

Watch Video Solution

100. A metal surface having a work function $\phi = 2.2 \times 10^{-19} J$, is illuminated by the light of wavelengh 1320Å. What is the maximum kinetic energy (in eV) of the emitted photoelectron ? [Take $h = 6.6 \times 10^{-34} Js$]

Watch Video Solution

101. If $Z = \dfrac{A \sin\theta + B \cos\theta}{A + B}$, then

A. the dimensions of Z and A are the same

B. the dimensions of Z and B are the same

C. Z is dimensionless quantity

D. none of these

Answer: C

Watch Video Solution

102. A point moves in the plane xy according to the law $x = a\sin\omega t$, $y = a(1 - \cos\omega t)$, where a and ω are positive constants. Find:

(a) the distance s traversed by the point during the time τ,

(b) the angle between the point's velocity and acceleration vectors.

A. $\frac{A\omega^2}{\tau}$

B. $A\omega^2\tau$

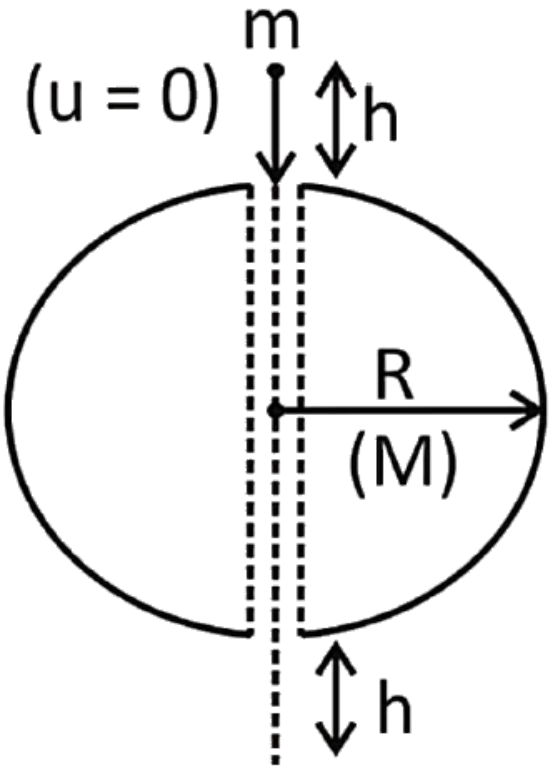
C. $A\omega\tau$

D. $\frac{A\omega}{\tau}$

Answer: C

Watch Video Solution

103. A ball of mass m is dropped from a height h in a tunnel, made across the earth (mass = M, radius = R) passing through its center. If $h << R$ such that the motion of the particle through h can be considered uniformly accelerated at g, then the time period of the particle is



A. $2\pi\sqrt{\frac{R}{g}}+\sqrt{\frac{2h}{g}}$

B. $2\pi\sqrt{\frac{R}{g}}+2\sqrt{\frac{h}{g}}$

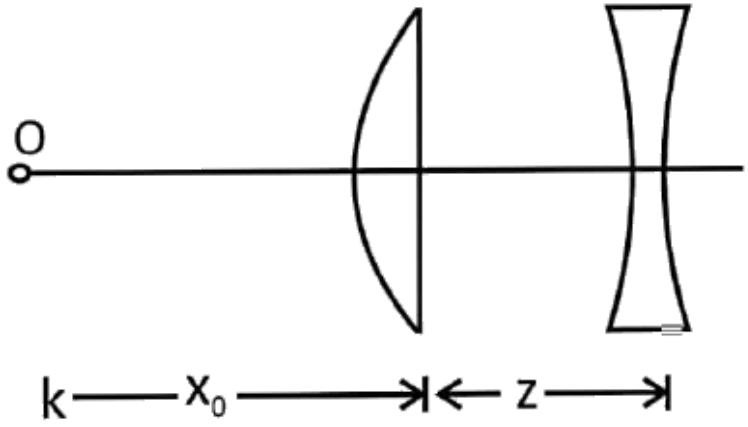
C. $2\pi\sqrt{\frac{R}{g}}+4\sqrt{\frac{2h}{g}}$

D. $2\pi\sqrt{\frac{2R}{g}}+2\sqrt{\frac{h}{g}}$

Answer: C

Watch Video Solution

104. A plano-convex lens $\left(\mu=\frac{3}{2}\right)$ has a radius of curvature R = 15 cm and is placed at a distance z from a concave lens of focal length 20 cm as shown . At what distance x_0 should a point object be placed from the plano-convex lens, so that position of the final image is independent of z?



A. 20 cm

B. 30 cm

C. 40 cm

D. 60 cm

Answer: B

Watch Video Solution

105. A block of mass m is gently placed over a massive plank moving horizontal over a smooth surface with velocity $10ms^{-1}$. The coefficient of friction between the block and the plank is 0.2. The distance travelled by the block till it slides on the plank is $[g = 10ms^{-2}]$

A. 10 m

B. 15m

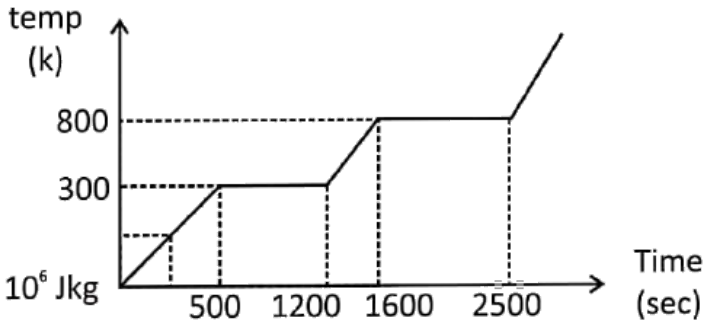
C. 25 m

D. 35m

Answer: C

Watch Video Solution

106. A heating curve has been plotted for a solid object as shown in the figure. If the mass of the object is 100g, then latent heat of vaporization for the material of the object is [Given, power supplied to the object is constant and equal to 1 kW]



A. $1.5 \times 10^6 J/kg$

B. $2.5 \times 10^6 J/kg$

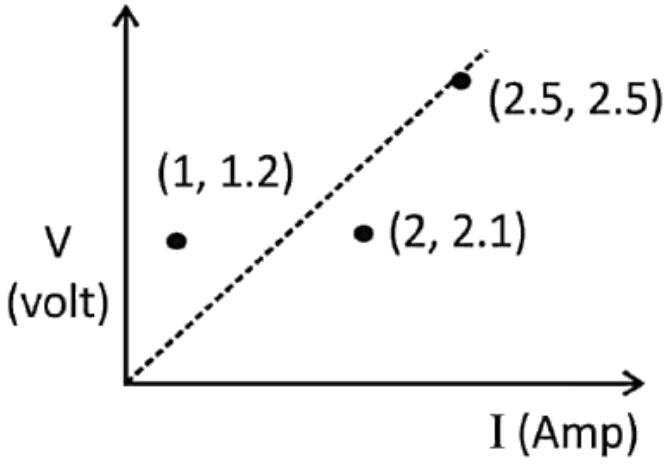
C. $3.5 \times 10^6 J/kg$

D. $9.0 \times 10^6 J/kg$

Answer: D

Watch Video Solution

107. In the measurement of resistance of a wire using Ohm's the plot between V and I is drawn as shown, then resistance of given wire will be



A. 0.833Ω

B. 0.9Ω

C. 1Ω

D. none of these

Answer: C

Watch Video Solution

108. In young's double slit experiment, the screen is kept 1.6m from the slits. The coherent sources are 0.032 cm apart and fringes are observed on the screen. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of 1.06 cm from the central fringe. The wavelength of the light used is

A. 530 nm

B. 265 nm

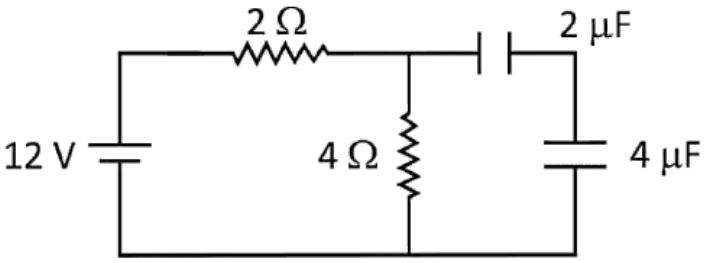
C. 1060 nm

D. 132.5 nm

Answer: A

Watch Video Solution

109. The charge on the $4\mu F$ capacitor in the steady state is



A. $10/3\mu C$

B. $32/3\mu C$

C. $4/3\mu C$

D. $8/3\mu C$

Answer: B

Watch Video Solution

110. Water from a tap emerges vertically downwards an intial speed of 1 m/s . The cross-sectional area of the tap is $10^{-4}m^2$. Assume that the pressure is contant throughout the stream of water and that the flow is steady . The cross-sectional area of the steam. 0.15 m below the tap is

A. $5.0 \times 10^{-4}m^2$

B. $1.0 \times 10^{-4}m^2$

C. $5.0 \times 10^{-5}m^2$

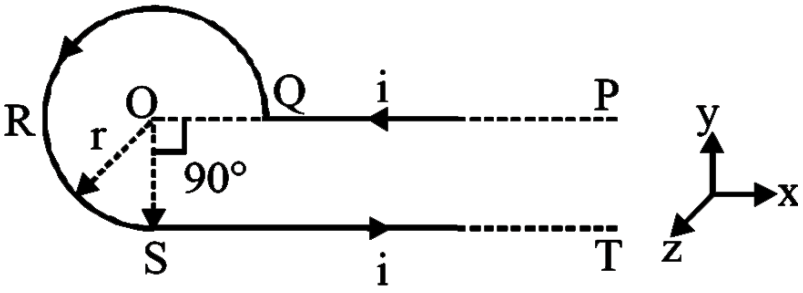
D. $2.0 \times 10^{-5}m^2$

Answer: C

Watch Video Solution

111. A current i is flowing in a conductor PQRST shaped as shown in the figure. The radius of curved part QRS is r and length of straight portions PQ and ST is very large. The magnetic field at the centre O of the curved

part is -



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

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

C. $\frac{9}{2}$

D. $\frac{9}{8}$

Answer: B

Watch Video Solution

112. A particle having mass m and charge q is released from the origin in a region in which electric field and megnetic field are given by $\vec{B} = -B_0\hat{j}$

and $\vec{E} = \vec{E}_0\hat{k}$. Find the speed of the particle as a function of its z-coordinate.

A. $\sqrt{\frac{2(qVB_0 + qE_0)Z}{m}}$

B. $\sqrt{\frac{(-qVB_0 + qE_0)2Z}{m}}$

C. $\sqrt{\frac{qE_0Z}{m}}$

D. $\sqrt{\frac{2qE_0Z}{m}}$

Answer: D

Watch Video Solution

113. Electrons having kinetic energy 30 eV are made to collide with atomic hydrogen gas (in ground state) and 42.5% of electron energy is used to excite the hydrogen wavelength in emission spectra are

A. 3

B. 6

C. 12

D. 18

Answer: B

Watch Video Solution

114. The probability that a particular nucleus of $.^{38}Cl$ will undergo beta decay in any time interval of 4 s is

$[T_{1/2} \text{ for } .^{38}Cl \text{ is } 37.2\text{min}]$

A. 3.1×10^{-4}

B. 6.2×10^{-4}

C. 12.4×10^{-4}

D. 28.8×10^{-4}

Answer: C

Watch Video Solution

115. P - V diagram of a diatomic gas is a straight line parallel to P-axis. The molar heat capacity of the gas in the process will be

A. 4R

B. $2.5R$

C. $3R$

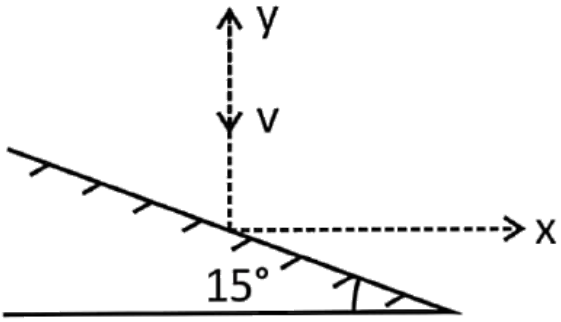
D. $\frac{4R}{3}$

Answer: B

Watch Video Solution

116. An object is moving towards a mirror with a velocity of $10ms^{-1}$ as shown in the figure. If the collision between the mirror and the object is perfectly elastic, then the velocity of the image after collision with mirror

in vector form is



A. $-10\hat{j}$

B. $-10\cos 15\hat{j}+10\sin 15\hat{j}$

C. $-10\hat{i}$

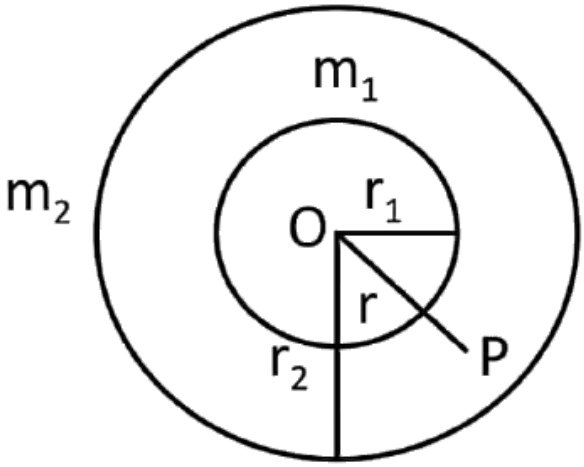
D. $-10\cos 30\hat{j}-10\sin 30\hat{i}$

Answer: D

Watch Video Solution

117. Two concentric spherical shells of masses and radii m_1, r_1 and m_2, r_2 respectively are as shown. The gravitational field

intensity at point P is



A. $\frac{Gm_1}{r_2^2 - r_1^2}$

B. $\frac{Gm_1}{r_1^2}$

C. $\frac{Gm_1}{r_1^2} + \frac{Gm_1}{r_2^2}$

D. $\frac{Gm_1}{r^2}$

Answer: D

Watch Video Solution

118. The zenar diode normally operates under reverse bias conditions, the major use of this fact is in the application where requirement is

A. large volume of current

B. a constant voltage

C. a current that is increasing without any change in applied voltage

D. all of the above

Answer: B

Watch Video Solution

119. An LCR series circuit is connected to an oscillator (AC supply) having RMS voltage 200 V. If the RMS voltages across resistor, inductor and capacitor are equal, then RMS voltage across the resistor would be

A. $100V$

B. $\frac{200V}{\sqrt{2}}$

C. $200V$

D. $\frac{100V}{\sqrt{2}}$

Answer: C

Watch Video Solution

120. The ends of a stretched wire of length l are fixed at x = 0 and x = l. in one experiment, the displacement of the wire is $y_1 = a\sin\left(\frac{\pi x}{l}\right)(\sin\omega t)$ and energy E_1 and in another experiment, its displacement is $y_2 = a\sin\left(\frac{3\pi x}{l}\right)(\sin 3\omega t)$ and energy is E_2 then

A. $E_2 = E_1$

B. $E_2 = 3E_1$

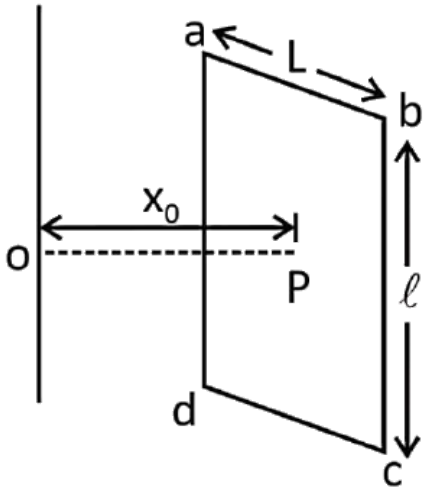
C. $E_2 = \frac{E_1}{3}$

D. $E_2 = 9E_1$

Answer: D

Watch Video Solution

121. Find the electric flux (in S.I. unit) through the rectangular plate abcd of length $l = 2m$ width L and whose centre is at a distance $OP = x_0 = \frac{L}{2}$ from an infinite line of charge with linear charge density $\lambda = \frac{1}{36\pi} \times 10^{-9} Cm^{-1}$. Consider that the plate of the frame is perpendicular to line OP.

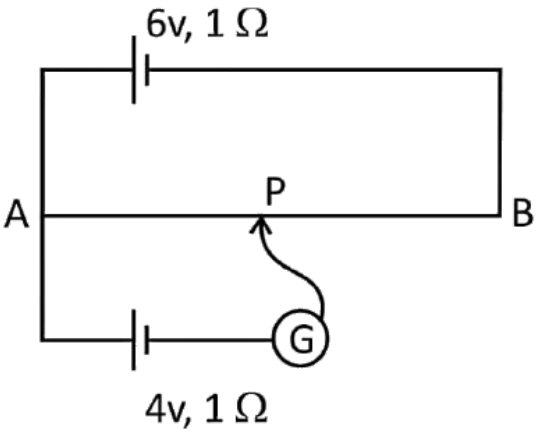


Watch Video Solution

122. water rises in a capillary tube to a height of 1 cm. In another capillary where the radius is one-third of it, how high will the water rise (in cm)?

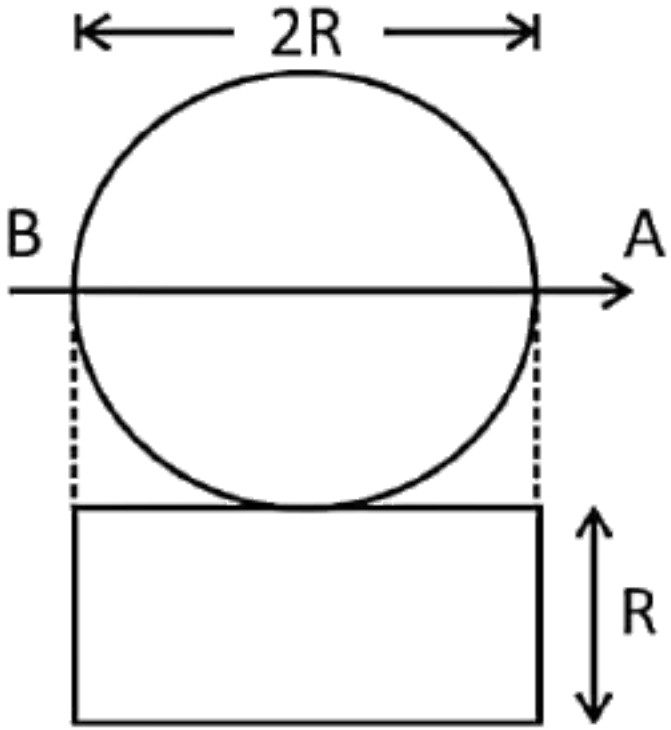
Watch Video Solution

123. A 6V battery of internal resistance 1Ω is connected across a uniform wire AB of length 100 cm. The positive terminal of another battery of E.M.F 4V and internal resistance 1Ω is joined to the point A as shown. The distance of point P from A is $\alpha \times 10cm$. Find the value of α, for which there is no current through the galvanometer. (resistance of AB wire is 5Ω)



Watch Video Solution

124. A disc of mass m and radius R is attached to a rectangular plate of the same mass m, breadth R and length 2R as shown in figure. The moment of inertia of the system about the axis AB passing through the centre of the disc and along the plane is $I = \frac{1}{\alpha}\left(\frac{31}{3}mR^2\right)$.

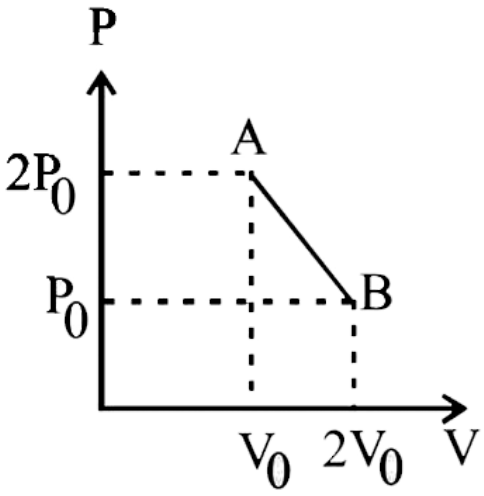


Watch Video Solution

125. A closed organ pipe and an open organ pipe of same length produce 4 beats when they are set into vibrations simultaneously. If the length of each of them were twice their initial lengths, the number of beats produced will be

Watch Video Solution

126. n moles of an ideal gas undergoes a process $A \to B$ as shown in the figure. The maximum temperature of the gas during the process will be:



A. $\frac{3P_0V_0}{2nR}$

B. $\frac{9P_0V_0}{4nR}$

C. $\frac{9P_0V_0}{4nR}$

D. $\frac{9P_0V_0}{nR}$

Answer: B

Watch Video Solution

127. A door 1.6 m wide requires a force of 1 N to be applied at the free and to open or close it. The force that is required at a point 0.4 m distant from the hinges for opening or closing the door is

A. 1.2 N

B. 2.4 N

C. 3.6 N

D. 4 N

Answer: D

Watch Video Solution

128. A second pendulum is moved to moon where acceleration due to gravity is 1/6 times that of the earth, the length of the second pendulum on moon would be

A. $\frac{1}{6}m$

B. 6 m

C. $\frac{1}{36}m$

D. 36 m

Answer: A

Watch Video Solution

129. For a transistor the current amplification factor is 0.8 The transistor is connected in common emitter configuration, the change in collector current when the base current changes by $6mA$ is

A. 6 mA

B. 4.8 mA

C. 24 mA

D. 8 mA

Answer: C

Watch Video Solution

130. A magnetic dipole is acted upon by two magnetic fields with inclined to each other at an angle of 75°. One of the fields has a magnitude of 15 mT. The dipole attains stable equilibrium at an angle of 30° with this field. The magnitude of the other field (in mT) is close to

A. 1

B. 11

C. 36

D. 1060

Answer: B

Watch Video Solution

131. An ideal gas is expanding such that $PT^2 =$ constant. The coefficient of volume expansion of the gas is:

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

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

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

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

Answer: C

Watch Video Solution

132. A student is performing the experiment of resonance column. The diameter of the column tube is $4cm$. The frequency of the tuning fork is

$512Hz$ The air temperature is $38.^{\circ}C$ in which the speed of sound is $336m/s$. The zero of the meter scale coincides with the top end of the resonance column tube. When the first resonance occurs, the reading of the water level in the column is.

A. 14.0 cm

B. 15.2 cm

C. 16.4 cm

D. 17.6 cm

Answer: B

Watch Video Solution

133. In a Young's double slit experiment, 12 fringes are observed to be formed in a certain segment of the screen when light of wavelength $600nm$ is used. If the wavelength of light is changed to $400nm$, number of fringes observed in the same segment of the screen is given by

A. 18

B. 24

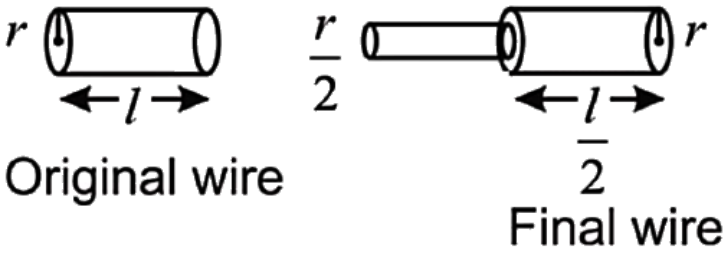
C. 30

D. 36

Answer: A

Watch Video Solution

134. A wire of length l has a resistance R. If half of the length is stretched to make the radius half of its original value, then the final resistance of the wire is



A. 9R

B. 5R

C. $\frac{17R}{2}$

D. 3R

Answer: C

Watch Video Solution

135. Find the Q value of the reaction $P + .^7 Li \rightarrow .^4 He + .^4 He$. Determine whether the reaction is exothermic or endothermic. The atomic masses of $.^1 H, .^4 He$ and $.^7 Li$ are $1.007825u, 4.002603u$, and $7.016004u$, respectively.

A. 17.35 MeV

B. 18.06 MeV

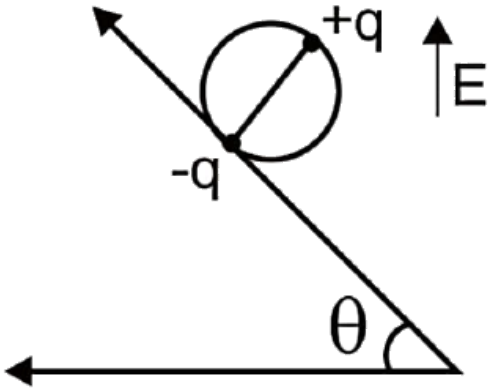
C. 177.35 MeV

D. 170.35 MeV

Answer: A

Watch Video Solution

136. A wheel having mass m has charges $+q$ and $-q$ on diametrically opposite points. It remains in equilibrium on a rough inclined plane in the presence of a uniform vertical electric field E. The value of E is



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

B. $\frac{mg}{2q}$

C. $\frac{mg\tan\theta}{2q}$

D. none

Answer: B

Watch Video Solution

137. If the following atoms and molecules for the transition from $n = 2$ to $n = 1$, the spectral line of minimum wavelength will be produced by

A. hydrogen atom

B. deuterium atom

C. singly ionized helium

D. doubly ionized lithium

Answer: D

Watch Video Solution

138. The $\beta -$ activity of a sample of CO_2 prepared form a contemporary wood gave a count rate of 25.5 counts per minute (cpm). The same of CO_2 form an ancient wooden statue gave a count rate of $20.5cpm$, in the same counter condition. Calculate its age to the nearest 50 year taking $t_{1/2}$ for $.^{14}C$ as 5770 year. What would be the expected count rate of an identical mass of CO_2 form a sample which is 4000 year old?

A. 1822 years

B. 182 years

C. 822 years

D. 18220 years

Answer: A

Watch Video Solution

139. The gravitational field in a region is given by $\overrightarrow{g} = \left(5\hat{i} + 12\hat{j}\right)\mathrm{N\ kg^{-1}}$. The change in the gravitational potential

energy of a particle of mass 2kg when it is taken from the origin to a point $(7m, -3m)$ is

A. 71 J

B. $13\sqrt{58}J$

C. 2 J

D. 1 J

Answer: C

Watch Video Solution

140. Time taken by the particle to reach from A to B is t. Then the distance AB is equal to

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

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

C. $\sqrt{3}ut$

D. $2ut$

Answer: A

Watch Video Solution

141. Two particles of charges $+Q$ and $-Q$ are projected from the same point with a velocity v in a region of unifrom magnetic filed B such that the velocity vector makes an angle θ with the magnetic filed Their masses

are M and $2M$ respectively Then, they will meet again for the first time at a point whose distane from the point of projection is .

A. $\frac{2\pi Mv\cos\theta}{QB}$

B. $\frac{8\pi Mv\cos\theta}{QB}$

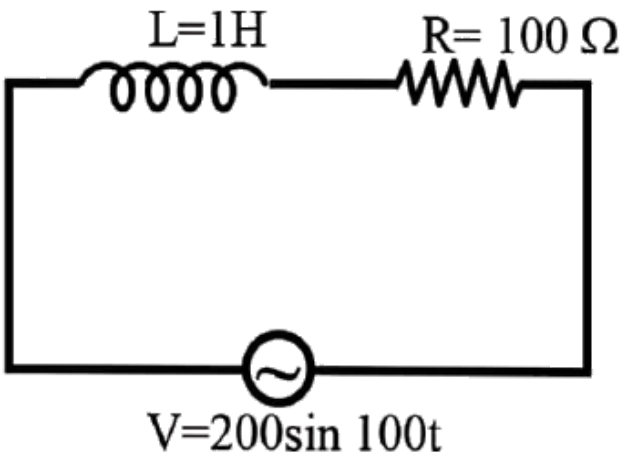
C. $\frac{\pi Mv\cos\theta}{QB}$

D. $\frac{4\pi Mv\cos\theta}{QB}$

Answer: D

Watch Video Solution

142. In the adjacent circuit, the instantaneous current equation is



A. $2\sin\left(100t-\frac{\pi}{4}\right)$

B. $\sqrt{2}\sin\left(100t-\frac{\pi}{4}\right)$

C. $\sqrt{2}\sin\left(200t-\frac{\pi}{4}\right)$

D. $\sqrt{2}\left(100t+\frac{\pi}{4}\right)$

Answer: B

Watch Video Solution

143. Oxygen gas is made to undergo a process in which its molar heat capacity C depends on its absolute temperature T as $C = \alpha T$. Work done by it when heated from an initial temperature T_0 to a final temperature $2T_0$, will be

A. $4\alpha T_0^2$

B. $(\alpha T_0 - R)\dfrac{3T_0}{2}$

C. $(3\alpha T_0 - 5R)\dfrac{T_0}{2}$

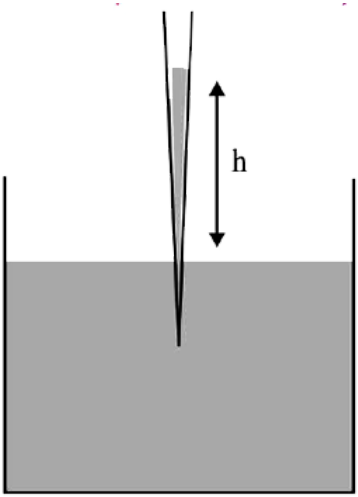
D. none of these

Answer: C

Watch Video Solution

144. A glass capillary tube is of the shape of a truncated cone with an apex angle α so that its two ends have cross sections of different radii. When dipped in water vertically, water rises in it to a high h, where the radius of its cross section is b. If the surface tension of water is S, its

density if ρ, and its contact angle with glass is θ, the value of h will be (g is the acceleration due to gravity)



A. $\frac{2S}{b\rho g}\cos(\theta - \alpha)$

B. $\frac{2S}{b\rho q}\cos(\theta + \alpha)$

C. $\frac{2S}{b\rho g}\cos\left(\theta - \frac{\alpha}{2}\right)$

D. $\frac{2S}{b\rho g}\cos\left(\theta + \frac{\alpha}{2}\right)$

Answer:

Watch Video Solution

145. Two electric lamps A and B radiate the same power. Their filaments have the same diemensions, and have emissivities. e_A and e_B. Their surface tempratures are T_A an T_B. The ratio T_A / T_B will be equal to

A. $\left(\frac{e_B}{e_A}\right)^{1/4}$

B. $\left(\frac{e_B}{e_A}\right)^{1/2}$

C. $\left(\frac{e_A}{e_B}\right)^{1/2}$

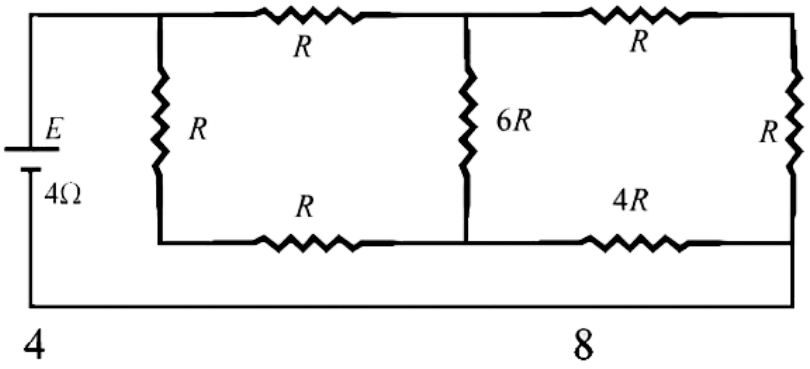
D. $\left(\frac{e_A}{e_B}\right)^{1/4}$

Answer: A

Watch Video Solution

146. A battery of internal resistance 4Ω is connected to the network of resistance as shown . In order that the maximum power can be delivered

to the network, the value of R in Ω should be



Watch Video Solution

147. A particular force (F) applied on a wire increases its length by 2×10^{-3} m. To increases the wire's length by 4×10^{-3} m, the applied force will be

Watch Video Solution

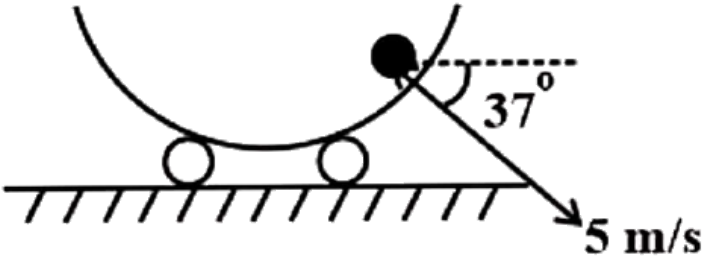
148. A rock is 1.5×10^{9} years old. The rock contains $.^{238}U$ which disintegretes to form $.^{236}U$. Assume that there was no $.^{206}Pb$ in the rock

initially and it is the only stable product fromed by the decay. Calculate the ratio of number of nuclei of $.^{238}U$ to that of $.^{206}Pb$ in the rock. Half-life of $.^{238}U$ is $4.5 \times 10^9. years.$ (2^(1//3)=1.259)`.

Watch Video Solution

149. A projectile of mass 1.2 kg undergoes a perfectly inelastic collision with a trolley of mass 3.6 kg as shown in the figure. At the time of the collision, the second of the projectile is $5ms^{-1}$ at an angle of 37° with the horizontal. The trolley is free to move, only along a horizontal rail which coincides with the direction of the projectile's horizontal motion. Assuming that the trolley doesn't topple, calculate the amount of heat energy (in J) released in the collision.

$[\text{Take } \sin 37^\circ = 3/5 \text{ and } \cos 37^\circ = 4/5]$



Watch Video Solution

150. Two blocks A and B of masses 3 kg and 6 kg are connected by a massless spring of force constant $1800\ \mathrm{N\ m^{-1}}$ and then they are placed on a smooth horizontal surface. The blocks are pulled apart to stretch the spring by 5 cm and then released. What is the relative velocity (in ms^{-1}) of the blocks when the spring comes to its natural length?

Watch Video Solution

151. Radiation coming from transition $n = 2 \to n = 1$ of hydrogen atoms falls on helium in $n = 1$ and $n = 2$ state. What are the possible transition of helium ions as they absorb energy from the radiation?

A. $n = 2 \to n = 3$

B. $n = 1 \to n = 4$

C. $n = 2 \to n = 5$

D. $n = 2 \to n = 4$

Answer: D

Watch Video Solution

152. A ball starts falling under the effect of gravitational force from a height of 45m. When it reaches a height of 25 m. When it reaches a height of 25 m it explodes into two pieces of mass ratio $1:2$. There is no change in the vertical motion of the piece after the explosion but they acquire horizontal velocity. If the heavier piece gains a horizontal velocity of $10ms^{-1}$, then the distance between the two pieces when both of them strike the ground is

A. 30 m

B. 10 m

C. 20 m

D. 15 m

Answer: A

Watch Video Solution

153. If a distance of 40 cm at an axial position of a dipole, the "magnetic potential" (analogous to electric potential) is $2.4 \times 10^{-5} \mathrm{J\ A\ m^{-1}}$ then the magnetic moment of the dipole is

A. $28.6Am^2$

B. $32.2Am^2$

C. $38.4Am^2$

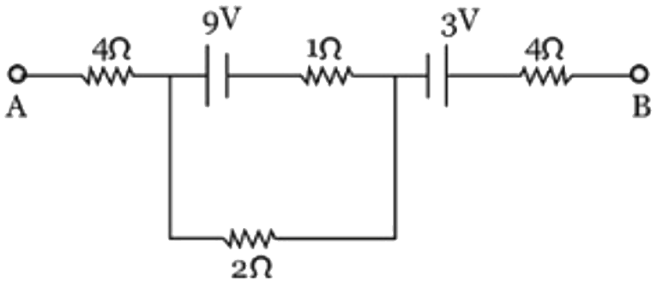
D. None of these

Answer: C

Watch Video Solution

154. In the part of the circuit shown in the figure, the potential difference between points $V_A - V_B = 16V$. The current passing through the 2Ω

resistance will be



A. 2.5 A

B. 3.5 A

C. 4.0 A

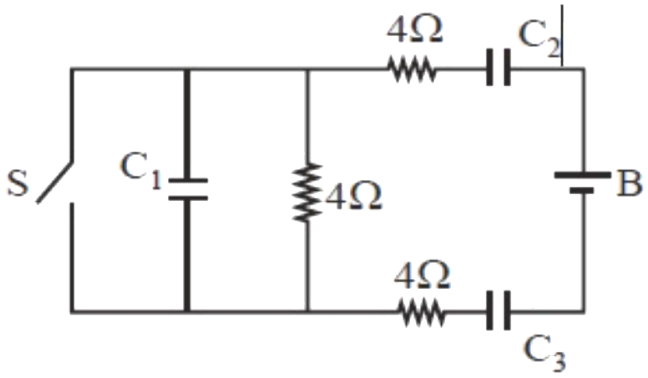
D. zero

Answer: B

Watch Video Solution

155. The capacitance of the capacitors C_1, C_2 and C_3 are $4\mu F, 6\mu F$ and $12\mu F$ respectively as shown, and the switch S remains closed for a long time. When the switch S is opened, which of the

following statements will be correct about the current flowing through the battery B ?



A. a finite and constant current will flow

B. a finite current will flow initially that will decrease exponentially with time

C. no current will flow

D. information is insufficient to predict

Answer: C

Watch Video Solution

156. A satellite is revolving in a circular orbit at a height h from the earth surface ,such that $h << R$ is the radius of the earth .Assuming that the effect of earth 's atmosphere can be neglected the minimum increase in the speed required so that the satellite could escape from the gravitational field of earth is :

A. $\left(\sqrt{2}-1\right)\sqrt{gR}$

B. $\frac{9\sqrt{gR}}{2}$

C. $\sqrt{2gR}$

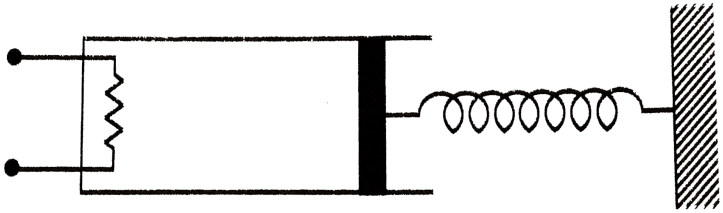
D. $\sqrt{gR}$

Answer: A

Watch Video Solution

157. An ideal monatomic gas is confined in a cylinder by a spring-loaded piston of cross section $8.0 \times 10^{-3} m^2$. Initially the gas is at $300K$ and occupies a volume of $2.4 \times 10^{-3} m^{-3}$ and the spring is in its relaxed state. The gas is heated by a small heater until the piston moves out

slowly by $0.1m$. Calculate the final temperature of the gas. The force constant of the spring is $8000Nm^{-1}$,and the atmospheric pressure is $1.0 \times 10^5 Nm^{-2}$.The cylinder and the piston are thermally insulated. The piston and the spring are massless and there is no friction between the piston and the cylinder. Neglect any heat-loss through the lead wires of the heater. The heat capacity of the heater coil is negligible.



A. $T_2 = 600K, Q = 680J$

B. $T_2 = 800K, Q = 600J$

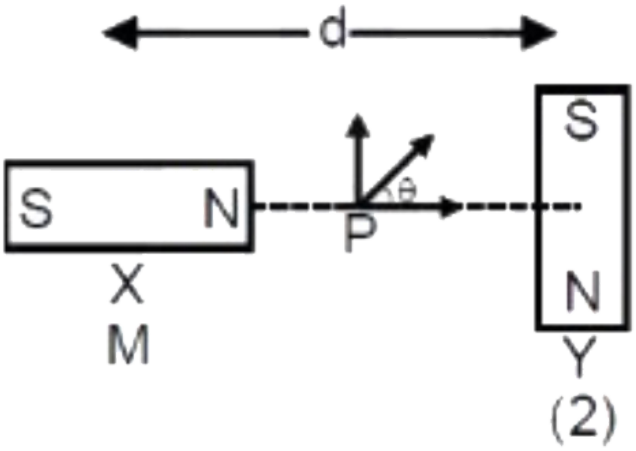
C. $T_2 = 600K, Q = 720J$

D. $T_2 = 800K, Q = 720J$

Answer: D

Watch Video Solution

158. Two magnetic dipoles X and Y are kept at a distance d apart, with their axes perpendicular to each other. The dipole moment of Y is twice that of X. P is a point along the horizonal line which is at the midpoint of d. What is the magnitude of the force of particle of charge q passing through P at angle $\theta = 45^\circ$? (d is very much larger in comparison to dipole)



A. $\sqrt{2}\left(\frac{\mu_0}{4\pi}\right)\frac{M}{(d/2)^3} \times qv$

B. $\left(\frac{\mu_0}{4\pi}\right)\frac{2M}{(d/2)^3} \times qv$

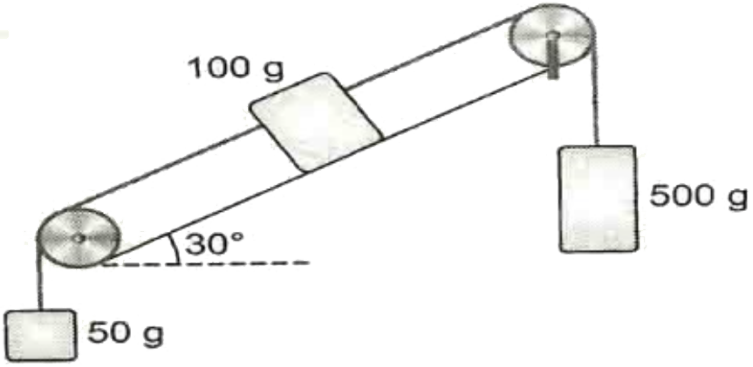
C. $\left(\frac{\mu_0}{\pi}\right)\frac{M}{(d/2)^3} \times qv$

D. 0

Answer: D

Watch Video Solution

159. Three blocks are suspended as shown in the figure. The acceleration of the 500 g block is



A. $\frac{6g}{13}$ downwards

B. $\frac{7g}{13}$ downwards

C. $\frac{8g}{13}$ downwards

D. $\frac{9g}{13}$ upwards

Answer: C

Watch Video Solution

160. The rate of disintegration of a radioactive substance falls from $\frac{40}{3}$ dps to $\frac{5}{3}$ dps in 6 hours. The half - life of the radioactive substance is

A. $\frac{6}{7}$ hours

B. 2 hours

C. 3 hours

D. 1 hours

Answer: B

Watch Video Solution

161. A body executes simple harmonic motion under the action of a force F_1 with a time period $\frac{4}{5}s$. If the force is changed to F_2, it executes SHM

with time period $\frac{3}{5}s$. If both the forces F_1 and F_2 act simultaneously in the same direction on the body, its time period (in seconds) is

A. $\frac{12}{25}$

B. $\frac{24}{25}$

C. $\frac{35}{24}$

D. $\frac{25}{12}$

Answer: A

Watch Video Solution

162. In a photoelectric experiment, the wavelength of the light incident on a metal is changed from 300 nm to 400 nm. Choose the closest value of change in the stopping potential from given options $\left(\frac{hc}{e} = 1240nm.V\right)$

A. 2.0 V

B. 0.5 V

C. 1.0 V

D. 1.5 V

Answer: C

Watch Video Solution

163. A vessel contains oil (density $= 0.8 gm / cm^3$) over mercury (density $= 13.6 gm cm^3$). A homogeneous sphere floats with half its volume immersed in mercury and the other half in oil. The density of the material of the sphere in gm / cm^3 is

A. 3.3

B. 6.4

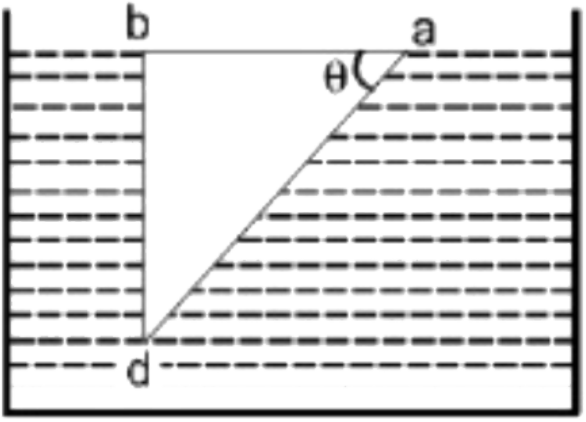
C. 7.2

D. 12.8

Answer: C

Watch Video Solution

164. A glass prism is immeresed in water as shown in the figure. When a beam of light incident is incident normally on the face ab, it is internally reflected at the face ad. If the refractive index of glass is 1.5 and that of water is $4/3$, then



A. $\sin\theta < (2/3)$

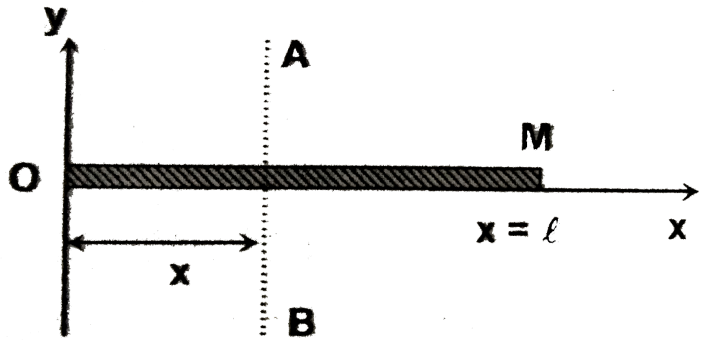
B. $\sin\theta > (8/9)$

C. $(2/3) < \sin\theta < (8/9)$

D. None of these

Answer: B

Watch Video Solution



165.

A non uniform rod OM (of length l m) is kept along x-axis and rotating about an axis AB, which is perpendicular to rod as shown in the figure. The rod has linear mass density that varies with the distance x from left end of the rod according to $\lambda = \lambda_0\left(\frac{x^3}{L^3}\right)$

Where unit of λ_0 is kg/m. What is the value of x so that moment of inertia of rod about axis AB (I_{AB}) is minimum?

A. $\frac{7l}{15}$

B. $\frac{2l}{5}$

C. $\frac{81}{15}$

D. $\frac{4l}{5}$

Answer: D

Watch Video Solution

166. For a CE transistor amplifier, the audio signal voltage across the collector resistance of $2k\Omega$ is $2V$. Suppose the current amplification factor of the transistor is 100. The value of R_B in series with V_{BB} supply of $2V$, if the DC base current has to be 10 times the signal current is.

A. $7k\Omega$

B. $26k\Omega$

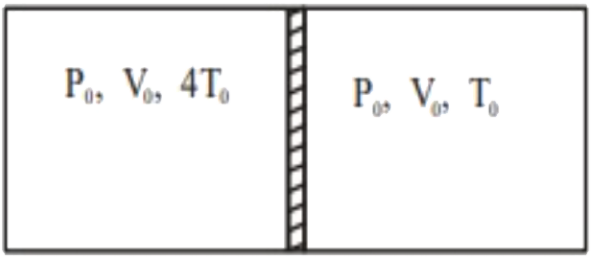
C. $10k\Omega$

D. $14k\Omega$

Answer: D

Watch Video Solution

167. A cylindrical adiabatic container of total volume $2V_0$ divided into two equal parts by a conducting piston which is free to move as shown in figure. Each part containing identical gas at pressure P_0. Initially temperature of left and right part is $4T_0$ and T_0 respectively. An external force is applied on the piston of area 'A' to keep the piston at rest. The value of external force required when thermal equilibrium is reached is.



A. $\frac{8}{5}P_0A$

B. $\frac{2}{5}P_0A$

C. $\frac{5}{6}P_0A$

D. $\frac{6}{5}P_0A$

Answer: D

Watch Video Solution

168. If velocity, force and time are taken as the fundamental quantities, them using dimensional analysis choose the correct dimensional formula for mass among the following. [K is a dimensionless constant]

A. $Q = Kv^{-1}FT$

B. $Q = Kv^3FT^2$

C. $Q = 2Kv^{-2}FT$

D. $Q = 3Kv^2Ft$

Answer: A

Watch Video Solution

169. Width of the principal maximum on a screen at a distance of 50 cm from the slit having width 0.02 cm is $312.5 \times 10^{-3} cm$. If waves were incident normally on the slit, then wavelength of the light from the source will be

A. 6000Å

B. 6250Å

C. 6400Å

D. 6525Å

Answer: B

Watch Video Solution

170. two particle of medium disturbed by the wave propagation are at $x_1 = 0cm$ and $x_2 = 1cm$. The respective displacement (in cm) of the

particles can be given by the equation:

$y_1 = 2\sin 3\pi t$, $y_2 \sin(3\pi t - \pi/8)$ the wave velocity is

A. $16\ \text{cm s}^{-1}$

B. $24\ \text{cm s}^{-1}$

C. $12\ \text{cm s}^{-1}$

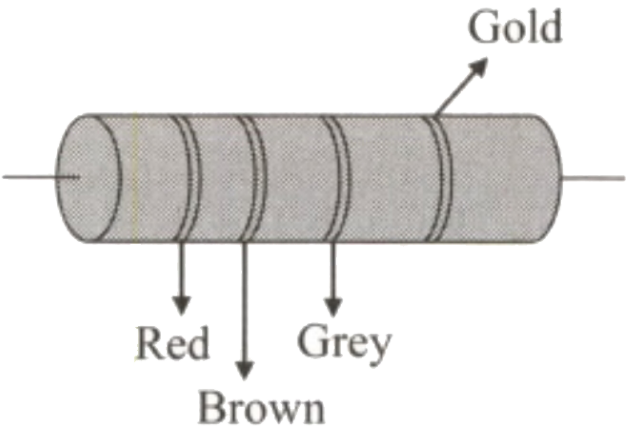
D. $8\ \text{cm s}^{-1}$

Answer: B

Watch Video Solution

171. The value of the resistance of a carbon resistor having the standard colour - coding as shown in the figure is $nG\Omega \pm 5\,\%$. What is the value

of n ?



Watch Video Solution

172. A conducing circular loop of area $2.5 \times 10^{-3} m^2$ and resistance 10Ω is placed perpendicular to a uniform time varying magnetic field $B(t) = 0.6 \sin(50\pi t) T$. What is the net charge (in mC) flowing through the loop during t = 0 and t = 10 ms ?

Watch Video Solution

173. An infinitely long solid cylinder of radius R with uniform volume charge density ρ has a spherical cavity of radius $\frac{R}{2}$ with its centre on the axis of the cylinder as shown in the figure. The magnitude of the electric field at a point P which is at a distance 2R from the axis of the cylinder is given by $\frac{23\rho R}{6K\varepsilon_0}$. What is the value of K ?

Watch Video Solution

174. A stone of mass 1.3 kg is being rotated in a horizontal plane as a conical pendulum with the help of a 140 cm long aluminium wire of cross - sectional area $1mm^2$. The wire makes an angle $\theta = 75^\circ$ with the vertical. What is the increment in the length (in mm) of the wire? [Young's modulus of aluminium $Y_{Al} = 7 \times 10^{10}\text{N m}^{-2}$, $\sin 75^\circ \approx 0.97$, co

Watch Video Solution

175. Three travelling waves are superimposed. The equations of the wave are

$y_! = A_0 \sin(kx - \omega t), y_2 = 3\sqrt{2}A_0 \sin(kx - \omega t + \phi)$ and

$y_3 = 4A_0 \cos(kx - \omega t)$

find the value of $\phi(\text{given } \ 0 \leq \phi \leq \pi/2)$ if the phase difference between the resultant wave and first wave is $\pi/4$

Watch Video Solution

Physics Single Choice

1. The electron in a hydrogen atom makes a transition from $n = n_1$ to $n = n_2$ state. The time period of the electron in the initial state (n_1) is eight times that in the final state (n_2). The possible values of n_1 and n_2 are

A. $n_1 = 8, n_2 = 2$

B. $n_1 = 4, n_2 = 2$

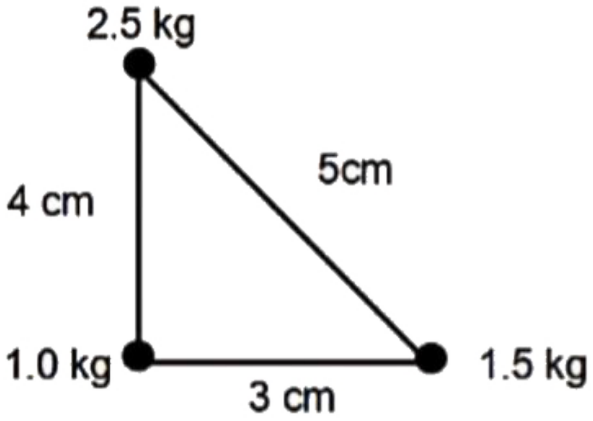
C. $n_1 = 3, n_2 = 1$

D. $n_1 = 4, n_2 = 1$

Answer: B

Watch Video Solution

2. Three points masses 1.0 kg , 1.5 kg and 2.5 kg are placed at the vertices of a right-angle triangle of sides 4.0 cm, 3.0 cm and 5.0 cm, as shown in the figure. The centre of mass of the system is



A. 0.6 cm right and 2.0 cm above 1 kg mass

B. 2.0 cm right and 0.9 cm above 1 kg mass

C. 0.9 cm right and 2.0 cm above 1 kg mass

D. 1.5 cm right and 1.2 cm above 1 kg mass

Answer: C

Watch Video Solution

3. A magnetic needle free to rotate in a horizontal plane is placed at the centre of a circular current-carrying coil whose axis is perpendicular to the magnetic meridian at that place. It is also known that the magnetic declination at this place is zero and in this condition, the magnetic needle is pointing towards conditions, the magnetic needle is pointing towards the north-west. Now, if we reverse the direction of current in the coil, then the magnetic needle will

A. point north - west

B. point north-east

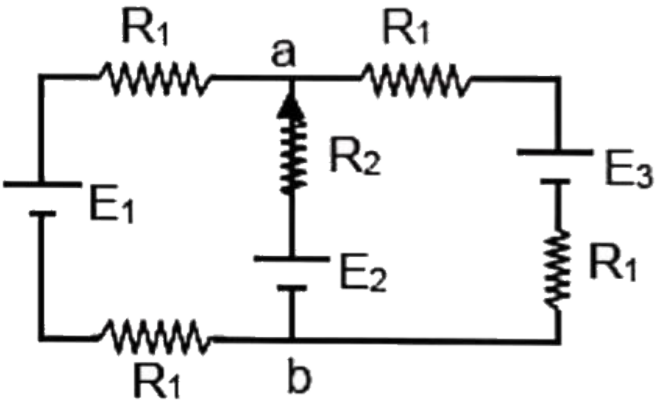
C. point south-east

D. point south-west

Answer: B

Watch Video Solution

4. In the given network of ideal cells and resistors, $R_1 = 1.0\Omega$, $R_2 = 2.0\Omega$, $E_1 = 2V$ and $E_2 = E_3 = 4V$. The potential difference between the point a and b is



A. $\frac{8}{3}V$

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

C. $\frac{9}{4}V$

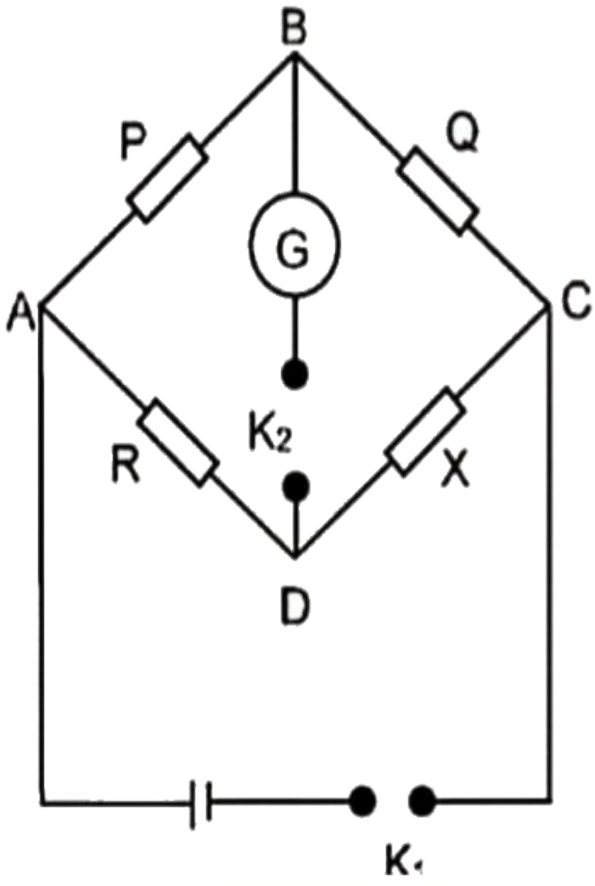
D. $\frac{13}{4}V$

Answer: B

Watch Video Solution

5. The figure below shows a wheatstone bridge with resistors P and Q having almost equal resistance. When R = 400Ω , the bridge is in balanced condition. If on interchanging P and Q, the bridge is again balanced for

$R = 405\Omega$, then the value of X is



A. 404.5Ω

B. 402.5Ω

C. 403.5Ω

D. 401.5Ω

Answer: B

Watch Video Solution

6. A circular coil, carrying a constant current i s kept in the x - y plane. The magnetic flux through the entire x - y plane exluding the area of the circular coil is given by ϕ and the magetic flux through the area of the circular coil area is given by ϕ_0, then

A. $\phi > -\phi_0$

B. $\phi < \phi_0$

C. $\phi = -\phi_0$

D. $\phi = \phi_0$

Answer: C

Watch Video Solution

7. A neutral sphere of radius r and density ρ is placed in a uniform electric field E that exists on the earth's surface in the vertically upward direction. If atomic number and the mass number of the material of the sphere are Z and A respectively, then the fraction of electrons that should be removed from the sphere for it to remain in equilibrium is [Assume that the sphere is able to hold the necessary charge without any leakage. Here N_A - Avogadro number]

A. $\frac{n}{n_{\text{total}}} = \frac{\rho g A}{eEN_A Z}$

B. $\frac{n}{n_{\text{total}}} = \frac{4gA}{\pi eEN_A Z}$

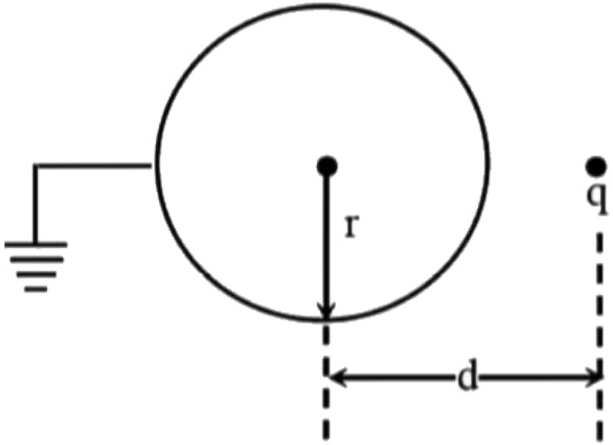
C. $\frac{n}{n_{\text{total}}} = \frac{gA}{eEN_A Z}$

D. $\frac{n}{n_{\text{total}}} = \frac{\pi \rho g A}{3eEN_A Z}$

Answer: C

Watch Video Solution

8. A point charge q is placed at some distance d away from the centre of a grounded conducting sphere of radius r, as shown in the figure. The charge that flows the earth to the sphere is



A. $-\frac{qr}{d-r}$

B. $-\frac{qd}{d-r}$

C. $-\frac{qr}{d}$

D. $-\frac{qd}{r}$

Answer: C

Watch Video Solution

9. A small planet is is revolving around a very massive star in a circular orbit of radius r with a period of revolution. T is the gravitational force between the planet and the star is proportional to $r^{-5/2}$,then T will be proportional to

A. $r^{3/2}$

B. $r^{5/3}$

C. $r^{7/4}$

D. r^3

Answer: C

Watch Video Solution

10. A liquid A of mass 100 g at $100^\circ C$ is added to 50 g of a liquid B at temperature $75^\circ C$, the temperature of the mixture becomes $90^\circ C$. Now

if 100 g of liquid A is $100^\circ C$ is added to 50 g of liquid B at $50^\circ C$, temperature of the mixture will be

A. $80^\circ C$

B. $60^\circ C$

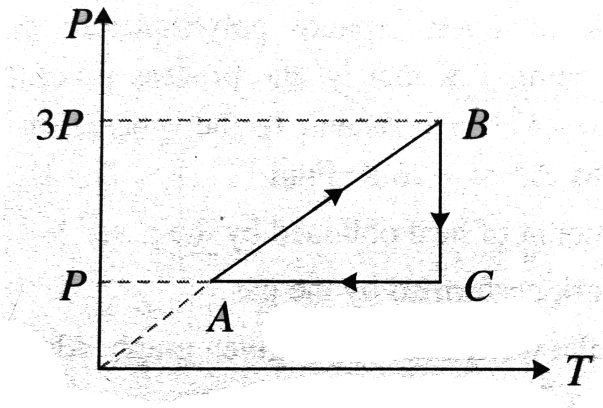
C. $70^\circ C$

D. 85°

Answer: A

Watch Video Solution

11. A fixed mass of oxygen gas performs a cyclic process ABCA as shown. Find the efficiency of the process.



A. $\frac{3\ln 3 - 2}{5 + 3\ln 3}$

B. $\frac{3\ln 4 - 2}{4 + 5\ln 3}$

C. $\frac{3\ln 4 - 3}{4 + 5\ln 3}$

D. $\frac{3\ln 3 - 1}{6 + 3\ln 4}$

Answer: A

Watch Video Solution

12. An electron of mass 0.90×10^{-30} kg under the action of a magnetic field moves in a circle of 2.0 cm radius at a speed $3.0 \times 10^{6} ms^{-1}$. If a

proton of mass $1.8 \times 10^{-27} kg$ was to move in a circle of the same radius in the same magnetic field, then its speed will be

A. $1.5 \times 10^{3} m/s$

B. $3 \times 10^{6} m/s$

C. $6 \times 10^{4} m/s$

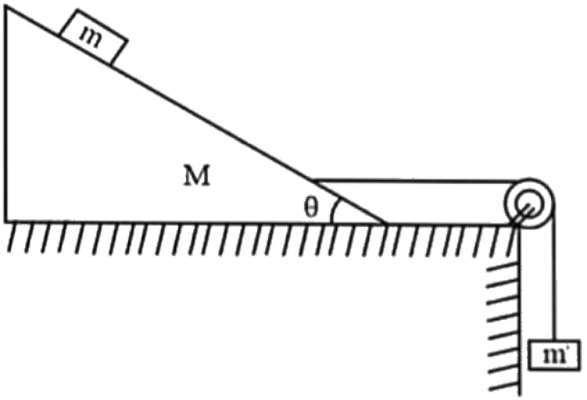
D. $2 \times 10^{8} m/s$

Answer: A

Watch Video Solution

13. A hanging block of mass m' prevents the smaller block of mass m from slipping over a movable triangular block of mass M. All the surface are frictionless and the strings and the pulleys are light. Value of mass m' in

terms of m, M and θ is



A. $\left[\frac{m+M}{\cot\theta-1}\right]$

B. $\left[\frac{m-M}{\cot\theta+1}\right]$

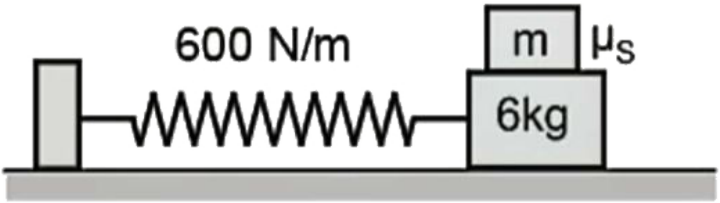
C. $\left[\frac{m-M}{\cot\theta-2}\right]$

D. $\left[\frac{m+M}{\cot\theta-2}\right]$

Answer: A

Watch Video Solution

14. A block of mass m is placed on the top of a 6kg cart such that the time period of the system is 0.75 s assuming there is no slipping. If the cart is displaced by 50 mm from its equilibrium position and released, then the coefficient of static friction μ_s between block and cart is just sufficient to prevent the block from sliding. The value of m and μ_s respectively are (Take $g = 9.8m/s^2$)



A. $1.63kg, 0.251$

B. $2.55kg, 0.385$

C. $3.42kg, 0.632$

D. $4.28kg, 0.876$

Answer: B

Watch Video Solution

Watch Video Solution

15. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level of water to fall from h to $\frac{h}{2}$ and from $\frac{h}{2}$ to zero is

A. $\sqrt{2}$

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

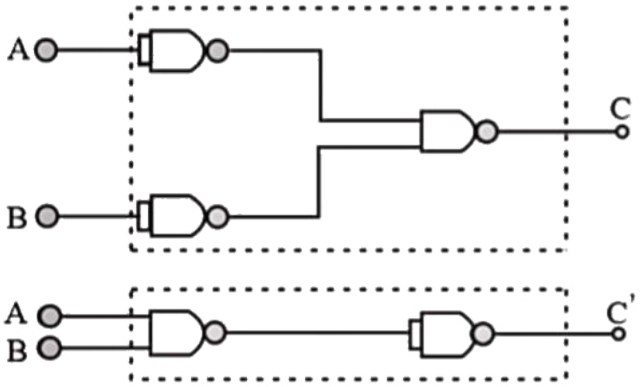
C. $\sqrt{2}-1$

D. $\frac{1}{\sqrt{2}-1}$

Answer: C

Watch Video Solution

16. The combination of NAND gates shown here in the figure give output C and C'. C and C' are equivalent to



A. OR gate and AND gate respectively

B. AND gate and NOT gate respectively

C. AND gate and OR gate respectively

D. OR gate and NOT gate respectively

Answer: A

Watch Video Solution

17. In a photoelectric effect measurement, the stopping potential for a given metal is found to be V_0 volt, when radiation of wavelength λ_0 is

used. If radiation of wavelength $2\lambda_0$ is used with the same metal, then the stopping potential (in V) will be

A. $\frac{V_0}{2}$

B. $2V_0$

C. $V_0 + \frac{hc}{2e\lambda_0}$

D. $V_0 - \frac{hc}{2e\lambda_0}$

Answer: D

Watch Video Solution

18. A student measures that distance traversed in free fall of a body, initially at rest in given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage error in measurement of the distance and the time are e_1 and e_2, respectively, the percentage error in the estimation of g is

A. $e_2 - e_1$

B. $e_1 + 2e_2$

C. $e_1 + e_2$

D. $e_1 - 2e_2$

Answer: B

Watch Video Solution

19. If a transverse pulse is created at the topmost point of a uniform rope suspended vertically, then

A. speed of pulse remains constant

B. speed of the pulse decreases with constant rate as pulse moves downward.

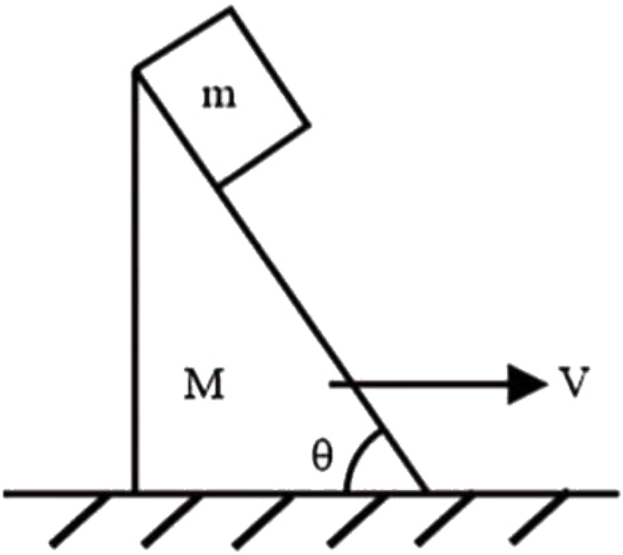
C. speed of the pulse decreases with increasing rate as pulse moves downward.

D. speed of the pules increases with constant rate as pulse moves downward.

Answer: B

Watch Video Solution

20. A block of mass m is stationary with respect to the wedge of mass M moving with uniform speed v on horizontal surface. Work done by friction force on the block in t seconds is



A. zero

B. $-\frac{mgvt}{2}\sin 2\theta$

C. $-(mgvt)2$

D. $-\frac{mgvt}{2}\sin\theta$

Answer: B

Watch Video Solution

Physics Subjective Numerical

1. The maximum kinetic energy of photoelectrons emitted from a metal surface increses from 0.4 eV to 1.2 eV when the frequency of the incident radiation is increased by 40% . What is the work function (in eV) of the metal surface?

Watch Video Solution

2. A very light, rectangular wire-frame of dimensions $7cm \times 5cm$ hangs just above the free surface of a liquid of surface tension T, with its plane parallel to the free surface. The wire -frame is just brought in contact with the liquid surface and then, lifted up. If the force required to lift the wire-frame is 3.36 N, then what is the value of T in $\left(Nm^{-1}\right)$?

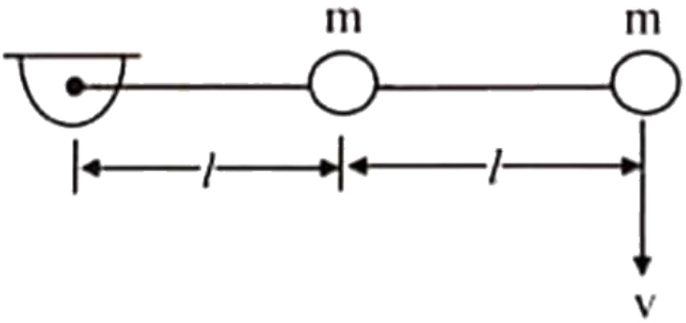
Watch Video Solution

3. A prism of refractive index $\sqrt{\frac{3}{2}}$ and refracting angle is 45° is placed in air. One of the two refracting surface of the prism is silvered and a ray of monochromatic light enters the prism from the other face at an angle θ. If the ray retraces its path, then what is the value of θ (in degree)?

Watch Video Solution

4. Two beads each of mass m are fixed on a light rigid rod of length 2l which is free to rotate in a horizontal plane. The bead on the far end is given some velocity v as shown in the figure. If K_{cm} represents the kinetic

energy of the centre of mass of the system and K_R represents the rotational kinetic energy of the system, then what is the value of $\frac{K_{cm}}{K_R}$?



Watch Video Solution

5. Unpolarized light of intensity 32 Wm^{-3} passes through three polarizers such that the transmission axis of the last polarizer is crossed with the first. If the intensity of the emerging light is $3Wm^{-2}$, what is the angle between the transmission axces of the first two polarizers ? At what angle will the transmitted intensity be maximum ?

Watch Video Solution

Mcqs Physics

1. Electrons in a certain energy level $n = n_1$ can emit 3 spectral lines. When they are in another energy level, $n = n_2$, they can emit 6 spectral lines. The orbital speed of the electrons in the two orbits are in the ratio

A. $4:3$

B. $3:4$

C. $2:1$

D. $1:2$

Answer: A

Watch Video Solution

2. A radioactive nucleus of mass number A, initially at rest, emits an $\alpha -$ particle with a speed v. What will be the recoil speed of the daughter nucleus ?

A. $\frac{2v}{(A-4V)}$

B. $\frac{2v}{(A+4)}$

C. $\frac{4v}{(A-4)}$

D. $\frac{4v}{(A+4)}$

Answer: C

Watch Video Solution

3. A paramagnetic sample shows a net magnetisation of $8Am^{-1}$ when placed in an external magnetic field of $0\cdot 6T$ at a temperature of $4K$. When the same sample is placed in an external magnetic field of $0\cdot 2T$ at a temperature of $16K$, the magnetisation will be

A. $\frac{32}{3}\ \mathrm{A}\ m^{-1}$

B. $\frac{2}{3}\ \mathrm{A}\ m^{-1}$

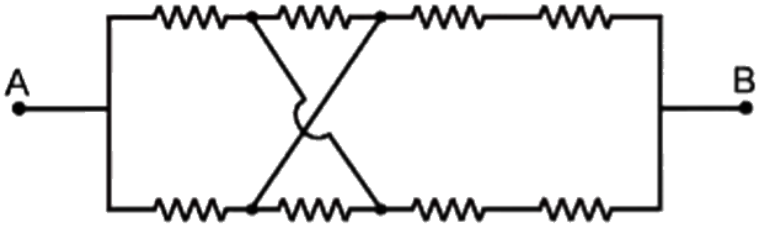
C. $6\ \mathrm{A}\ m^{-1}$

D. $2.4\ \mathrm{A}\ m^{-1}$

Answer: B

Watch Video Solution

4. In the circuit shown, each resistor is of resistance R. the equivalent resistance between the terminals A and B is



A. 2R

B. 1.3R

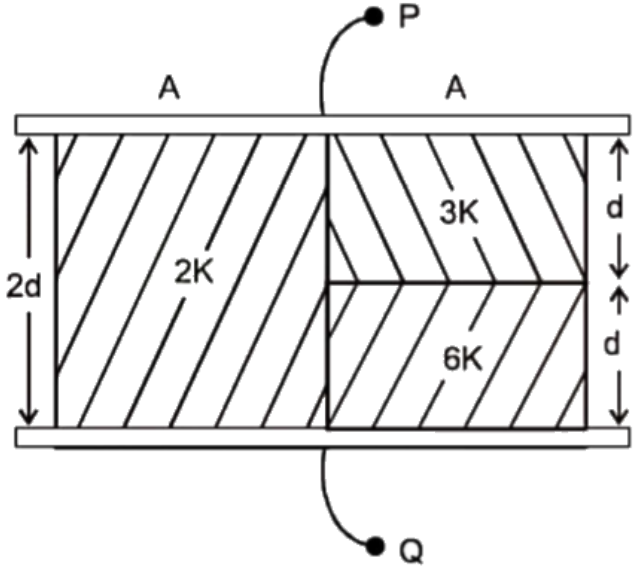
C. 1.5R

D. 15R

Answer: C

Watch Video Solution

5. Three different types of dielectric slabs have been arranged between the plates of a parallel plate capacitor, as shown in the figure. The equivalent capacitance of the system between the points P and Q will be



A. $\frac{K\varepsilon_0 A}{d}$

B. $\frac{2K\varepsilon_0 A}{d}$

C. $\frac{3K\varepsilon_0 A}{d}$

D. $\frac{3K\varepsilon_0 A}{2d}$

Answer: C

Watch Video Solution

6. The mass and the diameter of a planet are three times the repective value for the Earth. The period of oscillation of a simple pendulum on the Earth is 2 s. The period of oscillation of the same pendulum on the planet would be:

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

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

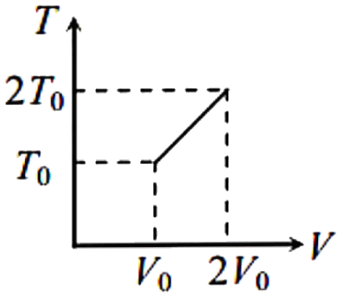
C. $\frac{\sqrt{3}}{2}S$

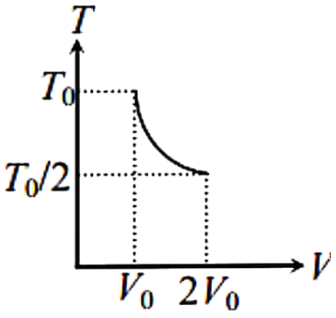
D. $2\sqrt{3}S$

Answer: D

Watch Video Solution

7. Temperature and volume curves are drawn for two thermodynamic processes. For the first process, it is a straight line and for the second, it is a rectangular hyperbola. The ratio of work done in the first process to the work done in the second process is





A. $2:1$

B. $3:1$

C. $4:1$

D. 3:2`

Answer: A

Watch Video Solution

8. A proton, a deuteron and an α- particle having the same kinetic energy are moving in circular trajectory in a constant magnetic field. If r_p, r_d and r_α denote respectively the radii of the trajectories of these particles then

A. $r_e > r_p = r_{He}$

B. $r_e > r_p > r_{He}$

C. $r_e < r_p < r_{He}$

D. $r_e < r_p = r_{He}$

Answer: D

Watch Video Solution

9. An object is placed on the surface of a smooth inclined plane of inclination θ. It takes time t to reach the bottom of the inclined plane. If the same object is allowed to slide down rough inclined plane of same inclination θ, it takes time nt to reach the bottom where n is a number greater than 1. The coefficient of friction μ is given by -

A. $\mu = \left(1 - \frac{1}{n^2}\right)\tan\theta$

B. $\mu = \left(1 - \frac{1}{n^2}\right)\coth\eta$

C. $\mu = \left(1 - \frac{1}{n^2}\right)^{1/2}\tan\theta$

D. $\mu = \left(1 - \frac{1}{n^2}\right)^{1/2}\cot\theta$

Answer: A

Watch Video Solution

10. A 27 mW laser beam has a cross-sectional maximum electric field in this electromagnetic wave is given by :

[Given permittivity of space $\in_0 = 9 \times 10^{12}$ SI units, Speed of light $c = 3 \times 10^8 m/s$]

A. 1kV/m

B. 1.4kV/m

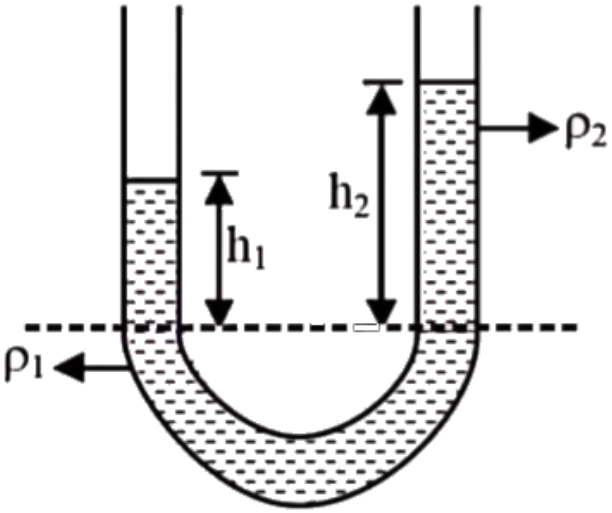
C. 0.7kV/m

D. 2kV/m

Answer: B

Watch Video Solution

11. Two chemically non-reactive liquids are placed in a U-shaped tube as shown in the figure. The height of any liquid above a common reference line is



A. directly proportional proportional to their densities

B. inversely proportional to their densities

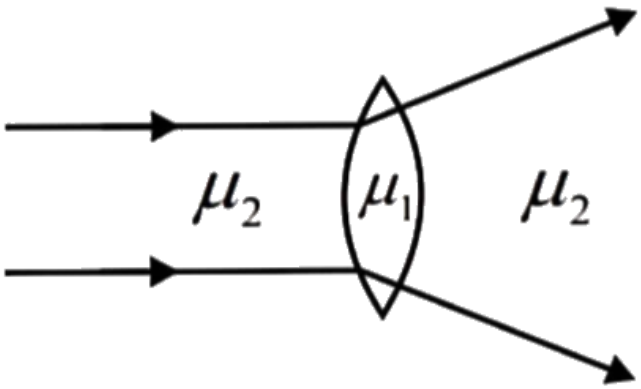
C. directly proportional to square of their densities

D. equal

Answer: B

Watch Video Solution

12. A thin bi-convex lens made out of a material of refractive index μ_1 is place in a medium of refractive index μ_2. A paraxial beam of light, parallel to the principal axis of the lens, is shown in the figure. Based on the ray diagram, we can conclude that



A. $\mu_1 > \mu_2$

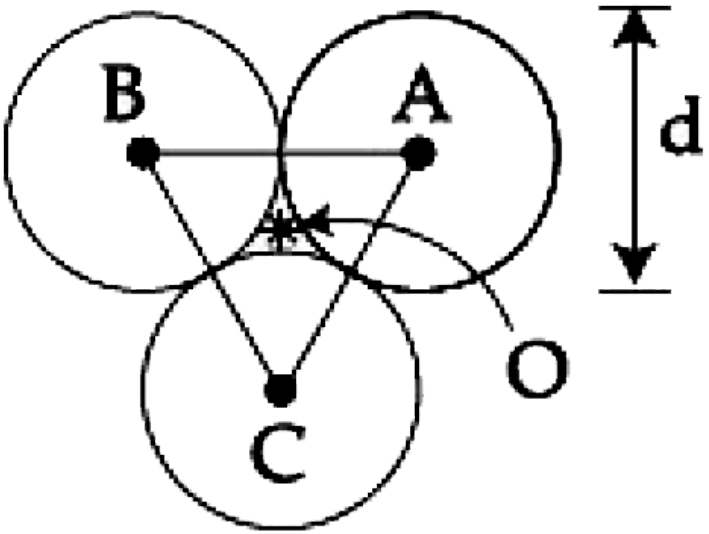
B. $\mu_1 < \mu_2$

C. $\mu_1 = \mu_2$

D. $\mu_1 < \mu_2$

Answer: D

Watch Video Solution



13.

Three solids sphere each of mass m and diameter d are stuck together

such that the lines connecting the centers from an equilateral triangle of side of length d. The ratio $\frac{I_0}{I_A}$ of moment of inertia I_0 of the system about an axis passing the centroid and about center of any of the spheres I_A and perpendicular to the plane of the triangle is

A. $\frac{23}{13}$

B. $\frac{13}{15}$

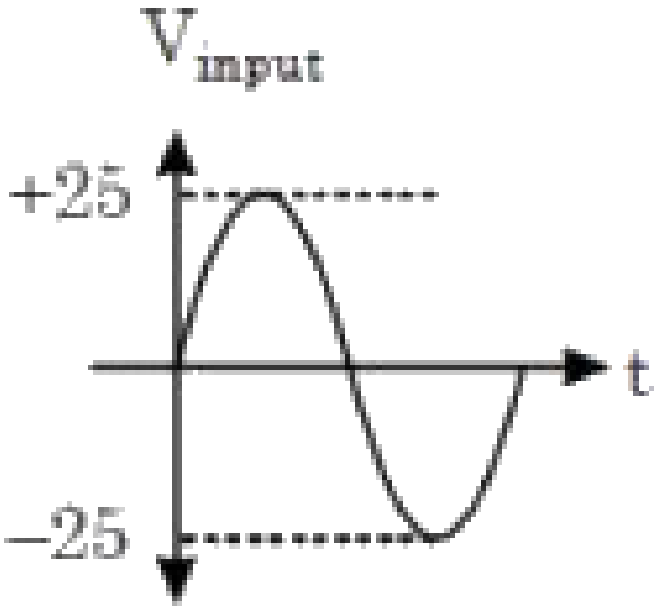
C. $\frac{13}{23}$

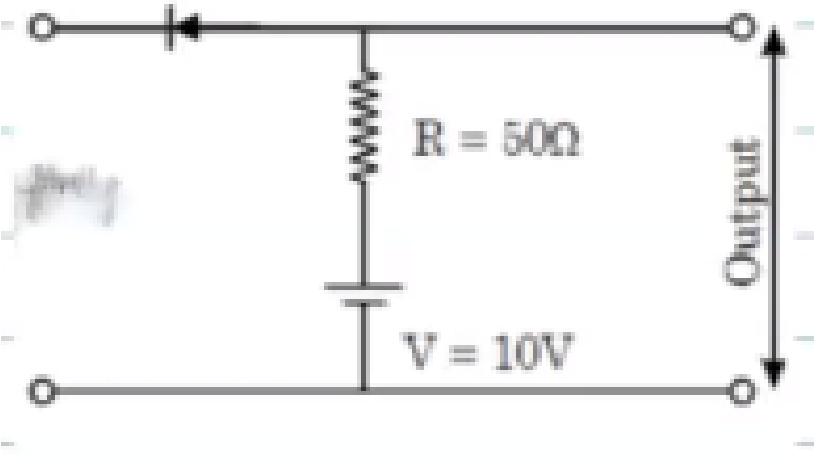
D. $\frac{15}{13}$

Answer: C

Watch Video Solution

14. An ideal diode is connected in a circuit with resistance $R = 50\Omega$ and $V = 10V$. If an AC input signal shown in the figure is given to the circuit, then the maximum and minimum value of output voltage (without load) is


V_{input}
+25
t
−25



A. 10V, -15V

B. 10V, -25V

C. 25V, -25V

D. 25V,-15V

Answer: B

Watch Video Solution

15. A thermally insulated vessel contains $150g$ of water at $0^\circ C$. Then the air from the vessel is pumped out adiabatically. A fraction of water turms

into ice and the rest evaporates at $0^{\circ}C$ itself. The mass of evaporated water will be closest to :

(Latent heat of vaporization of water $= 2.10 \times 10^{6} jkg^{-1}$ and Latent heat of Fusion of water $= 3.36 \times 10^{5} jkg^{-1}$)

A. 20g

B. 130g

C. 35g

D. 150g

Answer: A

Watch Video Solution

16. Suppose a quantilty x can be dimensionally represented in terms of M,L and T, that is $[x]$, $M^{a}L^{b}T^{c}$. The quantity mass

A. maybe represented in terms of L, T and y if a=0

B. maybe represented in terms of L, T and y if $a \neq 0$

C. can always be dimensinally represented in terms of L, T and y

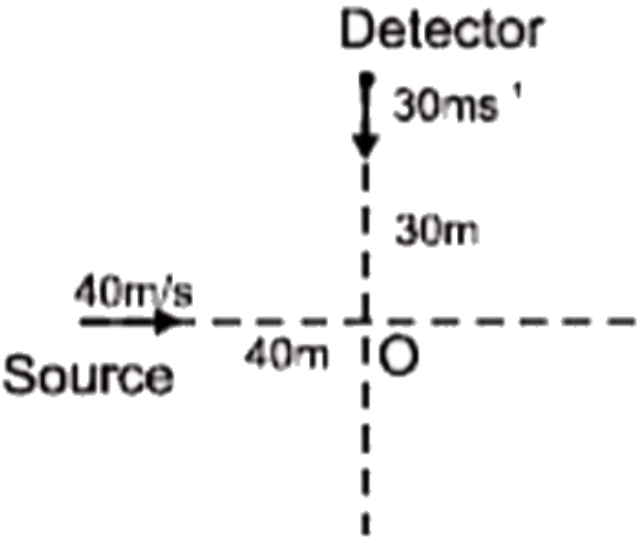
D. Can never be dimensionally represented in terms of L, T and y

Answer: B

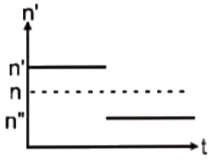
Watch Video Solution

17. A source and detector both start moving simultaneously from the position shown in the figure, one along x-axis and the other along y-axis with speeds 40 ms^{-1} and 30 ms^{-1} respectively. If n is the frequency of the source then the graph between the apparent frequency n' observed by detector and time t would be [assume that source and detector do not

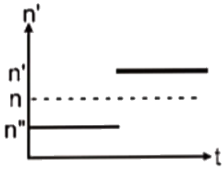
collide]



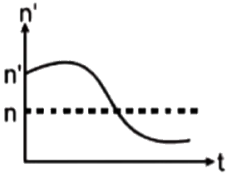
A.



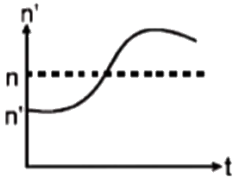
B.



C.



D.

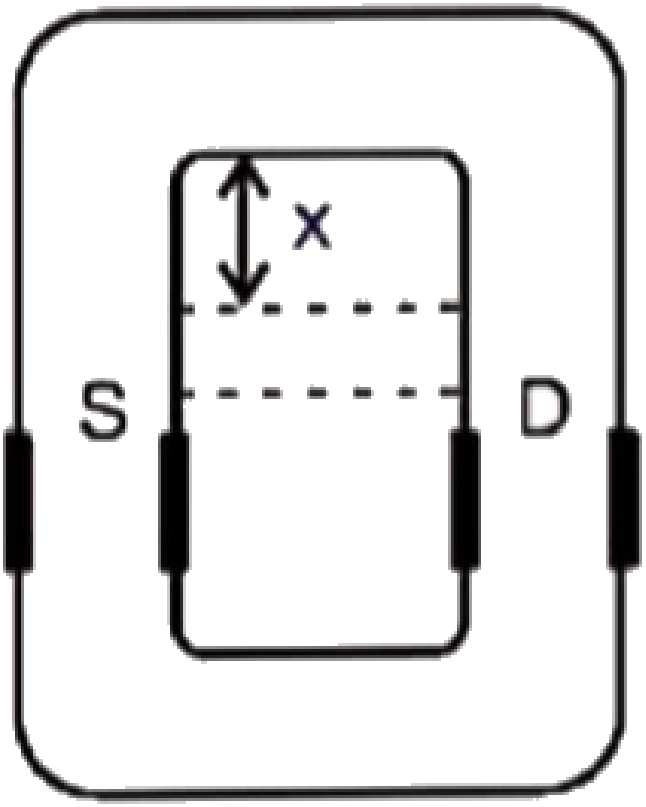


Answer: A

Watch Video Solution

18. In a closed tube whose length can be altered by sliding one of the halves relative to other is shown in the figure. In the initial condition the dector detects minimum intensity. One of the tubes is then displaced by 5 cm, during this displacement detector detects maximum intensity for 10 times and then a minimum intensity when the displacement is complete.

what is the wavelength of sound?



A. 10/9 cm

B. 1 cm

C. 1/2 cm

D. 5/9 cm

Answer: B

Watch Video Solution

19. An organ pipe of length L is open at one end and closed at other end. The wavelengths of the three lowest resonating frequencies that can be produced by this pipe are

A. 4L,2L,L

B. 2L,L,L/2

C. 2L,L,2L/3

D. 4L,4L/3,4L/5

Answer: D

Watch Video Solution

20. 10^{22} particles each of mass $10^{-26}Kg$ are striking perpendicular on a wall of area $1m^2$ with speed $10^4 m/s$ in $1\,\text{sec}$. The pressure on the well if collision are perfectly elastic is :

A. $2Nm^{-2}$

B. $4Nm^{-2}$

C. $8Nm^{-2}$

D. $16Nm^{-2}$

Answer: A

Watch Video Solution

21. A metal wire of circular cross-section has a resistance R_1. The wire is now stretched without breaking, so that its length is doubled and the density is assumed to remain the same. If the resistance of the wire now becomes R_2, then $R_2 : R_1$ is

Watch Video Solution

22. A power transmission line feeds input power at 2400V to a step-down transformer and which delivers power at 240V with its primary windings

having 5000 turns . If the current in the primary coil of the transformer is 5A and its efficiency is 80%, then what is the output current (in A)?

Watch Video Solution

23. The largest magnitude the electric field on the axis of a uniformly charged ring of radius 3m is at a distance h from its centre. What is the value of h? (Take $\frac{1}{\sqrt{2}} = 0.7$)

Watch Video Solution

24. If the displacement (x) and velocity (v) of a particle executing SHM are related through the expression $3v^2 = 30 - x^2$. If the time period of the particle is $T = \pi\sqrt{n}$, then what is the value of n?

Watch Video Solution

25. A body hanging from a spring stretches it by 1 cm at the earth's surface. How much will the same body stretch the spring at a place 1600 km above the earth surface ? Radius of the earth=6400 km.

Watch Video Solution