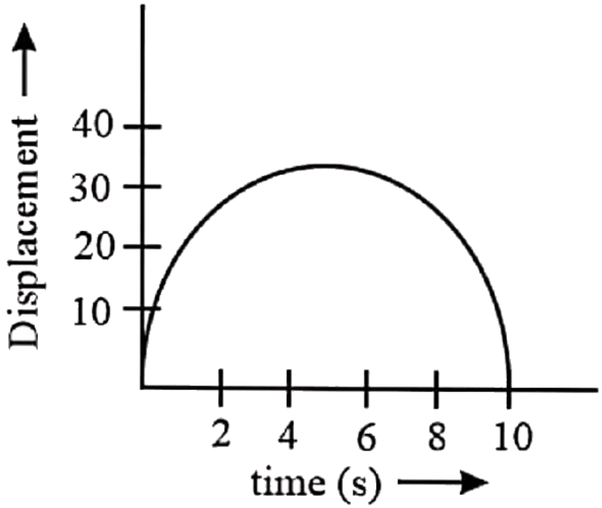
PHYSICS

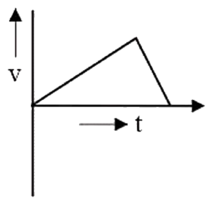
BOOKS - NTA MOCK TESTS

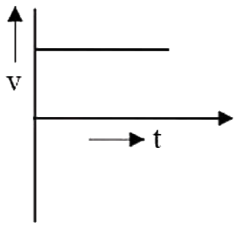
NEET MOCK TEST 1

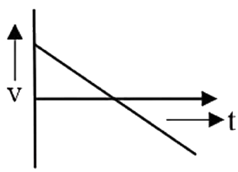
PHYSICS - SINGLE CHOICE

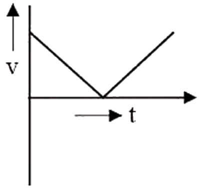
1. The displacement-time of a moving object is shown in figure. Which of the velocity-time graphs shown in figure could represent the motion of the same body?



A. 

B. 

C. 

D. 

Answer: C

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2. Charge is distributed uniformly in some space. The net flux passing through the surface of an imaginary cube of side a in the space is ϕ. The net flux passing through the surface of an imaginary sphere of radius a in the space will be

A. ϕ

B. $\frac{3}{4\pi}\phi$

C. $\frac{2\pi}{3}\phi$

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

Answer: D

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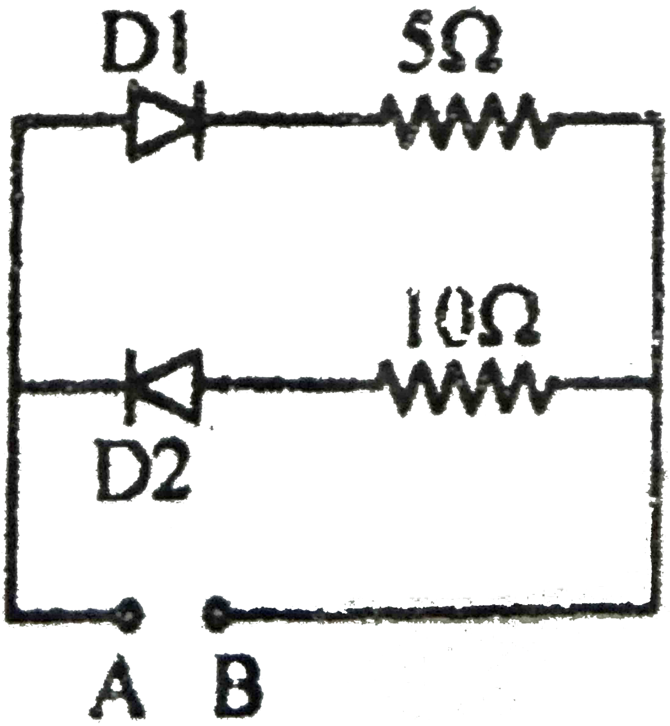
3. A 2V battery is connected across AB as shown in the figure. The value of the current supplied by the battery when in one case battery's positive terminal is connected to A and in other case when positive terminal of battery is connected to B will respectively be :-



A. $0.2A$ and $0.1A$

B. $0.1A$ and $0.2A$

C. $0.2A$ and $0.4A$

D. $0.4A$ and $0.2A$

Answer: D

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4. The velocity of sound in air at NTP is 330 m/s. What will be its value when temperature is doubled and pressure is halved ?

A. $330m/s$

B. $165m/s$

C. $330\sqrt{2}m/s$

D. $330/\sqrt{2}m/s$

Answer: C

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5. The total mechanical energy of a spring mass sytem in simple harmonic motion is $E=\frac{1}{2}m\omega^2A^2$. Suppose the oscillating particle is replaced by another particle of double the mass while the amplitude A remains the same. The new mechanical energy will

A. become 2E

B. become $\frac{E}{2}$

C. become $\sqrt{2}E$

D. remain E

Answer: D

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6. In a physical balance working on the principle of moments, when 5 mg weight is placed on the left pan, the beam becomes horizontal. Both the empty pans of the balance are of equal mass. Which of the following statements is correct ?

A. Every object that is weighed using this balance appears lighter than its actual weight

B. Left arm is shorter than the right arm

C. Both the arms are of same length

D. Left arm is longer than the right arm

Answer: B

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7. According to Bohr's theory of hydrogen atom , the product of the binding energy of the electron in the nth orbit and its radius in the nth orbit

A. is proportional to n^2

B. is inversely proportional to n^3

C. has a constant value of 10.2 e VÅ

D. has constant value 7.2 eVÅ

Answer: D

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8. A satellite of mass m is orbiting the earth (of radius R) at a height H from its surface. The total energy of the satellite in terms of g_0, the value of acceleration due to gravity at the earth's surface,

A. $\frac{mg_0R^2}{2(R+H)}$

B. $-\frac{mg_0R^2}{2(R+H)}$

C. $\frac{2mg_0R^2}{R+H}$

D. $-\dfrac{2mg_0R^2}{R+H}$

Answer: B

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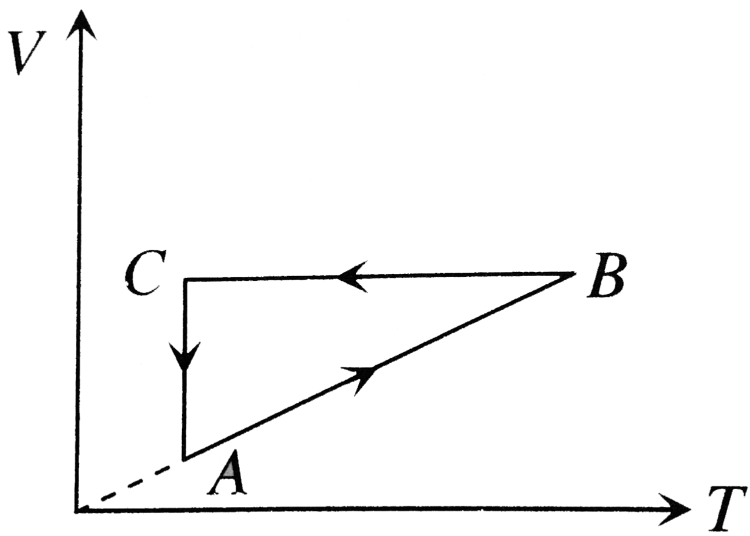
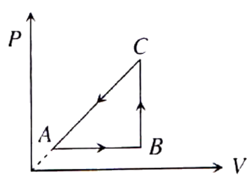
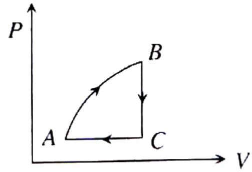
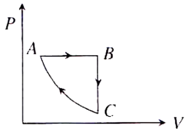
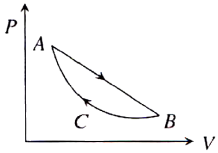
9. A cyclic process $ABCA$ is shown in the $V-T$ diagram, process on the $P-V$ diagram will be



A. 

B. 

C. 

D. 

Answer: C

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10. Consider a compound slab consisting of two different material having equal thickness and thermal conductivities K and $2K$ respectively. The equivalent thermal conductivity of the slab is

A. $\sqrt{2}K$

B. $3K$

C. $\frac{4}{3}K$

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

Answer: C

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11. Two identical satellites A and B revolve round the earth in circular orbits at distance R and 3R from the surface of the earth. The ratio of the linear momenta of A and B is (R = radius of the earth)

A. $1:1$

B. $1:\sqrt{2}$

C. $\sqrt{2}:1$

D. $2:1$

Answer: C

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12. A body is in simple harmonic motion with time period T = 0.5 s and amplitude A = 1 cm. Find the average velocity in the interval in which it moves from equilibrium position to half of its amplitude.

A. $16cm/s$

B. $6cm/s$

C. $4cm/s$

D. $12cm/s$

Answer: D

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13. A current I flows through a thin wire shaped as regular polygon of n sides which can be inscribed in a circle of radius R. The magnetic field induction at the center of polygon due to one side of the polygon is

A. $\frac{\mu_0 I}{\pi R}\left(\frac{\tan \pi}{n}\right)$

B. $\frac{\mu_0 I}{4\pi R}\left(\frac{\tan \pi}{n}\right)$

C. $\frac{\mu_0 I}{2\pi R}\left(\frac{\tan \pi}{n}\right)$

D. $\frac{\mu_0 I}{2\pi R}\left(\frac{\cos \pi}{n}\right)$

Answer: C

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14. 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. 0.80

Answer: D

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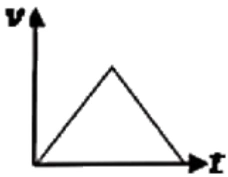
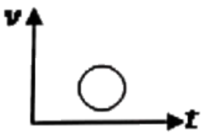
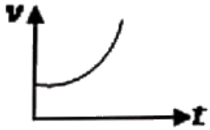
15. Which of the following curves does not represent motion in one dimension?

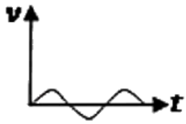


A.



B.

C. 

D. 

Answer: B

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16. A satellite is revolving round the earth in an orbit of radius r with time period T. If the satellite is revolving round the earth in an orbit of radius $r + \Delta r (\Delta r < < r)$ with time period $T + \Delta T (\Delta T < < T)$ then.

A. $\frac{\Delta T}{T} = \frac{3}{2} \frac{\Delta r}{r}$

B. $\frac{\Delta T}{T} = \frac{2}{3} \frac{\Delta r}{r}$

C. $\frac{\Delta T}{T} = \frac{\Delta r}{r}$

D. $\frac{\Delta T}{T} = -\frac{\Delta r}{r}$

Answer: A

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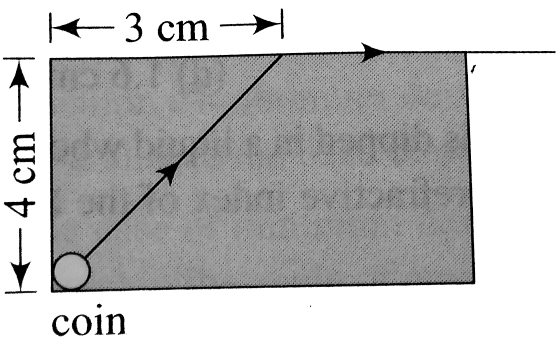
17. A small coin is resting on the bottom of a beaker filled with a liquid. A ray of light from the coin travels up to the surface of the liquid and moves along its surface (see figure).

How fast is the light travelling in the liquid ?



A. $2.4 \times 10^8 m / s$

B. $3.0 \times 10^8 m / s$

C. $1.2 \times 10^8 m / s$

D. $1.8 \times 10^8 m / s$

Answer: D

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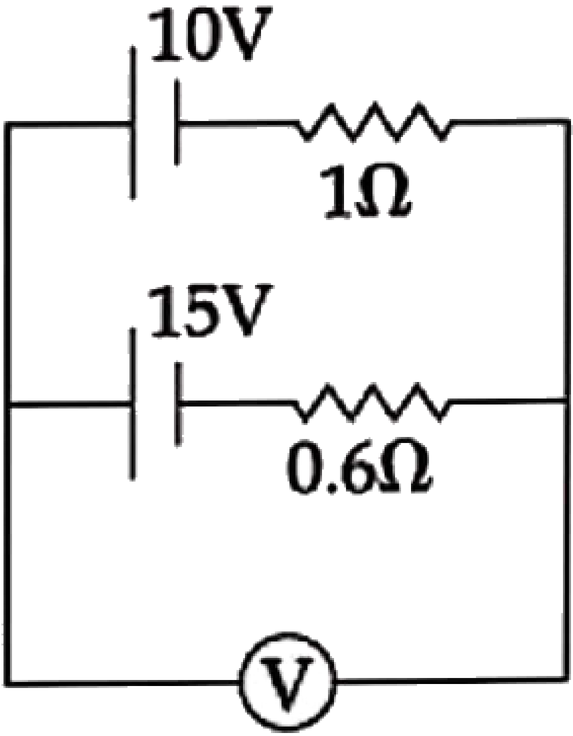
18. A 10 V battery with internal resistance 1Ω and a 15 V battery with internal resistance 0.6Ω are connected in parallel to a voltmeter (see figure). The reading in the voltmeter will be close to:



A. 11.9 V

B. 13.1 V

C. 12.5 V

D. 24.5V

Answer: B

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19. A copper ball of mass 100 gm is at a temperature T. It is dropped in a copper calorimeter of mass 100 gm, filled with 170 gm of water at room temperature. Subsequently, the temperature of the system is found to be $75^\circ C$. T is given by : (Given : room temperature = $30^\circ C$, specific heat of copper $= 0.1 cal / gm^\circ C$)

A. $825^\circ C$

B. $800^\circ C$

C. $885^\circ C$

D. $1250^\circ C$

Answer: C

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20. Dimension of resistance in an elecatrical circuit, in terms of dimension of mass M, of length L, of time T, and of current I, would be

A. $[ML^2T^{-3}I^{-1}]$

B. $[ML^2T^{-2}]$

C. $[ML^2T^{-1}I^{-1}]$

D. $[ML^2T^{-3}I^{-2}]$

Answer: D

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21. The process of superimposing signal frequency (i.e. audio wave) on the carrier wave is known as

A. Transmission

B. Reception

C. Modulation

D. Detection

Answer: C

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22. A ray of light is incident at an angle of 60° on one face of a prism of angle 30°. The ray emerging out of the prism makes an angle of 30° with the incident ray. The emergent ray is

A. 0°

B. 90°

C. 30°

D. 45°

Answer: B

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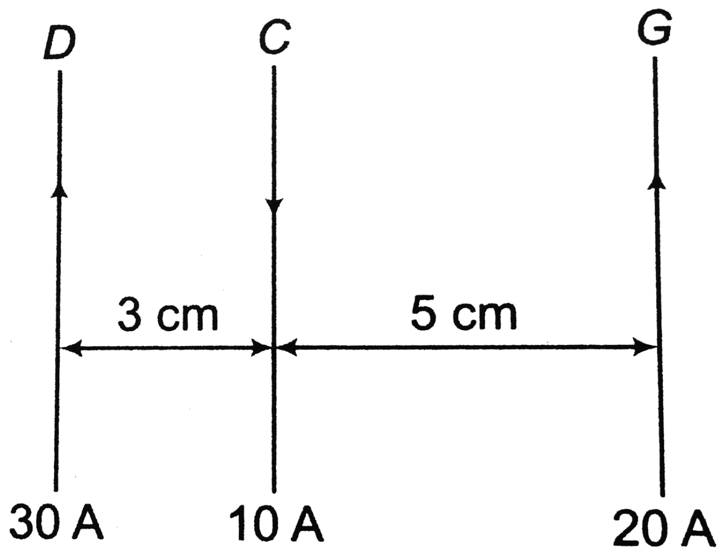
23. Consider three long straight parallel wires as shown in the figure. Find the force experienced by $25cm$ length of wire C.



A. $9 \times 10^{-4}N$ toward left

B. $3 \times 10^{-4}N$ toward right

C. $6 \times 10^{-4}N$ toward right

D. zero

Answer: B

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24. Light of wavelength 3000 $\mathring{A}$ falls on a sensitive surface. If the surface has received 10^{-7} J of energy, then the number of photons falling on the surface area is

A. 5×10^{11}

B. 2.5×10^{11}

C. 3×10^{11}

D. None of these

Answer: B

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25. Which among the following has a hydrogen-like spectrum and whose lines have wavelengths four times shorter that those of atomic hydrogen?

A. Helium ion

B. Hydrogen

C. Lithium ion

D. None of these

Answer: A

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26. A negative test charge is moving near a long straight wire carrying a current. The force acting on the test charge is parallel to the direction of the current. The motion of the charge is:

A. away from the wire

B. towards the wire

C. parallel to the wire along the current

D. parallel to the wire opposite to the current

Answer: B

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27. A metal ball falls from a height of 1m on to a steel plate and jumps upto a height of 81 cm. The coefficient of restitution of the ball and steel plate is

A. 0.2

B. 9

C. 0.9

D. 90

Answer: C

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28. One mole of a diatomic gas undergoes a thermodynamic process, whose process equation is $P \propto V^2$. The molar specific heat of the gas is

A. $\frac{17R}{3}$

B. $\frac{17R}{6}$

C. $\frac{15R}{4}$

D. $\frac{15R}{8}$

Answer: B

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29. In materials like aluminium and copper, the correct order of magnitude of various elastic moduli is:

A. Young's modulii lt shear modulii lt bulk modulii

B. er

C. shear modulii lt Young's modulii lt bulk modulii

D. bulk modulii lt Young's modulii lt shear modulii

Answer: C

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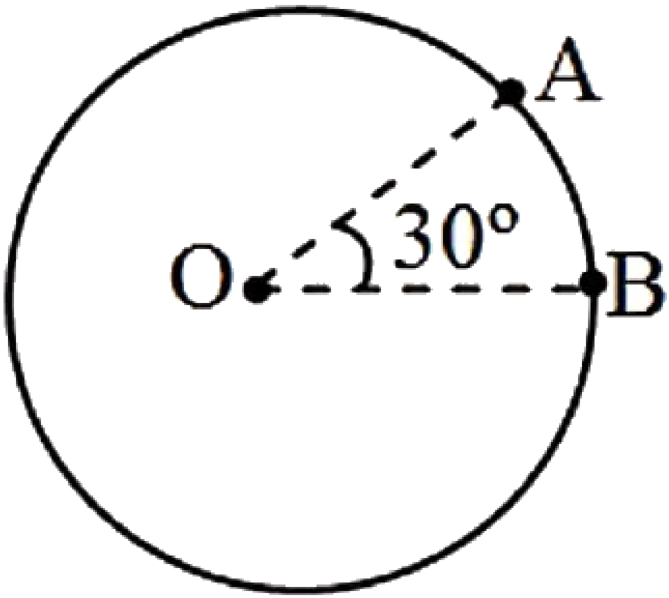
30. A uniform wire of resistance 36Ω is bent in the form of a circle. The Effective resistance between A and B is (O is the centre of circle):



A. 2.75Ω

B. 3Ω

C. 33Ω

D. 36Ω

Answer: A

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31. The relative error in the dertmination of the surface area of a sphere is α. Then the relative error in the determination of its volume is :

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

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

C. α

D. $\frac{5}{2}\alpha$

Answer: A

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32. Water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap, the instant the first drop touches the ground. How far above the ground is the second drop at that instant. $(g = 10ms^{-2})$

A. 1.25m

B. 2.50 m

C. 3.75 m

D. 5.00 m

Answer: C

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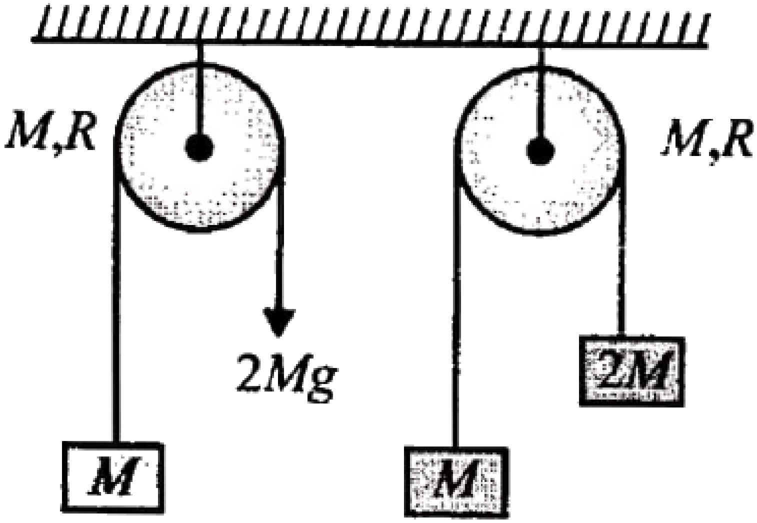
33. A cord is wrapped on a pulley (disk) of mass M and radius R as shown in figure. To one end of the cord, a block of mass M is connected as shown and to other end in (a) a force of 2 Mg and in (b) a block of mass 2 M. Let angular acceleration of the disk in (a) and (b) is α_A and α_B respectively, then (cord is not slipping on the pulley)



(a) (b)

A. $\alpha_A = \alpha_B$

B. $\alpha_A > \alpha_B$

C. $\alpha_A < \alpha_B$

D. None of these

Answer: B

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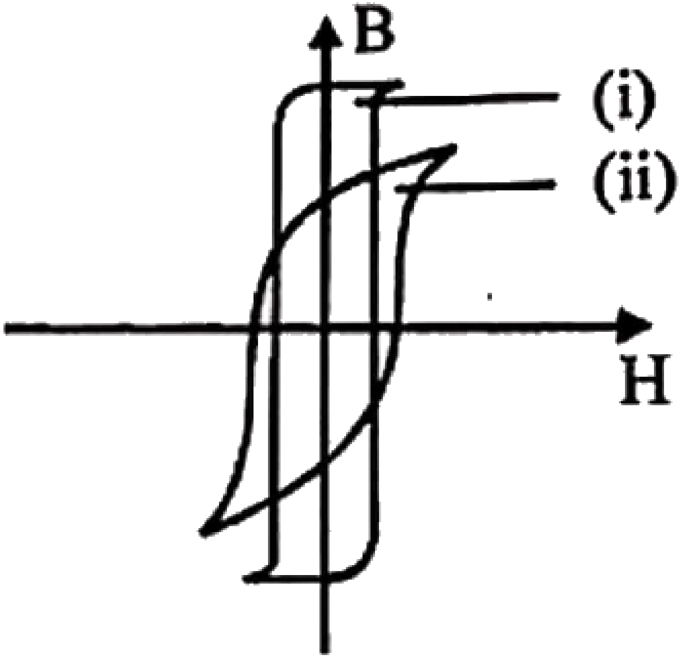
34. The B-H curve (i) and (ii) shown in the figure is associated with



A. (i) diamagnetic and (ii) paramagnetic substance

B. (i) paramagnetic and (ii) ferromagnetic substance

C. (i) soft iron and (ii) steel respectively

D. (i) steel and (ii) soft iron respectively

Answer: C

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35. A stone is tied to a string of length L and is whirled in a vertical circle with the other end of the string as the center. At a certain instant of time, the stone is at its lowest position and has a speed u. The magnitude of the change in velocity as it reaches a position where the string is horizontal (g being acceleration due to gravity) is

A. $\sqrt{u^2 - 2gL}$

B. $\sqrt{2gL}$

C. $\sqrt{u^2 - gL}$

D. $\sqrt{2(u^2 - gL)}$

Answer: D

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36. Which of the following phenomenon is not explained by Huygen's construction of wavefront ?

A. Refraction

B. Reflection

C. Diffraction

D. Origin of spectra

Answer: D

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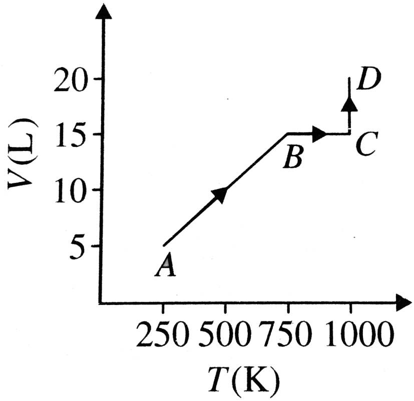
37. Two moles of helium gas are taken along the path $ABCD$ (as shown in Fig.) The work done by the gas is



A. $2000R\left(\frac{1}{2}+1n\frac{4}{3}\right)$

B. $500R(3+1n4)$

C. $500R\left(2+1n\frac{16}{9}\right)$

D. $2000R\left(1+1n\frac{16}{9}\right)$

Answer: A

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38. A train of weight 10^7N is running on a travel track with uniform speed of $36kmh^{-1}$. The frictional force is 0.5 kg f per quintal. If

$g = 10ms^{-2}$, power of engine is

A. $500kW$

B. $50kW$

C. $5kW$

D. $0.5kW$

Answer: A

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39. A body of mass m is accelerated uniformly from rest to a speed v in a time T . The instantaneous power delivered to the body as a function of time, t is given by

A. $\frac{mv^2}{T^2}t$

B. $\frac{mv^2}{T^2}t$

C. $\frac{1}{2}\frac{mv^2}{T^2}t$

D. $\frac{1}{2}\frac{mv^2}{T^2}t$

Answer: A

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40. In a nuclear reaction of α - decay, the daughter nuclei $._Z^A X$ is moving with kinetic energy E. The total energy released if parent nuclei was at rest will be

A. $E\left(1+\frac{4}{A}\right)$

B. $\frac{E}{A}(A)$

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

D. $E(A+4)$

Answer: A

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41. If A is the amplitude of the wave coming from a line source at a distance r, then :

A. $A \propto r^{-2}$

B. $A \propto r^{-1}$

C. $A \propto r^{2}$

D. $A \propto r^{1}$

Answer: B

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42. A source of sound of frequency 600 Hz is placed inside water. The speed of sound in water is $1500m/s$ and in air it is $300m/s$. The frequency of the sound recorded by an observer who is standing in air is :

A. 200 Hz

B. 3000 Hz

C. 120 Hz

D. 600 Hz

Answer: D

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43. A projectile is fired with a speed u at an angle θ with the horizontal. Find its speed when its direction of motion makes an angle α with the horizontal.

A. $u \cos \theta \sec \alpha$

B. $u \cos \theta \cos \alpha$

C. $u^2 \cos^2 \alpha \sin^2 \alpha$

D. $u \sin \theta \sin \alpha$

Answer: A

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44. At room temperature copper has free electron density of $8.4 \times 10^{28} m^{-3}$. The copper conductor has a cross-section of $10^{-6} m^2$ and carries a current of $5.4\ A$. What is the electron drift velocity in copper?

A. $4ms^{-1}$

B. $0.4ms^{-1}$

C. $4cms^{-1}$

D. $0.4mms^{-1}$

Answer: D

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45. Water rises up to a height h in a capillary tube of certain diameter. This capillary tube is replaced by a similar tube of half the diameter. Now the water will rise to the height of

A. 4 h

B. 3 h

C. 2 h

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

Answer: C

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PHYSICS

1. The rate of change of torque $'\tau'$ with deflection θ is maximum for a magnet suspended freely in a uniform magnetic field of induction B

when θ is equal to

A. $\theta = 0^\circ$

B. $\theta = 45^\circ$

C. $\theta = 60^\circ$

D. $\theta = 90^\circ$

Answer: A

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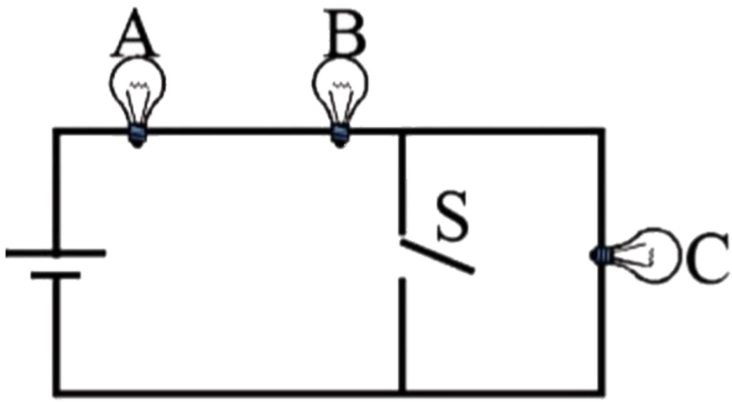
2. A circuit consists of three identical lamps connected to a battery as shown in figure. When the switch S is closed then the intensities of lamps A and B



A. will increase by eight times

B. will decrease by two times

C. will increase by more than two times

D. will remain the same

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3. When a shunt of 4Ω is attahced to a galvanometer, the deflection reduces to $\frac{1}{5}$th. If an additional shunt of 2Ω is attached. What will be the deflection?

A. $\frac{1}{10}$ th of initial

B. $\frac{1}{13}$ th of initial

C. remains the same

D. none of these

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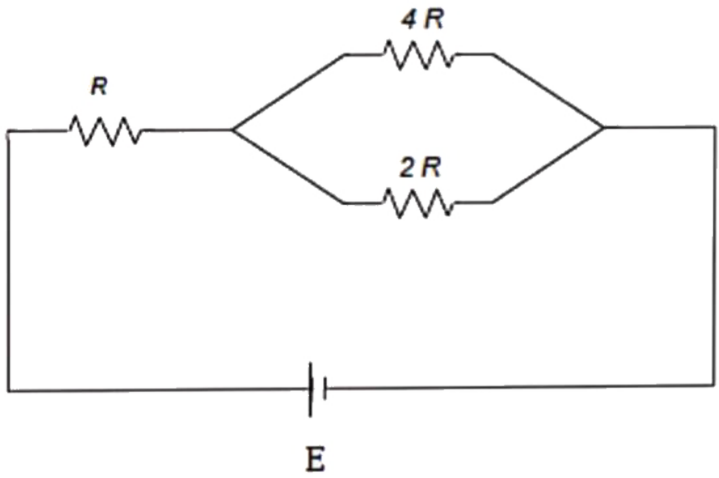
4. The figure shows a network in which the cell is deal and it has an emf E. The potential difference across the resistance 2R is



A. 2E

B. $\frac{4E}{7}$

C. $\frac{E}{7}$

D. $\frac{3E}{7}$

5. A step-up transformer has transformation ratio of $3:2$ what is the voltage in secondary if voltage in primary is $30V$?

A. 45V

B. 15V

C. 90V

D. 300V

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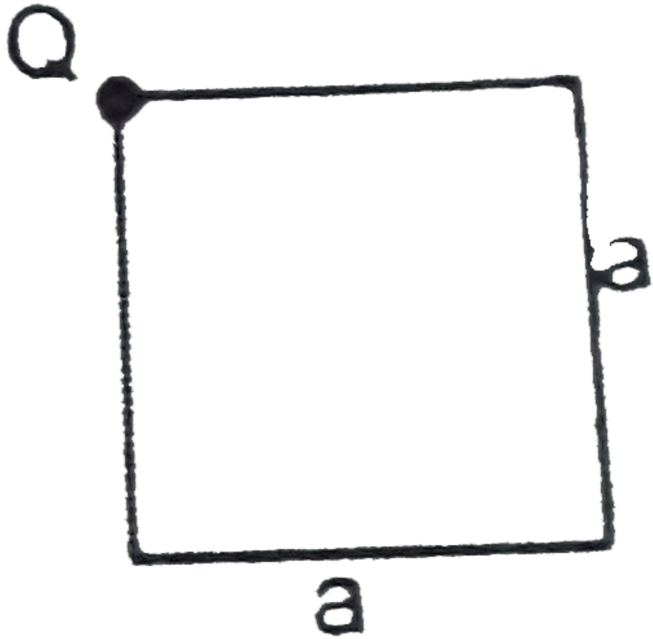
6. A point charge Q is placed at the corner of a square of side a, then find the flux through the square.



A. $\frac{Q}{8 \in_0}$

B. $\frac{Q}{4 \in_0}$

C. $\frac{Q}{\in_0}$

D. Zero

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7. In Young's double-slit experiment, the separation between the slits is halved and the distance between the slits and the screen in doubled. The fringe width is

A. remain the same

B. be halved

C. be doubled

D. be quadrupled

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8. Three long straight conductors are arranged parallel to each other in the same plane and carrying currents of $1A, 2A$ and$3A$ all in the same direction. The distance between the first two conductors is x and the distance between the second and third conductors$\mathrm{y}$. If the middle conductor is in equilibrium, the ratio $x : y$ is

A. $1:3$

B. $3:1$

C. $1:\sqrt{3}$

D. $\sqrt{3}:1$

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9. A particle of mass m and charge q moves with a constant velocity v along the positive x direction. It enters a region containing a uniform magnetic field B directed along the negative z direction, extending from $x = a$ to $x = b$. The minimum value of v required so that the particle can just enter the region $x > b$ is

A. $\dfrac{qbB}{m}$

B. $\dfrac{q(b-a)B}{m}$

C. $\dfrac{qaB}{m}$

D. $\dfrac{q(b+a)B}{2m}$

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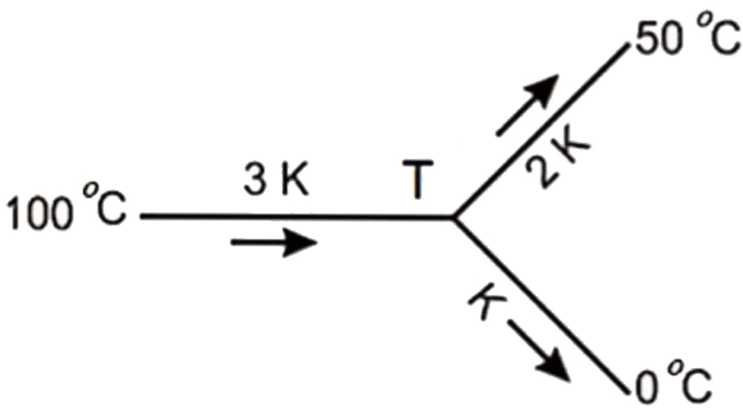
10. Three rods of the same dimension have thermal conductivity 3K, 2K and K as shown in the figure. The temperature of the junction in steady-state is



A. $\dfrac{200}{3}{}^{\circ}C$

B. $\dfrac{100}{3}{}^{\circ}C$

C. $75^{\circ} C$

D. $\frac{50}{3}{ }^{\circ} C$

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11. If 21 J of heat energy is supplied to an ideal diatomic gas at constant pressure, then the change in its energy is

A. 10J

B. 12J

C. 15J

D. 18J

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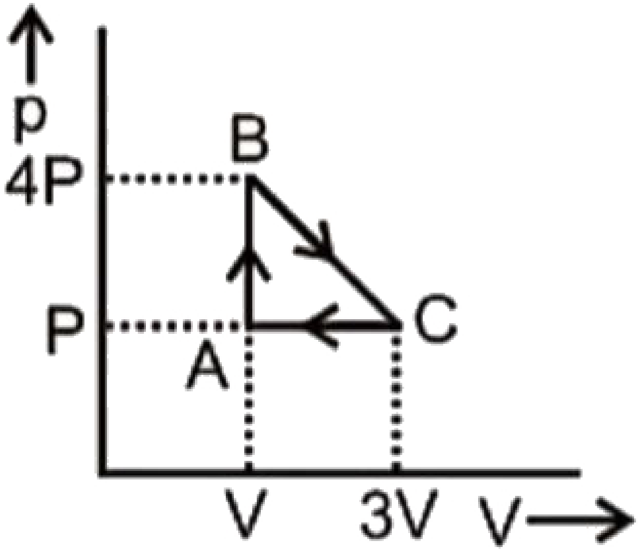
12. An ideal gas is taken around the cycle ABCA as shown in the P-V diagram. The total work done by the gas during the cycle is



A. PV

B. 2PV

C. 4PV

D. 3PV

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13. In a process, temperature and volume of one mole of an ideal monoatomic gas are varied according to the relation VT= K, where K is a constant. In this process the temperataure of the gas is increased by ΔT. The amount of heat absorbed by gas is (R is gas constant).

A. $\frac{1}{2}R\Delta T$

B. $\frac{3}{2}R\Delta T$

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

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

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14. Consider a mixture of n moles of helium gas and 2n moles of oxygen gas (molecules taken to be rigid) as an ideal gas. Its C_p / C_v

value will be:

A. $\frac{23}{15}$

B. $\frac{40}{27}$

C. $\frac{67}{45}$

D. $\frac{19}{13}$

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15. The percentage change in internal energy, when a gas is cooled from $927^{\circ}C$ to $27^{\circ}C$, is

A. 0.75

B. 3

C. 0.5

D. 1

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16. A string is hanging from a rigid support. A transverse pulse is excited at its free end. The speed at which the pulse travels a distance x is proportional to

A. x^2

B. x

C. $\sqrt{x}$

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

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17. While measuring the speed of sound by performing a resonance column experiment, a student gets the first resonance condition at a column length of $18cm$ during winter. Repeating the same experiment during summer, she measures the column length to be xcm for the second resonance. Then

A. $x < 18$

B. $x > 54$

C. $18 < x < 36$

D. $18 < x < 54$

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18. a projectile is fired from the surface of the earth with a velocity of $5ms^{-1}$ and angle θ with the horizontal. Another projectile fired from another planet with a velocity of $3ms^{-1}$ at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth.The value of the acceleration due to gravity on the planet is in ms^{-2} is given $\left(g = 9.8ms^{-2}\right)$

A. $16.3ms^{-2}$

B. $1.8ms^{-2}$

C. $3.5ms^{-2}$

D. $5.9ms^{-2}$

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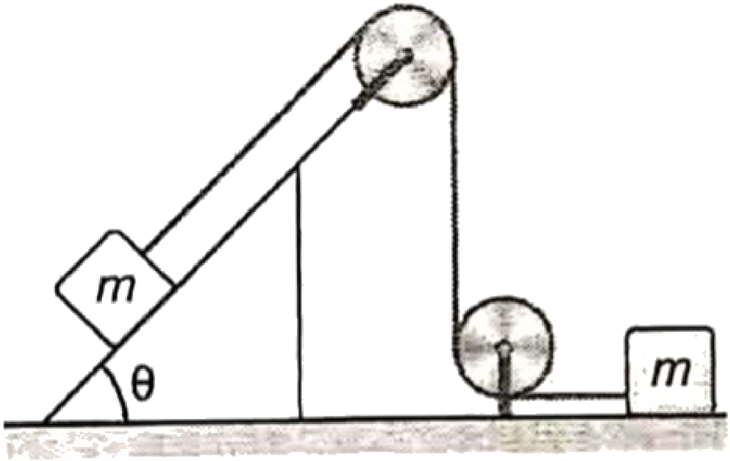
19. For the system shown in the figure, the inclined plane is fixed, all the pulleys are light and friction is absent every where.The tension in the string will be



A. $\frac{2}{3}mg\sin\theta$

B. $\frac{3}{2}mg\sin\theta$

C. $\frac{1}{2}mg\sin\theta$

D. $2mg\sin\theta$

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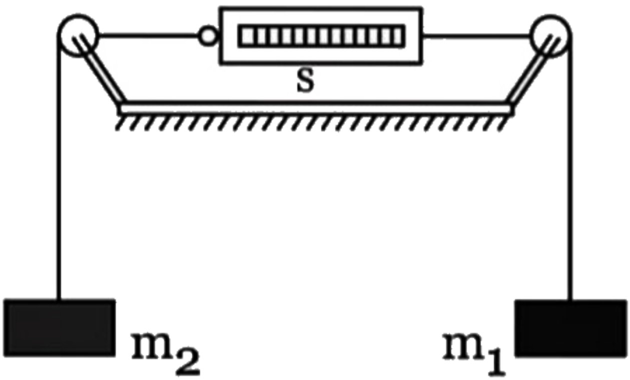
20. In the arrangement shown, the pulleys, string and the spring balance, all the ideal. If $m_1 > m_2$, then the reading of the spring balance is



A. $m_1 - m_2$

B. $\frac{1}{2}(m_1 + m_2)$

C. $\frac{4m_1m_2}{m_1 + m_2}$

D. $\frac{2m_1m_2}{m_1 + m_2}$

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21. it is estimated that per minute, each cm^2 of earth recives about 2 calories of heat energy from the sun. This constant is called solar constant S. Express solar constant in SI units.

A. $8kWm^{-2}$

B. $1.4kWm^{-2}$

C. $1.8kWm^{-2}$

D. $2.5kWm^{-2}$

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22. The potential energy of a particle under a conservative force is given by $U(x) = (x^2 - 3x)$ J. The equilibrium position of the particle is at

A. $x = 1.5m$

B. x = 2m

C. x = 2.5m

D. x= 3m

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23. A bullet of mass 0.02 kg travelling horizontally with velocity 250 ms^{-1} strikes a block of wood of mass 0.23 kg which rests on a rough horizontal surface. After the impact, the block and bullet move together and come to rest after travelling a distance of 40m. The coefficient of sliding friction of the rough surface is $\left(g = 9.8ms^{-2}\right)$

A. 0.75

B. 0.61

C. 0.51

D. 0.30

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24. A skater of mass m standing on ice throws a stone of mass M =2m with a velocity of $v = 5m/s$ in horizontal direction. If the coefficient of friction between the skater and the ice is 0.5 , find the distance over which the skater will move (take $g = 10ms^{-2}$)

A. 20m

B. 15m

C. 10m

D. 5m

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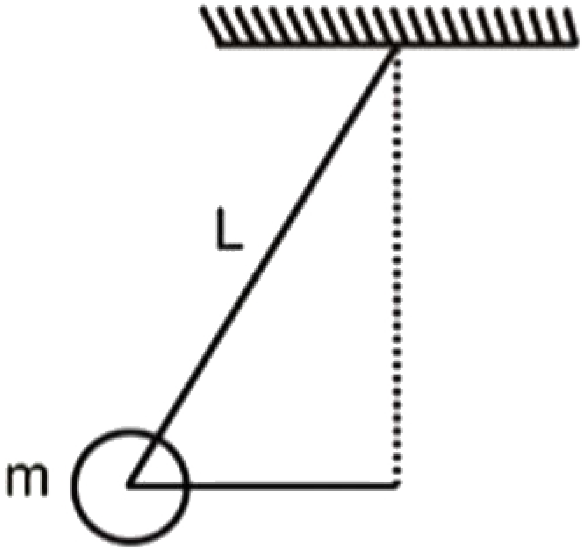
25. A ball of mass m = 0.5 kg is attached to the end of a string having length L = 0.5 is rotated on a horizontal circular path about the vertical axis. The maximum tension that the string can bear is 324N.What is the maximum possible value of angular velocity of ball (in radian / s) ?



A. 9

B. 18

C. 27

D. 36

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26. The distance of Neptune and Saturn from the Sun are respectively 10^{13} and 10^{12} meters and their periodic times are respectively T_n and T_s. If their orbits are circular, then the value of T_n / T_s is

A. 10

B. 100

C. $10\sqrt{10}$

D. 1000

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27. If a man goes from the surface of Earth to a height equal to the radius of the Earth, then what will be his weight relative to that on the Earth? What if he goes equally below the surface of Earth?

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

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

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

D. 1

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28. A particle starts oscillating simple harmonically from its equilibrium position then, the ratio of kinetic energy and potential energy of the particle at the time $T/12$ is: $(T = \text{time period})$

A. $1:4$

B. $2:1$

C. $3:1$

D. $4:1$

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29. The phase difference between two waves represented by $y_1 = 10^{-6}\sin[100t + (x/50) + 0.5]m$, $y_2 = 10^{-6}\cos[100t + (x/50)]m$ where x is expressed in metres and t is expressed in seconds, is approximately

A. 1.07 radians

B. 2.07 radians

C. 0.5 radian

D. 1.5 radians

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30. What will be the change in interatomic distance (in $\mathring{A}$) of steel on applying a stress of $10^9 N/m^2$. The Young's modulus of steel is $2 \times 10^{11} N/m^2$ and the interatomic distance in steel is $2.8\mathring{A}$.

A. 7×10^{-3}

B. 14×10^{-3}

C. 21×10^{-3}

D. 28×10^{-3}

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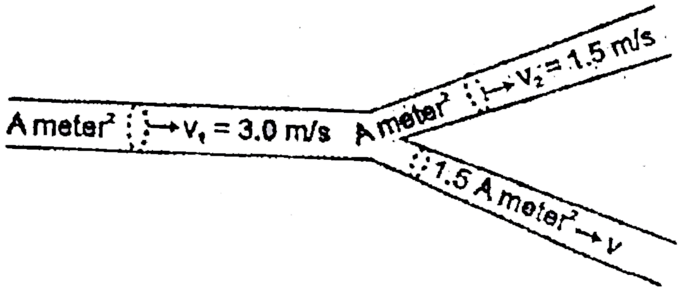
31. An incompressible liquid flows through a horizontal tube as shown in the figure. Then the velocity 'v' of the fluid is:



A. $3.0m / s$

B. $1.5m / s$

C. $1.0m / s$

D. $2.25m / s$

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32. Two blocks of masses 10 kg and 30 kg are placed along a vertical line. The first block is raised through a height of 7 cm. By what distance should the second mass be moved to raise the centre of mass by 1 cm?

A. 1 cm up

B. 1 cm down

C. 2 cm down

D. 2 cm up

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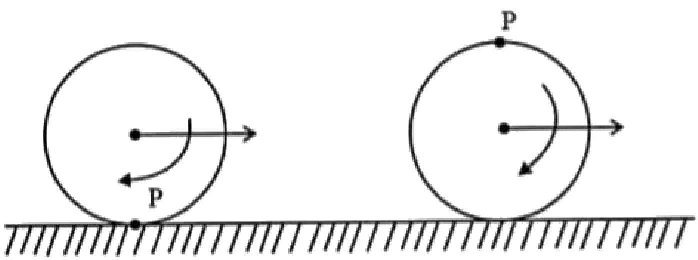
33. If a given point P is in contact with ground initially and wheel of radius R is in pure rolling, then the displacement of point P when point P reaches topmost of the sphere for the first time will be



A. πR

B. $2\pi R$

C. $\left(\sqrt{\pi^2+1}\right)R$

D. $\left(\sqrt{\pi^2+4}\right)R$

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34. How many different wavelength may be observed in the spectrum from a hydrogen sample if the atoms excited to states with principal quantum number n?

A. $\dfrac{n(n-1)}{2}$

B. $\dfrac{n(n+1)}{2}$

C. $\dfrac{n(n+2)}{2}$

D. $\dfrac{n(n-2)}{2}$

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35. 1 amu (atomic mass unit) mass is equal to energy of

A. 931 keV

B. 93.1 eV

C. 931 MeV

D. 9.31 MeV

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36. To measure the resistance of a galvanometer by half deflection method, a shunt is connected to the galvanometer . The shunt is

A. low resistance connected in parallel

B. low resistance connected in series

C. high resistance connected in parallel

D. high resistance connected in series

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37. Cadmium and Broron rods are used in a nuclear reactor to

A. slowing down fast neutrons

B. speeding up slow neutrons

C. absorbing neutrons

D. provides more fuel to nuclear reactor

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38. Calculate the number of photons emitted per second by a 10 watt sodium vapor lamp. Assume that 90% of the consumed energy is converted into light. Wavelength of sodium light is 590nm. $h = 6.62 \times 10^{-34} Js$

A. 1.67×10^{18}

B. 1.67×10^{20}

C. 2.67×10^{19}

D. 3.67×10^{23}

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39. A proton when accelerated through a potential difference of V volt has a wavelength λ associated with it. An alpha-particle in order to have the same λ must be accelerated through a potential difference of

A. V volt

B. 4V volt

C. 2V volt

D. $(V/8)$ volt

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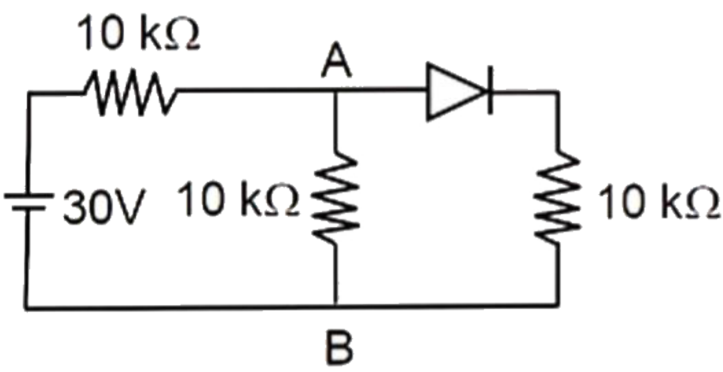
40. Find the potential difference between A and B as shown in the figure



A. 15V

B. Zero

C. 10V

D. 5V

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41. when the electrical conductivity of a semiconductor is due to the breaking of its covalent bonds, then the semiconductor is said to be

A. donor

B. acceptor

C. intrinsic

D. extrinsic

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42. Two plano-convex lenses of focal lengths 20cm and 30cm are placed together to form a double convex lens. The final focal length will be

A. 12 cm

B. 60 cm

C. 20 cm

D. 30 cm

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43. A ray of light is incident normally on one of the faces of a prism of apex angle 30 degree and refractive index sqrt2. The angle of deviation of the ray is...degrees.

A. 30°

B. 45°

C. 15°

D. none of these

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44. In Young's experiment, the third bright band for the wavelength of light source A having wavelength 6000Å coincides with the fourth bright band for source B in the same arrangement .Wavelength of light emitted by source B is

A. 6289Å

B. 4500Å

C. 2250Å

D. 6000Å

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45. In Young's double slit experiment how many maximas can be obtained on a screen (including the central maximum) on both sides of the central fringe if $\lambda = 2000 Å$ and $d = 7000 Å$

A. 12

B. 7

C. 18

D. 6

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46. the energy required to excite an electron in hydrogen atom to its first excited state is

A. 10.2 eV

B. 5.1 eV

C. 3.4 eV

D. 6.8 eV

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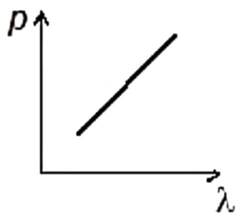
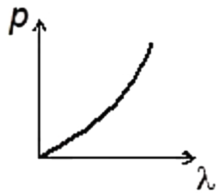
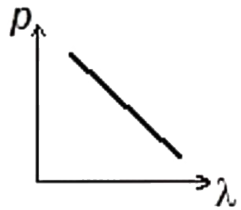
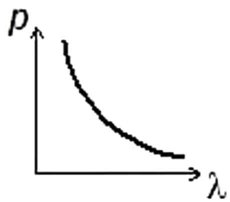
47. Which of the following figure represents the variation of particle momentum and the associated de - Broglie wavelength ?



A.

B. 

C. 

D. 

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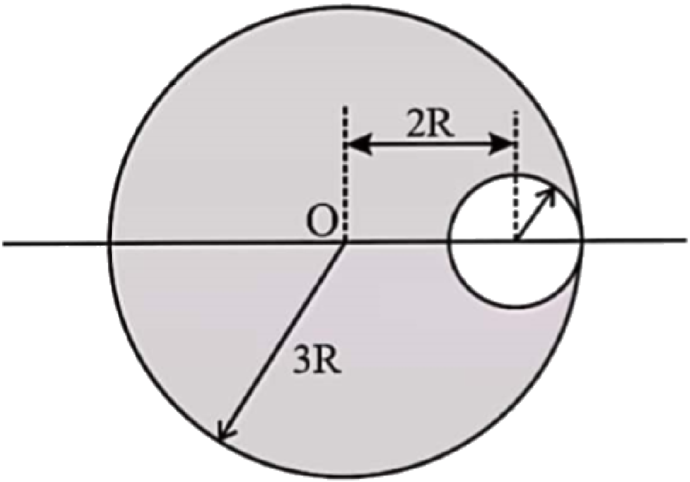
48. The figure shows a disc of radius 3R from which a circular hole of radius R is cut as shown in the figure. The distance of the centre of mass of the remaining object from the point O is



A. R/4

B. R/5

C. R/3

D. R/6

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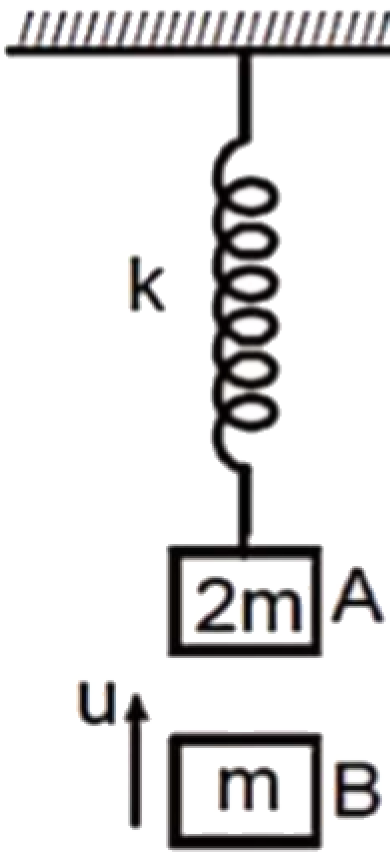
49. A block A of mass 2m is hanging from a vertical massless spring of spring constant k and is in equilibrium. Another block B of mass m strikes the block A with velocity u and sticks to it as shown in the figure. The magnitude of the acceleration of the combined system of the blocks just after the collision is



A. $g/2$

B. g/3

C. g

D. zero

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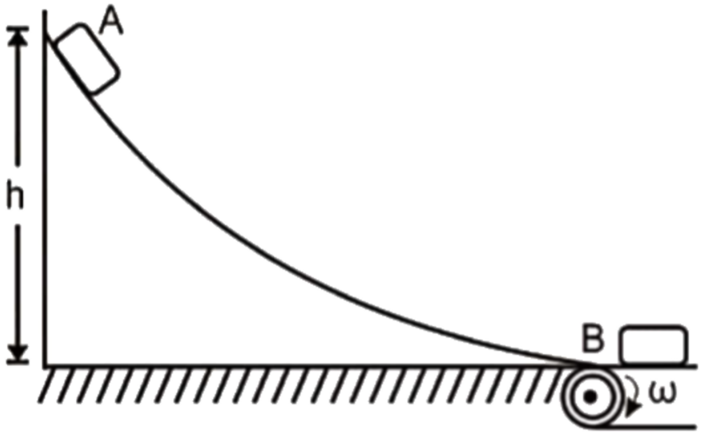
50. A block A starts sliding on a smooth track from a height h as shown in the figure. The track smoothly joins into a conveyor belt which is being driven by a pulley of radius r. I the angular velocity ω of the pulley is such that the block A doesn't slip on the belt, the value of

ω is



A. $\frac{\sqrt{gh}}{r}$

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

C. $\frac{\sqrt{2gh}}{r}$

D. $\frac{2\sqrt{gh}}{r}$

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51. If a copperr rod (free to move and rotate) is brought in a region of a non-uniform magnetic field, then it will align itself

A. Along the direction of the magnetic field, at a location where the magnetic field is strongest

B. along the direction of the magnetic field, at a location where the magnetic field is weakest

C. perpendicular to the direction of the magnetic field, at a location where the magnetic field is strongest

D. perpendicular to the direction of the magnetic field, at location where the magnetic field is weakest

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52. In a house 15 Bulbs of 45 W, 15 bulbs of 100 W, 15 bulbs of 10 W and Two heaters of 1 KW each is connected to 220 V Mains supply then find minimum fuse current

A. 20A

B. 15A

C. 10A

D. 25A

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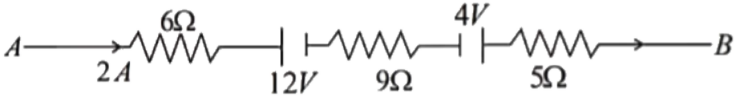
53. The voltage drop between the points A and B in the given figure is



A. 24V

B. 14V

C. 32V

D. 48V

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54. A charged $30\mu F$ capacitor is connected to a 27mH inductor.

What is the angular frequency of free oscillations of the circuit?

A. $9.1 \times 10^3 rad \quad s^{-1}$

B. $3 \times 10^3 rad \quad s^{-1}$

C. $1.1 \times 10^3 rad \quad s^{-1}$

D. $0.3 \times 10^3 rad \quad s^{-1}$

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55. In an AC circuit, a resistance of $R ohm$ is connected is series with an inductance L. If phase angle between volage and current be 45°, the value of inductive reactance will be

A. $R/4$

B. $R/2$

C. R

D. $R/8$

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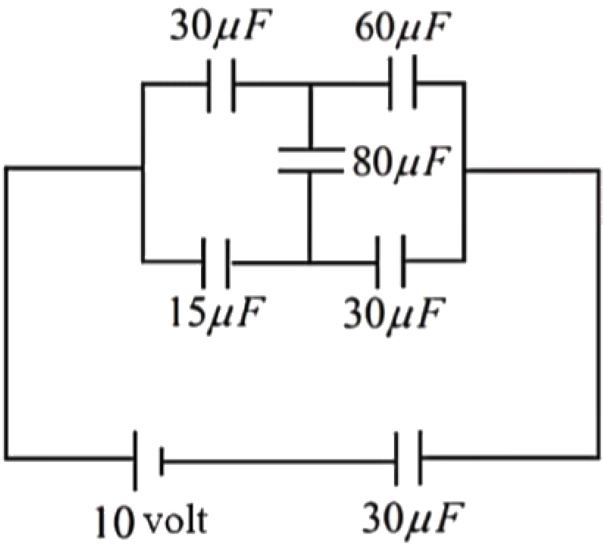
56. In the circuit shown below, the charge on the $60\mu F$ capacitor is



A. $150\mu C$

B. $100\mu C$

C. $50\mu C$

D. $75\mu C$

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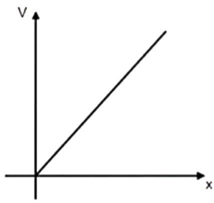
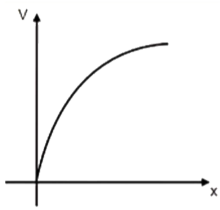
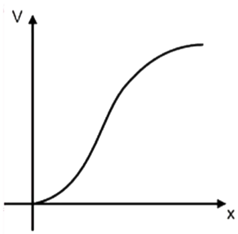
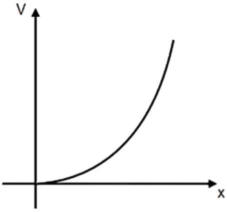
57. In a uniform electric field, a point charge of mass m and charge q is released from rest. If there are no other forces acting on the particle, then which of the following graphs, correctly show the dependence of the particles speed v on the distance x travelled by the particles speed v on the distance x travelled by it? [Graphs are schematic and not drawn to scale]

A. 

B. 

C. 

D. 

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58. One division on the main scale has 20 equal divisions which match with 16 main scale division. The leat count of the vernier calipers is

A. 0.02mm

B. 0.2mm

C. 0.8mm

D. 0.08mm

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59. A body is projected up with a velocity equal to $\sqrt{\frac{9GM}{8R}}$, where M is the mass of the earth and R is the radius of the earth. The maximum distance it reaches from the centre of the earth is

A. $\frac{10R}{9}$

B. $\frac{16R}{7}$

C. $\frac{10R}{3}$

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

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60. The acceleration due to gravity at a depth $R/2$ below the surface of the earth is

A. g

B. 2g

C. g/2

D. g/4

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61. A spherical black body with a radius of $12cm$ radiates $450W$ power at $500K$. If the radius were halved and the temperature doubled, the power radiated in watt would be

A. 3600W

B. 450 W

C. 900W

D. 1800W

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62. The temperature of an ideal gas undergoing adiabatic expansion varies with volume as $T \propto V^{-\frac{3}{4}}$, then the value of $\frac{C_P}{C_V}$ for the gas is

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

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

C. $\frac{7}{3}$

D. $\frac{7}{4}$

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63. The specific heats, C_P and C_V of a gas of diatomic molecules, A are given (in units of $Jmol^{-1}K^{-1}$) by 29 and 22 , respectively. Another gas of diatomic molecules , B has the corresponding values 30 and 21. if they are treated as ideal gases, then :

A. A has one vibrational degree of freedom and B has two vibrational degrees of freedom

B. A has one vibrational degree of freedom and B has zero vibrational degree of freedom

C. A and B both have one vibrational degree of freedom

D. A and B both have two vibrational degrees of freedom

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64. In an isobaric process, heat is supplied to a monoatomic ideal gas. The fraction of heat that goes itno mechanical work is

A. 1

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

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

D. $\frac{2}{5}$

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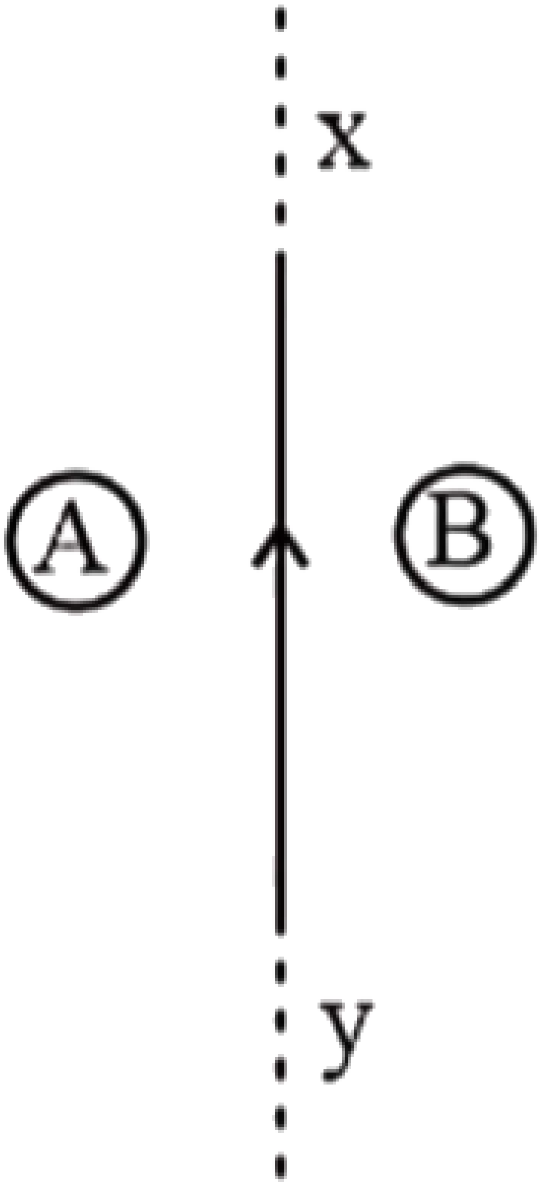
65. Consider the situation shown in figure. If the current I in the long straight wire xy is increased at a steady rate the induced current in loop A and B will be



A. Clockwise in A and anticlockwise in B

B. Anticlockwise in A and clockwise in B

C. Clockwise in both A and B

D. Anticlockwise in both A and B

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66. A short bar magnetic is placed in a uniform magnetic field of 0.25 T, with its axis at an angle of 30° with the field. If it experiences a torque of magnitude 4.5×10^{-2} N m, then its magnetic momentum is

A. 0.36N m T^{-1}

B. 0.25 N m T^{-1}

C. 0.5N m T^{-1}

D. 1.25 N m T^{-1}

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67. Find the time after which the particle's initial velocity will be perpendicular to instantaneous velocity whebn it is projected with 30 m/s from horizontal ground by making an angle 60° with vertical

A. 6 second

B. $2\sqrt{3}$second

C. 3 second

D. Never possible

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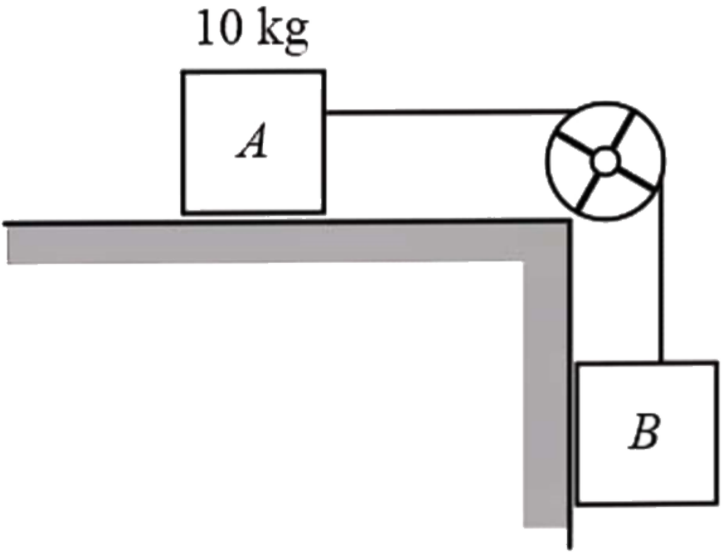
68. If the mass of A=10 kg, coefficient of static friction=0.22, coefficient of kinetic friction=0.2, then minimum mass of B to start motion is



A. 2 kg

B. 2.2 kg

C. 4.8 kg

D. 3.4 kg

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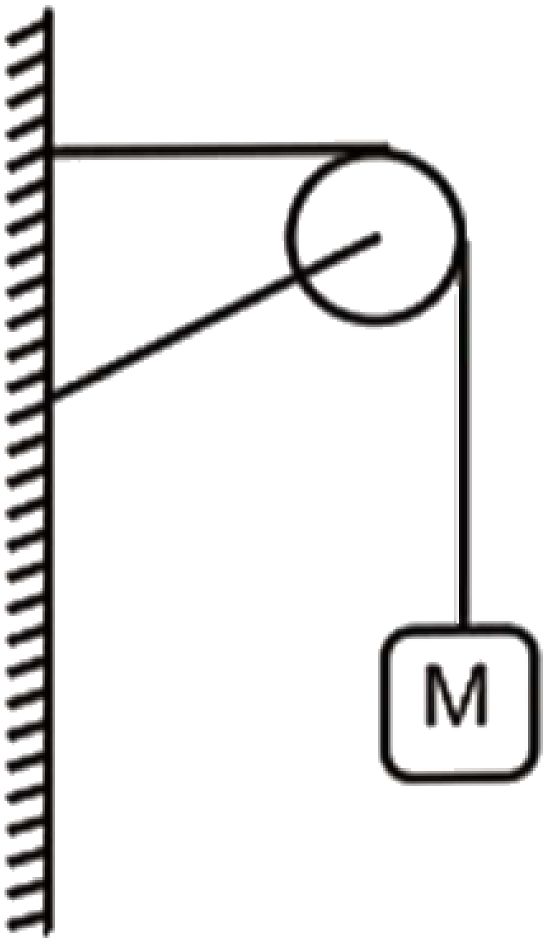
69. A mass string going over a clamped pulley of mass m supports a block of mass M as shown in the figure. The force on the pulley by the clamp is given



A. $\sqrt{2}Mg$

B. $\sqrt{2}mg$

C. $g\sqrt{(M+m)^2+m^2}$

D. $g\sqrt{(M+m)^2+M^2}$

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70. In a radioactive material the activity at time t_1 is R_1 and at a later time t_2, it is R_2. If the decay constant of the material is λ, then

A. $R_1 = R_2$

B. $R_1 = R_2 e^{-\lambda(t_1-t_2)}$

C. $R_1 = R_2 e^{\lambda(t_1-t_2)}$

D. $R_1 = R_2(t_2/t_1)$.

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71. ${}_{92}\mathrm{U}^{235}$ undergoes successive disintegrations with the end product of ${}_{82}\mathrm{Pb}^{203}$. The number of α and β particles emitted are

A. $\alpha = 6, \beta = 4$

B. $\alpha = 6, \beta = 0$

C. $\alpha = 8, \beta = 6$

D. $\alpha = 3, \beta = 3$

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72. A pendulum is executing simple harmonic motion and its maximum kinetic energy is K_1. If the length of the pendulum is doubled and it performs simple harmonic motion with the same amplitude as in the first case, its maximum kinetic energy is K_2 Then:

A. K_2

B. $K_2 = \frac{K_1}{2}$

C. $K_2 = K_1$

D. $K_2 = \frac{k_1}{4}$

Watch Video Solution

73. A radio transmitter operates at a frequency of $880kHz$ and a power of $10kW$. The number of photons emitted per second are

A. 1.72xx10^(31)`

B. 1.327×10^{25}

C. 1.327×10^{37}

D. 1.327×10^{45}

Watch Video Solution

74. Let K_1 be the maximum kinetic energy of photoelectrons emitted by a light of wavelength λ_1 and K_2 corresponding to λ 2). If $\lambda_1 = 2\lambda_2$, then

A. $2K_1 = K_2$

B. $K_1 = 2K_2$

C. $K_1 < K_2 / 2$

D. $K_1 > 2K_2$

Watch Video Solution

75. P is the atmospheric pressure and the pressure at the bottom of a tank of water is 3P. If the water is drawn out to lower the level of water by one fifth, then the pressure at the bottom of the tank will be

A. 2P

B. $(13/5)P$

C. (8/5)P

D. (4/5)P

Watch Video Solution

76. One end of a horizontal thick copper wire of length $2L$ and radius $2R$ is welded to an end of another horizontal thin copper wire of length L and radius R .When the arrangement is stretched by applying forces at two ends , the ratio of the elongation in the thin wire to that in the thick wire is

A. 0.5

B. 0.25

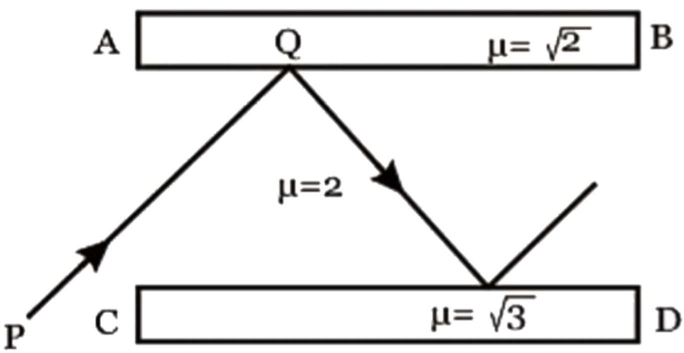
C. 4

D. 2

Answer: D

Watch Video Solution

77. AB and CD are surfaces ot two slabs as shown in Figure . The medium between the slabs has refractive indes 2. Refractive indes of the slab above Ab is $\sqrt{2}$ and below CD is $\sqrt{3}$. Find the minimum angle of incidence at Q, so that the ray is totally reflected by both the slabs.



A. 60

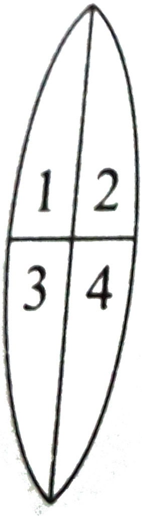
B. 30

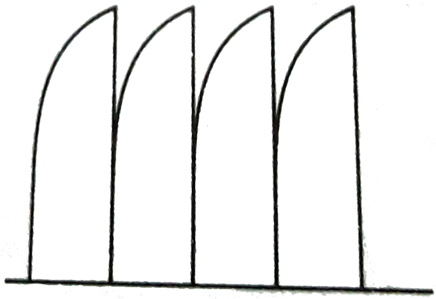
C. 45

D. 15

Watch Video Solution

78. The given lens is broken into four parts rearranged as shown. If the initial focal length is f, then after rearrangement the equivalent focal length is





A. f

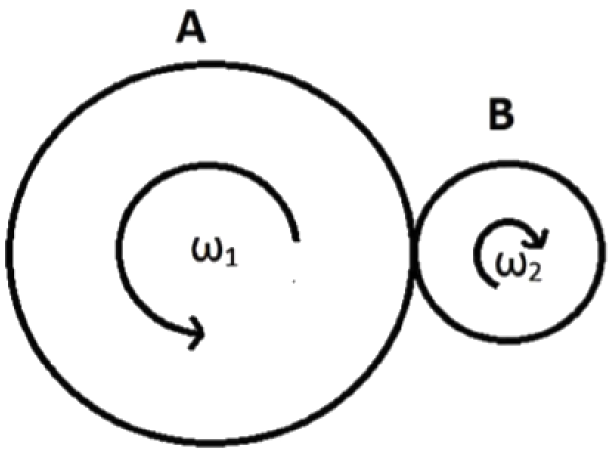
B. f/2

C. f/4

D. 4f

Watch Video Solution

79. Two discs A and B are in contact and rotating with angular velocity with angular velocities ω_1 and ω_2 respectively as shown. If there is no slipping between the discs, then



A. $\omega_1 = \omega_2$

B. $\omega_1 > \omega_2$

C. $\omega_1 < \omega_2$

D. data insufficient

Watch Video Solution

80. A ring of radius R rolls without slipping on a rough horizontal surface with a constant velocity. The radius of curvature of the path followed by any particle of the ring at the highest point of its path will be :

A. 5R

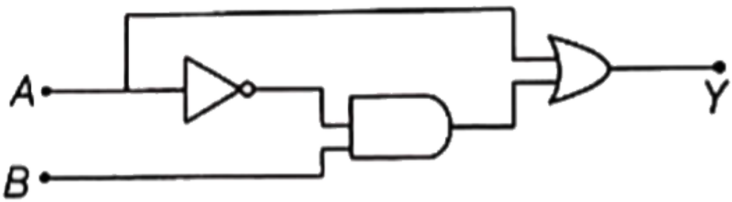
B. 2R

C. 4R

D. none of these

Watch Video Solution

81. The circuit is equivalent to



A. AND gate

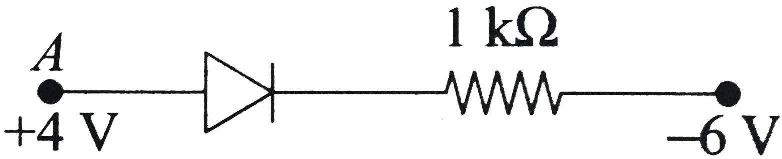
B. OR gate

C. NOT gate

D. NAND gate

Watch Video Solution

82. Consider the junction diode as ideal. The value of current flowing throgh AB is:



A. 0A

B. $10^{-2}A$

C. $10^{-1}A$

D. $10^{-3}A$

Watch Video Solution

83. A steel scale is to be prepared such that the millimeter intervals are to be accurate within $6 \times 10^{-5}mm$. The maximum temperature variation form the temperature of calibration during the reading of the millimeter marks is $(\alpha = 12 \times 10^{-6} / {}^{\circ}C)$

A. $4.0^{\circ} C$

B. $4.5^{\circ} C$

C. $5.0^{\circ} C$

D. $5.5^{\circ} C$.

Watch Video Solution

84. When a bimetallic strip is heated, it

A. does not bend at all

B. gets twisted in the from of an helix

C. bends in the form of an arc with the more expandable metal outside

D. bends in the form of an arc with the more expandable metal inside

Watch Video Solution

85. The internal and external diameters of a hollow cylinder are measured with the help of a Vernier callipers . Their values are $4.23 \pm 0.01 cm$ and $3.87 \pm 0.01 cm$, respectively . The thickness of the wall of the cylinder is

A. 0.35 ± 0.02m

B. $0.18 \pm 0.02 cm$

C. $0.36 \pm 0.01 cm$

D. $0.18 \pm 0.01 cm$

Watch Video Solution

86. In a Young's double slit experiment, I_0 is the intensity at the central maximum and β is the fringe width. The intensity at a point P distant x from the centre will be

A. $I_0 \cos \frac{\pi x}{\beta}$

B. $4I_0 \cos^2 \frac{\pi x}{\beta}$

C. $I_0 \cos^2 \frac{\pi x}{\beta}$

D. $\frac{I_0}{4} \cos^2 \frac{\pi x}{\beta}$

Watch Video Solution

87. In Young's double experiment , in air interference pattern second minimum is observed exactly in front of one slit. The distance beween the two coherent source is 'd' and the distance between source and screen 'D'. The wavelength of light source used is

A. $\frac{d^2}{D}$

B. $\frac{d^2}{2D}$

C. $\frac{d^2}{3D}$

D. $\frac{d^2}{4D}$.

Watch Video Solution

88. $x_1 = 12\sin(484\pi t - 7\pi x)$ and $x_2 = 12\sin(480\pi t - 7\pi x)$ represent the equation of two sound waves and x and t are in metre and second. Beat frequency (in Hz) produced by these two waves is

A. 4

B. 3

C. 2

D. 1

Watch Video Solution

89. If the bulk modulus of water is 2100 M Pa, what is the speed of sound in water ?

A. 1320m/s

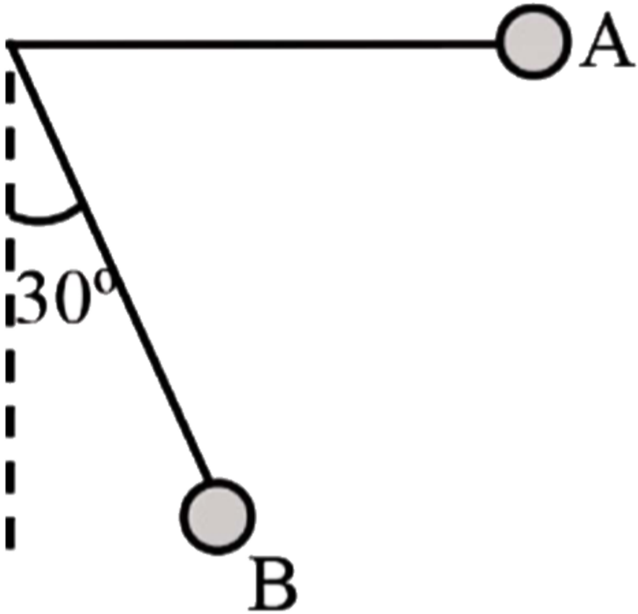
B. 1450m/s

C. 1580m/s

D. 1630m/s

Watch Video Solution

90. A simple pendulum is released from A as shown. If m and 1 represent the mass of the bob and length of the pendulum, the gain kinetic energy at B is



A. $\frac{mg1}{2}$

B. $\frac{mg1}{\sqrt{2}}$

C. $\frac{\sqrt{3}}{2}mg1$

D. $\frac{2}{\sqrt{3}}mg1$

Watch Video Solution

91. A current $I = 20\sin(100\pi t)A$ is passed in the first coil, which induces a maximum emf of $10\pi V$ in the second coil. The mutual inductance for the pair of coils is

A. 10 mH

B. 15 mH

C. 25 mH

D. 5 mH

Answer: D

Watch Video Solution

92. A uniform magnetic field exists in region given by $\overrightarrow{B} = 3\hat{i} + 4\hat{j} + 5\hat{k}$. A rod of length $5m$ is placed along y-axis is moved along x- axis with constant speed $1m/\text{sec}$. Then the magnitude of induced $e.m.f$ in the rod is :

A. zero

B. 25 V

C. 20 V

D. 15 V

Answer: B

Watch Video Solution

93. A transformer is used to light a 140 W, 24 V lamp from 240 V AC mains. The current in mains cable is 0.7 A, find the efficiency of transformer.

A. 63.8%

B. 84%

C. 83.3%

D. 48%

Answer: C

Watch Video Solution

94. The current in an LCR circuit is given by $I = 20\sin\left(100\pi t + \frac{\pi}{6}\right)A$. The voltage across the the inductance L of $0.1H$ at t = 0 will be

A. 31.4 V

B. 3.14 V

C. 157 V

D. 314 V

Answer: D

Watch Video Solution

95. The time required for a 50Hz alternating current to increase from zero to 70.7% of its peak value is-

A. 2.5 ms

B. 10 ms

C. 20 ms

D. 14.14 ms

Answer: A

Watch Video Solution

96. The focal length of a simple convex lens used as a magnifier is 10 cm. For the image to be formed at a distance of distinct vision D = 25 cm, the object must be placed away from the lens nearly at a distance of

A. 5 cm

B. 7 cm

C. 8 cm

D. 16 cm

Answer: D

Watch Video Solution

97. In Young's double slit experiment, the ratio of maximum and minimum intensities in the fringe system is $9:1$ the ratio of amplitudes of coherent sources is

A. $9:1$

B. $3:1$

C. $2:1$

D. $1:1$

Answer: C

Watch Video Solution

98. The plane surface of a plano-convex lens of focal length f is silvered. It will behave as

A. plane mirror

B. convex mirror of focal length 2F

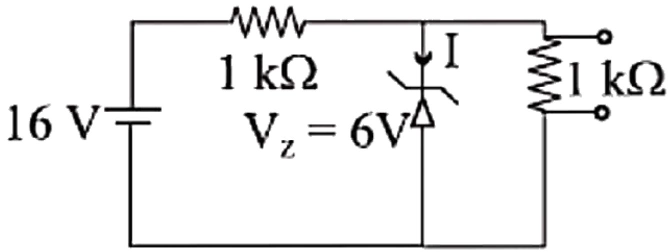
C. concave mirror of focal length $\frac{F}{2}$

D. none of these

Answer: C

Watch Video Solution

99. What is value of current I in given circuit



A. 6 mA

B. 10 mA

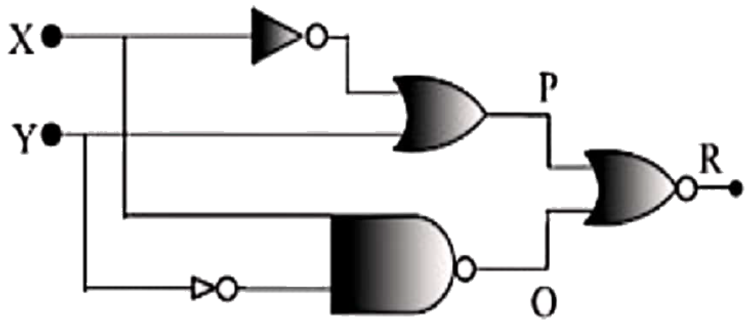
C. 4 mA

D. zero

Answer: C

Watch Video Solution

100. The figure gives a system of logic gates. From the study of the truth tabe, it can be found that to produce a high output (1) at R, we must have



A. X = 0, Y = 1

B. X = 1, Y = 1

C. X = 1, Y = 0

D. X = 0, Y = 0

Answer: C

Watch Video Solution

101. In an excited state of hydrogen like atom an electron has total energy of $-3.4eV$. If the kinetic energy of the electron is E and its de-Broglie wavelength is λ, then

A. $E = 6. eV, \lambda \text{~} 6.6 \times 10^{-10} m$

B. $E = 3.4eV, \lambda \text{~} 6.6 \times 10^{-10} m$

C. $E = 3.4eV, \lambda \text{~} 6.6 \times 10^{-11} m$

D. $E = 6.8eV, \lambda \text{~} 6.6 \times 10^{-11} m$

Answer: B

Watch Video Solution

102. The energies of energy levels A, B and C for a given atom are in the sequence $E_A < E_B < E_C$. If the radiations of wavelength λ_1, λ_2 and λ_3 are emitted due to the atomic transitions C to B, B to A and C to A respectively then which of the following relations is correct :-

A. $\lambda_3 = \lambda_1 + \lambda_2$

B. $\lambda_3 = \frac{\lambda_1 + \lambda_2}{\lambda_1 + \lambda_2}$

C. $\lambda_1 + \lambda_2 + \lambda_3 = 0$

D. none

Answer: B

Watch Video Solution

103. If the overbridge is concave instead of being convex, the thrust on the road at the lowest position will be

A. $mg + \frac{mv^2}{r}$

B. $mg - \frac{mv^2}{r}$

C. $\frac{m^2 v^2 g}{r}$

D. $\frac{v^2 g}{r}$

Answer: A

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104. A particle is moving with a constant speed along a straight line path. A force is not required to

A. increase its speed

B. decrease the momentum

C. change the direction

D. keep it moving with uniform velocity

Answer: D

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105. Which of the following statements is not true

A. the coefficient of fricition between two surface increases as the surface in contact are made rough

B. the force of friction acts in a direction opposite to the applied force

C. rolling friction is greater than sliding friction

D. the coefficient of friction between wood and wood is less than 1

Answer: C

Watch Video Solution

106. If $\overrightarrow{A} = 4\hat{i} - 3\hat{j}$ and $\overrightarrow{B} = 6\hat{i} + 8\hat{j}$ then magnitude and direction of $\overrightarrow{A} + \overrightarrow{B}$ will be

A. $5, \tan^{-1}\left(\frac{3}{4}\right)$

B. $5\sqrt{5}, \tan^{-1}\left(\frac{1}{2}\right)$

C. $10, \tan^{-1}(5)$

D. $25, \tan^{-1}\left(\frac{3}{4}\right)$

Answer: B

Watch Video Solution

107. The random error in the arithmetic mean of 100 observations is x, then random error in the arithmetic mean of 400 observations would be

A. $4x$

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

C. $2x$

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

Answer: B

Watch Video Solution

108. 50 g ice at $0^\circ C$ in kept in an insulating vessel and 50 g water at $100^\circ C$ is mixed in it. Then the final temperature of the mixture is (neglect the heat loss)

A. $10^\circ C$

B. $0^\circ C < Tm < 20^\circ C$

C. $20^\circ C$

D. above $20^\circ C$

Answer: A

Watch Video Solution

109. Distribution of energy in the spectrum of a black body can be correctly represented by .

A. wien's law

B. stefan's law

C. planck's law

D. kirchhoff's law

Answer: C

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110. Air is bad conductor of heat or partly conducts heat, still vacuum is to be placed between the walls of the thermos flask because

A. it is difficult to fill the air between the walls of thermos flask

B. due to more pressure of air, the thermos can get crack

C. by convection, heat can flow through air

D. on filling the air, there is no advantage

Answer: C

Watch Video Solution

111. Water enters through end A with a speed v_1 and leaves through end B with a speed v_2 of cylindrical tube AB. The tube is always completely filled with water. In case I the tube is horizontal, in case II it vertical with the end A upward and in case III it is vertical with the end B upward. We have $v_1 = v_2$for

A. Case I

B. Case II

C. Case III

D. each case

Answer: D

Watch Video Solution

112. If a bullet of mass 5gm moving with velocity `100m/sec, penetrates the wooden block upto 6cm. Then the average force imposed by the bullet on the block is

A. 8300 N

B. 417 N

C. 830 N

D. zero

Answer: B

Watch Video Solution

113. A constant pressure air thermometer gave a reading of 47.5 units of volume when immersed in ice cold water, and 67 units in a boiling liquid. The boiling point of the liquid will be

A. $135^{\circ} C$

B. $125^{\circ} C$

C. $112^{\circ} C$

D. $100^{\circ} C$

Answer: C

Watch Video Solution

114. When vapour condenses into liquid

A. it absorbs heat

B. it liberates heat

C. its temperature increases

D. its temperature decreases

Answer: B

Watch Video Solution

115. A travelling wave passes a point of observation. At this point, the time interval between successive crests is 0.2 seconds and

A. the wavelength is 5 m

B. the frequency is 5 Hz

C. the velocity of propagation is 5 m/s

D. the wavelength is 0.2 m

Answer: B

Watch Video Solution

116. A tuning fork makes 256 vibrations per second in air. When the speed of sound is $330m/s$, the wavelength of the note emitted is :

A. 0.56 m

B. 0.89 m

C. 1.11 m

D. 1.29 m

Answer: D

Watch Video Solution

117. A particle executes a simple harmonic motion of time period T. Find the time taken by the particle to go directly from its mean position to half the amplitude.

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

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

C. $\frac{T}{8}$

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

Answer: D

Watch Video Solution

118. The length of the two rods made up of the same metal and having the same area of cross-section are 0.6 m and 0.8 m respectively. The temperature between the ends of first rod is 90° C and 60° C and that for the other rod is 150 and 110° C. For which rod the rate of conduction will be greater

A. first

B. second

C. same for both

D. none of the above

Answer: C

Watch Video Solution

119. In thermodynamic process, 200 Joules of heat is given to a gas and 100 Joules of work is also done on it. The change in internal energy of the gas is

A. 100 J

B. 300 J

C. 419 J

D. 24 J

Answer: B

Watch Video Solution

120. A perfect gas at $27^{\circ}C$ is heated at constant pressure so as to triple its volume. The temperature of the gas will be

A. $1^{\circ}C$

B. $900^{\circ} C$

C. $627^{\circ} C$

D. $450^{\circ} C$

Answer: C

Watch Video Solution

121. When a copper ball is heated, the largest percentage increase will occur in its

A. diameter

B. area

C. volume

D. density

Answer: C

Watch Video Solution

122. For a particle of a rotating rigid body, $v = r\omega$, which of the following are correct ?

A. $\omega \propto \frac{1}{r}$

B. $\omega \propto v$

C. $v \propto \frac{1}{r}$

D. ω is independent of r

Answer: D

Watch Video Solution

123. Two rings of same radius and mass are placed such that their centres are at a common point and their planes are perpendicular to each other. The moment of inertia of the system about an axis

passing through the centre and perpendicular to the plane of one of the rings is (mass the ring $= m$, radius $= r$)

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

B. mr^2

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

D. $2mr^2$

Answer: C

Watch Video Solution

124. In one dimensional elastic collision of equal masses, the velocities are interchanged. Can velocities in a one dimensional collision be interchanged if the masses are not equal?

A. only (i) is correct

B. only (ii) is correct

C. both (i) and (ii) are correct

D. both (i) and (ii) are wrong

Answer: A

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125. A projectile is fired with velocity v_0 at angle 60° with horizontal. At top os its trajectory it explodes into three fragments of equal masses. First fragment retraces the path, second moves vertically upwards with speed $\frac{3v_0}{2}$. Speed of the third fragment is

A. $\frac{3v_0}{2}$

B. $\frac{5v_0}{2}$

C. v_0

D. $2v_0$

Answer: B

Watch Video Solution

126. Two men A and B are carrying a uniform bar of length L on their shoulders. The bar is held horizontally such that A gets one-fourth load. If A is at one end of the bar, the distance of B from that end is

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

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

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

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

Answer: A

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127. A body, constrained to move in the Y-direction is subjected to a force given by $\overrightarrow{F} = \left(-2\hat{i} + 15\hat{j} + 6\hat{k}\right)N$. What is the work done by this force in moving the body a distance 10 m along the Y-axis

A. 20 J

B. 150 J

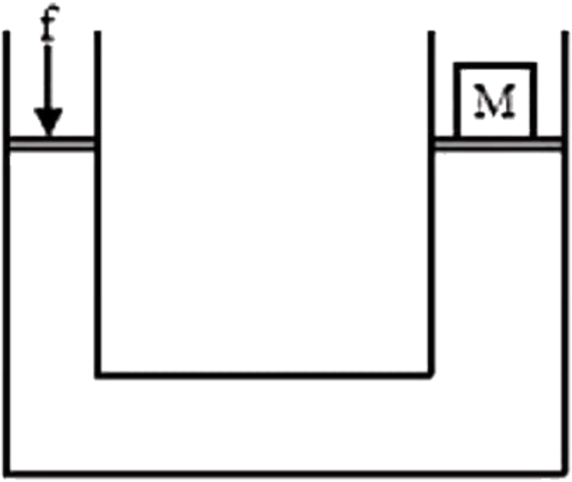
C. 160 J

D. 190 J

Answer: B

Watch Video Solution

128. In a hydraulic press, radii of connecting pipes, r_1 and r_2 are in the ratio $1:2$. In order to lift a heavy mass M on the larger piston, the small piston must be pressed through a minimum force f equal to



A. Mg

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

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

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

Answer: C

Watch Video Solution

129. Two liquids A and B are at $30^\circ C$ and $20^\circ C$, respectively When they are mixed in equal masses, the temperature of the mixture is found to be $26^\circ C$. The ratio of their specific heat is

A. $3:2$

B. $1:1$

C. $2:3$

D. $4:3$

Answer: A

Watch Video Solution

130. If a stone is to hit at a point which is at a horizontal distance 100 m away and at a hight 50 m above the point from where the stone starts, then what is the value of initial speed u if the stone is launched at an angle 45°?

A. $10\sqrt{2}m / s$

B. $10\sqrt{5}m / s$

C. $20\sqrt{5}m / s$

D. $20\sqrt{10}m / s$

Answer: C

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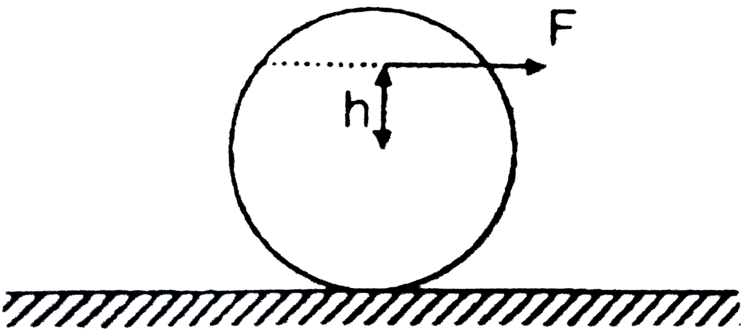
131.



A solid sphere of mass m and radius R is placed on a rough horizontal surface A horizontal force F is applied to sphere at a height h, $(0 \leq h \leq R)$ from centre. If sphere rolls slipping then,

A. $h = \frac{2}{5}R$ and $v = \frac{J}{M}$

B. $h = \frac{2}{5}R$ and $v = \frac{2}{5}\frac{J}{M}$

C. $h = \frac{7}{5}R$ and $v = \frac{7}{5}\frac{J}{M}$

D. $h = \frac{7}{5}R$ and $v = \frac{J}{M}$

Answer: A

Watch Video Solution

132. A body is displaced from $(0, 0)$ to $(1m, 1m)$ along the path $x = y$ by a force $F = \left(x^2\hat{j} + y\hat{i}\right)N$. The work done by this force will be

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

B. $\frac{5}{6}J$

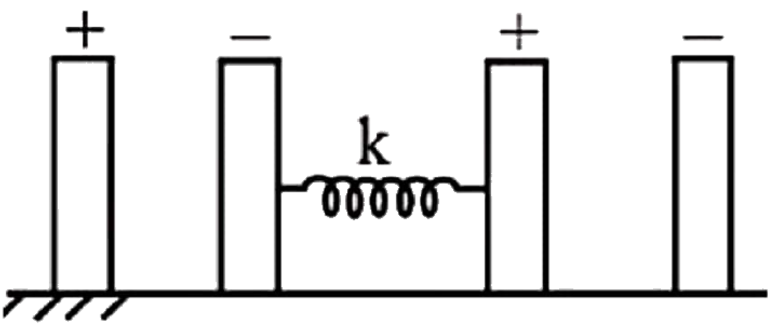
C. $\frac{3}{2}J$

D. $\frac{7}{5}J$

Answer: B

Watch Video Solution

133. Two charged capacitors have their outer plates fixed and inner plates connected by a spring of force constant k. The magnitude of charge on each capacitor is q and sign of charge on each capacitor is q and sign of charge is shown in figure. Find the extension in the spring at equilibrium.



A. $\dfrac{q^2}{2A\varepsilon_0 k}$

B. $\dfrac{q^2}{2A\varepsilon_0 k}$

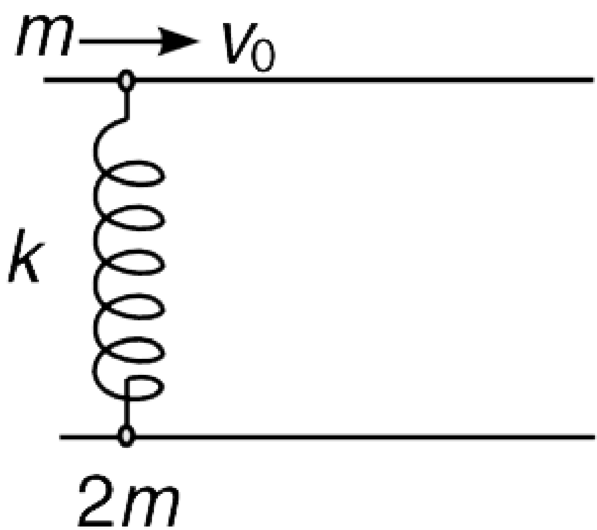
C. $\frac{q^2}{4A\varepsilon_0 k}$

D. Zero

Answer: A

Watch Video Solution

134. Two ring of mass m and $2m$ are connected with a light spring and can slide over two frictionless parallel horizontal rails as shown in figure. Ring of mass m is given velocity $'v_0'$ in horizontal direction as shown. Calculate the maximum stretch in spring during subsequent motion.



A. $\sqrt{\frac{m}{k}v_0}$

B. $\sqrt{\frac{3m}{k}v_0}$

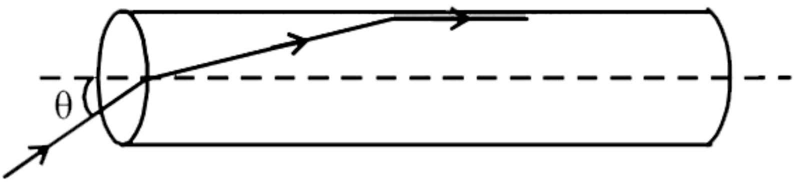
C. $\sqrt{\frac{2m}{3k}v_0}$

D. $\sqrt{\frac{2m}{k}v_0}$

Answer: C

Watch Video Solution

135. A transparent solid cylindrical rod has a refractive index of $\frac{2}{\sqrt{3}}$ .It is surrounded by air. A light ray is incident at the mid-point of one end of the rod as shown in the figure. The incident angle θ for which the light ray grazes along the wall of the rod is:



A. $\sin^{-1}\left(\frac{1}{2}\right)$

B. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

C. $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$

D. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: D

Watch Video Solution

136. Light of wavelength 5000Å is incident over a slit of width $1\mu m$.

The angular width of central maxima will be

A. 30°

B. 60°

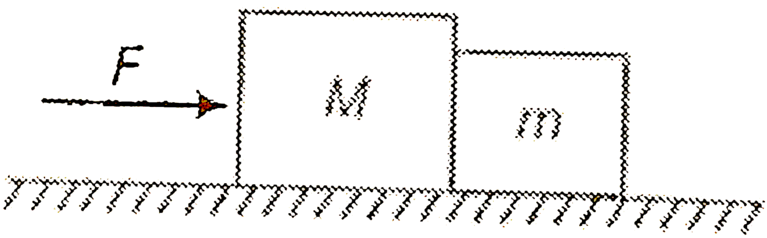
C. 90°

D. 120°

Answer: B

Watch Video Solution

137. Two blocks of masses M = 3 kg and m = 2 kg are in contact on a horizontal table. A constant horizontal force F = 5 N is applied to block M as shown. There is a constant frictional force of 2 N between the table and the block m but no frictional force between the table and the first block M, then acceleration of the two blocks is



A. $0.4ms^{-2}$

B. $0.6ms^{-2}$

C. $0.8ms^{-2}$

D. $1ms^{-2}$

Answer: B

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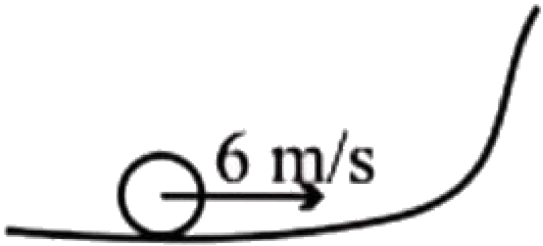
138. A disc of radius 0.1 m rolls without sliding on a horizontal surface with a velocity of $6ms^{-1}$. It then ascends a smooth continuous track as shown in figure. The height upto which it will ascend is $(g = 10ms^{-2})$



A. 2.4m

B. 0.9m

C. 2.7 m

D. 1.8 m

Answer: D

Watch Video Solution

139. A bob hangs from a rigid support by an inextensible string of length l. It is released from rest when string makes an agngle 60° with vertical . The speed of the bob at the lowest position is

A. $\sqrt{gl}$

B. $\sqrt{3gl}$

C. $\sqrt{2gl}$

D. $\sqrt{5gl}$

Answer: A

Watch Video Solution

140. The activity of a sample of radioactive material A_1 at time t_1 and A_2 at time $t_2(t_2 > t_1)$. Its mean life is T.

A. $A_1t_1 = A_2t_2$

B. $\dfrac{A_1 + A_2}{t_2 - t_1} =$ constant

C. $A_2 = A_1e^{(t_1 - t_2)/T}$

D. $A_2 = A_1e^{(t_1/Tt_2)}$

Answer: C

Watch Video Solution

141. Light rays of wavelength $6000A^\circ$ and of photon intensity $39.6Wm^{-2}$ is incident on a metal surface. If only one percent of photons incident on the surface of electrons emitted per second unit area from the surface will be [Planck constant $=6.64 \times 10^{-34}J - S$,Velocity of light $=3 \times 10^8ms^{-1}$]

A. 12×10^{18}

B. 10×10^{18}

C. 12×10^{17}

D. 12×10^{19}

Answer: C

Watch Video Solution

142. Microscope is an optical instrument which

A. enlarges the object

B. increases the visual angle formed by the object at the eye

C. decreases the visual angle formed by the object at the eye

D. brings the object nearer

Answer: B

Watch Video Solution

143. The maximum intensity in young's double-slit experiment is I_0. Distance between the slit is $d = 5\lambda$, where λ is the wavelength of monochromatic light used in the experiment. What will be the intensity of light in front of one of the slits on a screen at a distance $D = 10d$?

A. $\frac{I_0}{2}$

B. $\frac{3}{4}I_0$

C. $\frac{I_0}{4}$

D. I_0

Answer: A

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144. A thin glass prism of $\mu = 1.5$ is immersed in water of $\mu = 1.33$. The ratio of deviation of the ray in water to that in air for the same prism is

A. $1:4$

B. $1:2$

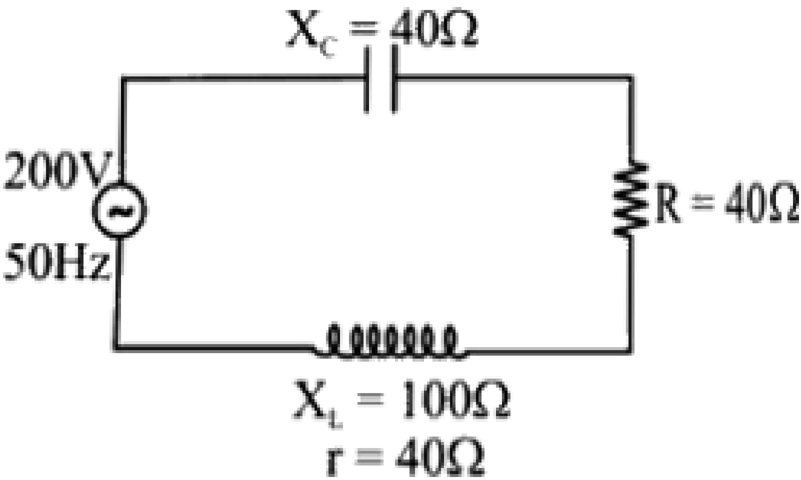
C. $1:8$

D. $1:3$

Answer: A

Watch Video Solution

145. The power factor of the following circuit will be



A. 0.2

B. 0.4

C. 0.6

D. 0.8

Answer: D

Watch Video Solution

146. A uniform magnetic field existsin region given by $\overrightarrow{B} = 3\hat{i} + 4\hat{j} + 5\hat{k}$. A rod of length $5m$ is placed along y-axis is moved along x- axis with constant speed $1m/\sec$. Then the magnitude of induced $e.m.f$ in the rod is :

A. zero

B. 25V

C. 20V

D. 15V

Answer: B

Watch Video Solution

147. Magnetic susceptibility of a paramagnetic substance is

A. 0.003

B. 0.012

C. 0.018

D. 0.0045

Answer: B

Watch Video Solution

148. A rectangular loop of metallic wire is of length a and breadth b and carries a current i. The magnetic field at the centre of the loop is

A. $\dfrac{\mu_0 i}{4\pi}\dfrac{8\sqrt{a^2+b^2}}{ab}$

B. $\dfrac{\mu_0 i}{4\pi}\dfrac{4\sqrt{a^2+b^2}}{ab}$

C. $\dfrac{\mu_0 i}{4\pi}\dfrac{2\sqrt{a^2+b^2}}{ab}$

D. $\dfrac{\mu_0 i}{4\pi}\dfrac{\sqrt{a^2+b^2}}{ab}$

Answer: A

Watch Video Solution

149. Resistance of 100Ω and 200Ω are connected in series with 220 V mains. When a voltmeter of 1000Ω resistance is connected in parallel to100Ω , then the reading of voltmeter is

A. 82.5 volts

B. 6.87 volts

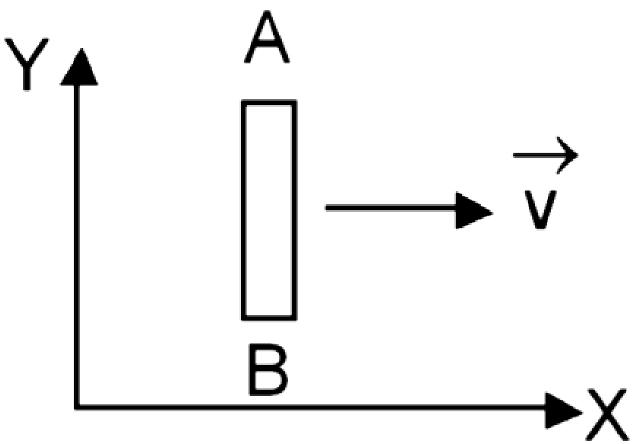
C. 587 .5 volts

D. 58.75 volts

Answer: A

Watch Video Solution

150. A conductor rod AB moves parallel to X-axis in a uniform magnetic field, pointing in the positive Z-direction. The end A of the rod gets-



A. positively charged

B. negatively charged

C. neutral

D. first positively charged and then negatively charged

Answer: A

Watch Video Solution

151. In a compound microscope, the focal lengths of two lenses are $1.5cm$ and $6.25cm$ an object is placed at $2cm$ form objective and the final image is formed at $25cm$ from eye lens. The distance between the two lenses is

A. 6.00 cm

B. 7.75 cm

C. 9.25 cm

D. 11.00 cm

Answer: D

Watch Video Solution

152. A freshly prepared radioactive source of half-life $2h$ emits radiation of intensity which is 64 times the permissible safe level. The minimum time after which it would be possible to work safely with this source is

A. 6h

B. 12h

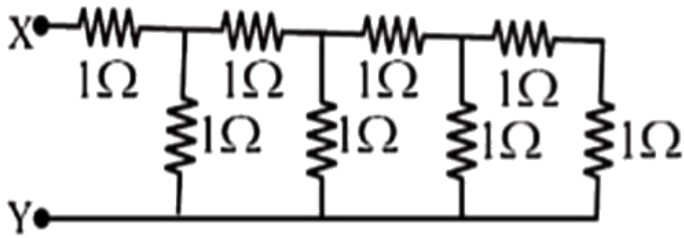
C. 24h

D. 128 h

Answer: D

Watch Video Solution

153. Figure shows an infinite ladder network of resistances. The equivalent resistance between points X and Y is



A. infinite

B. 3Ω

C. 8.62Ω

D. 1.62Ω

Answer: D

Watch Video Solution

154. A coil of water of resistance 50Ω is embedded in a block of ice and a potential difference of 210 V is applied across it. The amount of ice which melts in 1 second is [latent heat of fusion of ice $= 80 cal g^{-1}$]

A. 0.262g

B. 2.62g

C. 26.2g

D. 0.0262g

Answer: B

Watch Video Solution

155. A small drop of water falls from rest through a large height h in air, the final velocity is

A. $\propto \sqrt{h}$

B. $\propto h$

C. $\propto \left(\frac{1}{h}\right)$

D. almost independent of h

Answer: D

Watch Video Solution

156. Four point charge $q, \ -q, 2Q$ and Q are placed in order at the corners A, B, C and D of a square. If the field at the midpoint of CD is zero then the value of q/Q is $\frac{5\sqrt{5}}{x}$. Find the value of x.

A. 1

B. 2

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

D. $\frac{5\sqrt{5}}{2}$

Answer: D

Watch Video Solution

157. The electric potential V at any point (x,y, z) in space is given by $V = 4x^2 V$. The electric field E (in $\frac{V}{m}\Big)$ at the point (1,0,2) is

A. $+8$ in x direction

B. 8 in - x direction

C. 16 in $+x$ direction

D. 16 in -x direction

Answer: B

Watch Video Solution

158. Two spheres A and B have diameters in the ratio $1:2$, densities in the ratio $2:1$ and specific heat in the ratio $1:3$. Find the ratio of their thermal capacities.

A. $1:6$

B. $1:12$

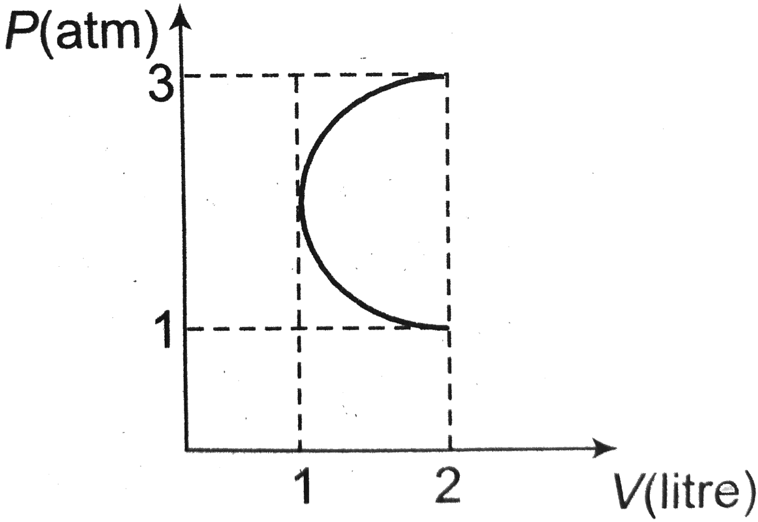
C. $1:3$

D. $1:4$

Answer: B

Watch Video Solution

159. In the $P-V$ diagram shown in figure ABC is a semicircle. The work done in the process ABC is



A. zero

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

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

D. 4

Answer: B

Watch Video Solution

160. A sphere and a cube of same material and same total surface area are placed in the same evacuated space turn by turn after they are heated to the same temperature. Find the ratio of their initial rates of cooling in the enclosure.

A. $\sqrt{\frac{\pi}{6}}:1$

B. $\sqrt{\frac{\pi}{3}}:1$

C. $\frac{\pi}{\sqrt{6}}:1$

D. $\frac{\pi}{\sqrt{3}}:1$

Answer: A

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161. Two stationary soruces of sound, S_1 and S_2 having an equal frequency are fixed some distance apart. The position A is left of S_1 , position B in the middle of the two sources and positionC is to the right of S_2. An observer starts moving with velocity V_0 from position A towards S_1, then

A. beats for three position A,B and C will be heard

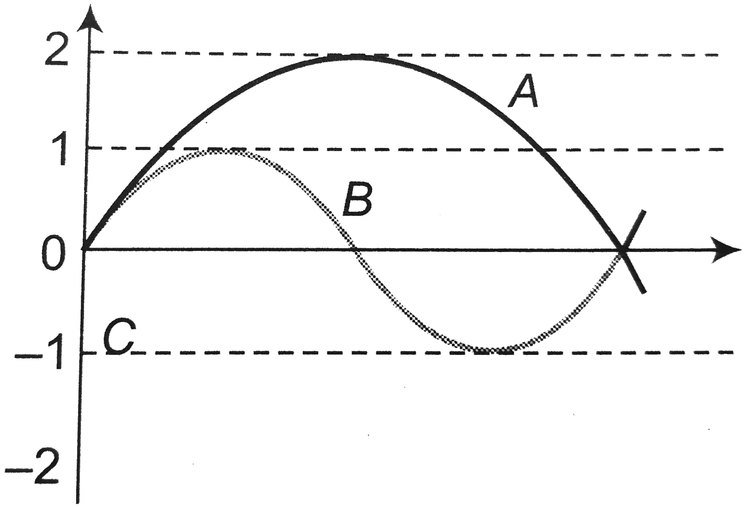
B. beats will be heard from A and C but not in case of B

C. beats will be not heard for A and C but will be heard for B

D. beats will be not heard for three position of A,B and C

Answer: C

Watch Video Solution

162. 

The displacement time graph for two sound waves A and B are shown in the figure. Then the ratio of their intensities I_A / I_B is equal to

A. $1:4$

B. $1:16$

C. $1:2$

D. $1:1$

Answer: D

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163. A and B are two points on uniform metal ring whose centre is O The angle $AOB = \theta$ A and B are maintaind at two different constant temperatures When $\theta = 180^\circ$ the rate of total heat flow from A to B is $1.2W$ When $\theta = 90^\circ$ this rate will be .

A. $0.6W$

B. $0.9W$

C. $1.6W$

D. $1.8W$

Answer: C

Watch Video Solution

164. The displacement of a particle (in meter) from its mean position is given by the equation $y = 0.2\left(\cos^2\frac{\pi t}{2} - \sin^2\frac{\pi t}{2}\right)$, The motion of the above particle is

A. not simple harmonic

B. simple harmonic with amplitude 0.2m

C. simple harmonic with the period double that of a second's pendulum

D. simple harmonic with amplitude 0.4 m

Answer: B

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165. The escape velocity from the earth is about 11 km/s. The escape velocity from a planet having twice the radius and the twice mean density as the earth, is

A. $31.11 kms^{-1}$

B. $11 kms^{-1}$

C. $5.5kms^{-1}$

D. $15.5kms^{-1}$

Answer: A

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166. A small block of super dense material has mass $2 \times 10^{24} kg$. It is at a height $h < < R$. It falls towards the earth.Find its speed when it is at a height $\frac{h}{2}$

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

B. $\sqrt{\frac{3gh}{4}}$

C. $\sqrt{\frac{3gh}{5}}$

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

Answer: B

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167. The position vector of a particle is $\vec{r} = \left(3\hat{i} + 4\hat{j}\right)$ metre and its angular velocity $\vec{\omega} = \left(\hat{j} + 2\hat{k}\right) rads^{-1}$ then its linear velocity is (in ms^{-1})

A. $-\left(8\hat{i} - 6\hat{j} + 3\hat{k}\right)$

B. $\left(3\hat{i} + 6\hat{j} + 8\hat{k}\right)$

C. $-\left(3\hat{i} + 6\hat{j} + 6\hat{k}\right)$

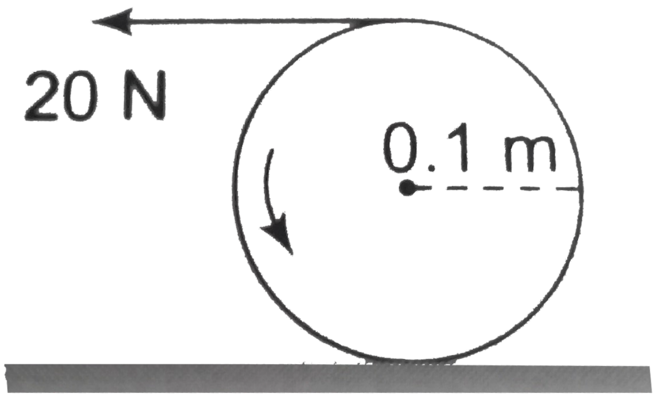
D. $\left(6\hat{i} + 8\hat{j} + 3\hat{k}\right)$

Answer: A

Watch Video Solution

168. The rope shown in figure is wound around a cylinder of mass $4kg$ and moment of inertia $0.02kgm^2$ about the cylinder axis. If the

cylinder rolls without slipping, then the linear acceleration of its centre of mass is.



A. $6.7ms^{-2}$

B. $10.0ms^{-2}$

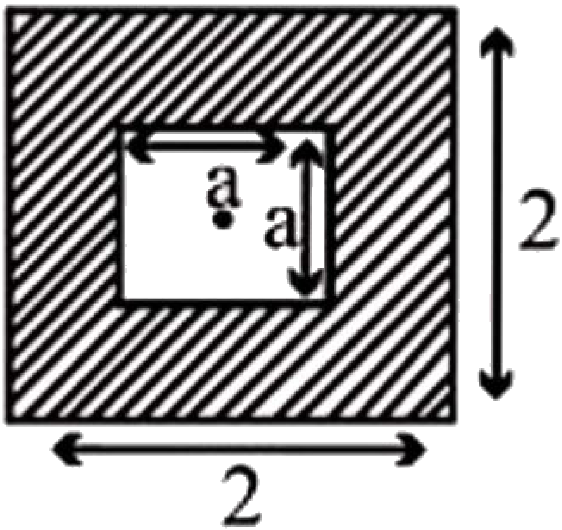
C. $9.0ms^{-2}$

D. none of these

Answer: A

Watch Video Solution

169. A square of a side a is cut from a square of side 2a as shown in the figure. Mass of this square with a hole is M. Then its moment of inertia about an axis passing through its centre of mass and perpendicular to its plane will be



A. $\frac{Ma^2}{6}$

B. $\frac{2Ma^2}{6}$

C. $\frac{4Ma^2}{6}$

D. $\frac{5Ma^2}{6}$

Answer: D

Watch Video Solution

170. Assuming that potential energy of spring is zero when it is stretched by $\frac{x_0}{2}$, its potential energy when it is compressed by x_0 is

A. $\frac{3}{8}kx_0^2$

B. $-\frac{3}{4}kx_0^2$

C. $\frac{3}{4}kx_0^2$

D. $\frac{1}{8}kx_0^2$

Answer: A

Watch Video Solution

171. The solid rubber balls A and B having masses 200 and 400 gm respectively are moving in opposite directions with velocity of A equal to 0.3 m / s . After collision the two balls come to rest, then the velocity of B is

A. $0.15ms^{-1}$

B. $-0.15ms^{-1}$

C. $1.5ms^{-1}$

D. none of these

Answer: B

Watch Video Solution

172. A particle of mass 100 gm moves in a potential well given by $U = 8x^2 - 4x + 400$ joule. Find its acceleration at a distance of 25 cm from equilibrium in the positive direction

A. $4ms^{-1}$

B. $40ms^{-1}$

C. $-40ms^{-1}$

D. $-4ms^{-1}$

Answer: C

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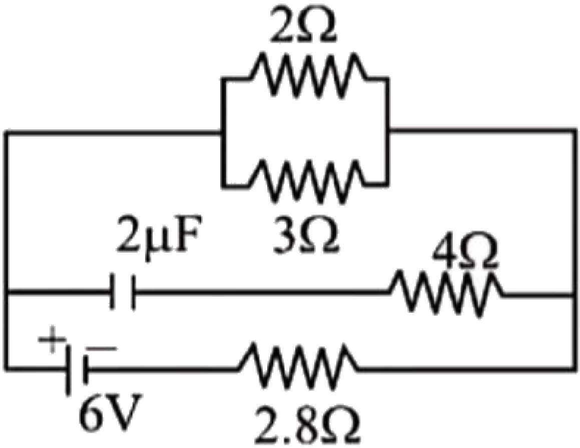
173. In the figure shown, the capacity of the condenser C is $2\mu F$. The current in 2Ω resistor is



A. 9A

B. 0.9 A

C. $\frac{1}{9}A$

D. $\frac{1}{0.9}A$

Answer: B

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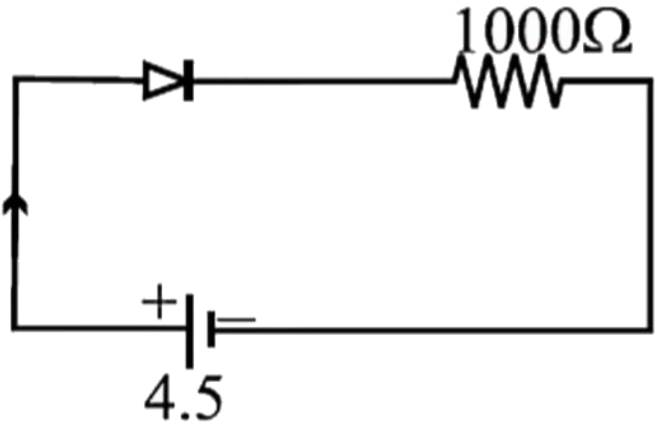
174. A P-N junction diode connected to a battery of e.m.f. 4.5 V and an external resistance of 1000Ω. What is the value of current in the circuit, if potential barrier in the diode $= 0.5V$



A. 4A

B. 4mA

C. 5A

D. 5mA

Answer: B

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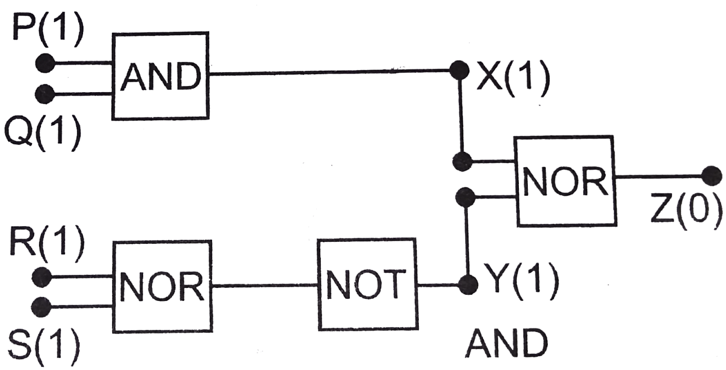
175. The circuit diagram (see fig.) shows a 'logic combination' with the states outputs X, Y and Z given for input P, Q, R and S all at state 1 (i.e., high). When inputs P and R change to state 0 i.e., low) with inputs Q and S still at 1, the condition of output X, Y and Z chages to



A. $X=0, Y=0, Z=0$

B. $X=1, Y=1, Z=1$

C. $X=0, Y=1, Z=0$

D. $X=1, Y=0, Z=0$

Answer: C

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176. A solid sphere of radius R has charge q uniformly distributed over its volume. The distance from it surfce at which the electrostatic potential is equal to half of the potential at the centre is

A. R

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

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

D. 2R

Answer: C

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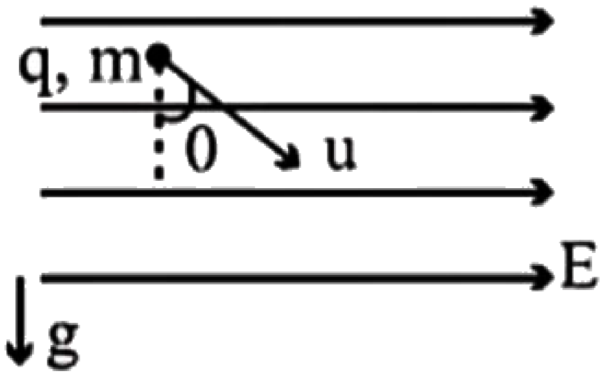
177. A particle of mass m and charge q is thrown from a point in space where uniform gravitational field & electric field are present.The particle



(1) may follow a straight line

(2) may follow a circular path

(3) may follow a parabolic apth

A. 1 & 2 are correct

B. 1 & 3 are correct

C. 2& 3 are correct

D. all these are correct

Answer: B

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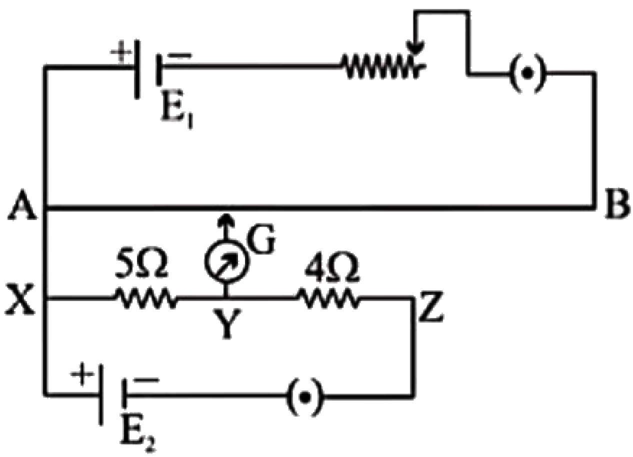
178. In a potential meter arrangement shown in fig. The balancing length for potential difference across X,Y points is found to be 45.5 cm. Then the balancing length for potential difference across (Y) and (Z) would be



A. 45.50 cm

B. 56.87 cm

C. 36.40 cm

D. none of the above

Answer: C

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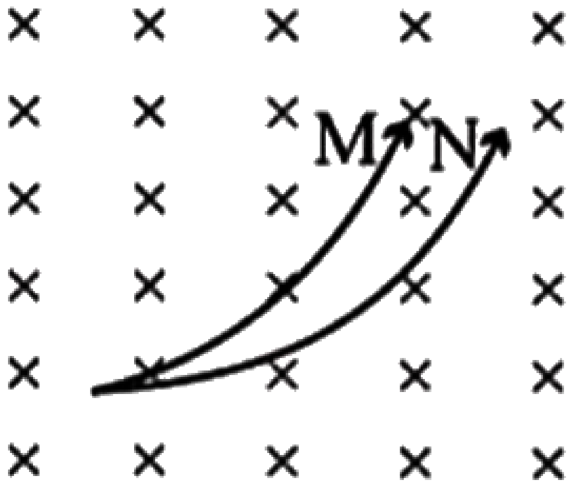
179. Two charged particle M and N are projected with same velocity in a uniform magnetic field. Then M and N respectively.



A. an electron and a proton

B. a deuteron and a photon

C. a deuteron and an electron

D. a proton and α particle

Answer: D

Watch Video Solution

180. The average radius of an air cored made toroid is 0.1 m and it has 500 turns. If it carries 0.5 ampere current, then the magnetic field inside it is :

A. 5×10^{-4}

B. 5×10^{-3}

C. 5×10^{-2}

D. 2×10^{-3}

Answer: A

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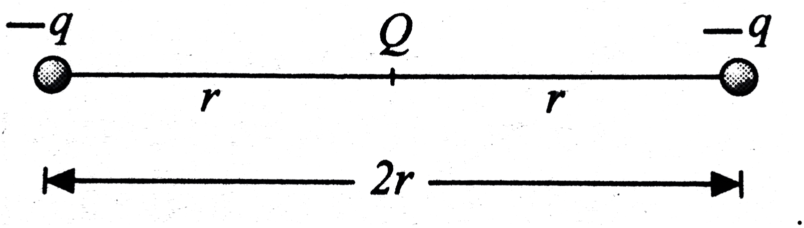
181. Charges $-q, Q,$ and $-q$ are placed at an equal distance on a straight line. If the total potential energy of the system of three charges is zero, then find the ratio Q/q.



A. $1:1$

B. $1:2$

C. $1:3$

D. $1:4$

Answer: D

Watch Video Solution

182. If an alpha particle and a proton are accelerated from rest by a potential difference of 1MeV, then the ratio of their kinetic energies will be

A. 3

B. 1

C. 2

D. 4

Answer: C

Watch Video Solution

183. A thin spherical conducting shell of radius R has a charge q. Another charge Q is placed at the centre of the shell. The electrostatic potential at a point P a distance $\frac{R}{2}$ from the centre of the shell is

A. $\frac{2Q}{4\pi\varepsilon_0 R} - \frac{2q}{4\pi\varepsilon_0 R}$

B. $\frac{2Q}{4\pi\varepsilon_0 R} - \frac{q}{4\pi\varepsilon_0 R}$

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

D. $\frac{2Q}{4\pi\varepsilon_0 R}$

Answer: B

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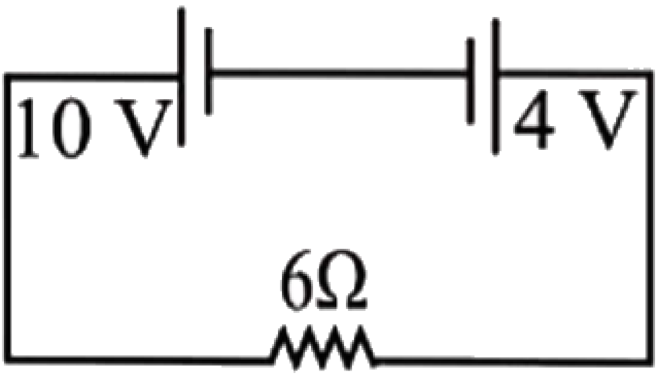
184. The power consumed by the 4 V battery is



A. 4 W

B. 8 W

C. 7 W

D. Cannot be calculated

Answer: A

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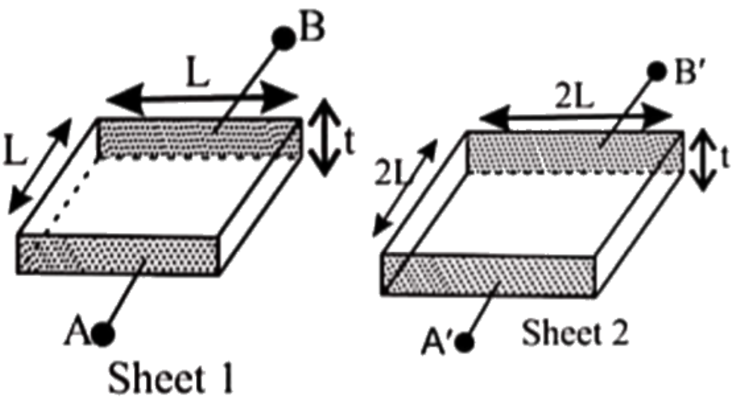
185. The resistance of metal sheet 1 between A and B is R_1 and the resistance of sheet 2 between A' and B' is R_2. The value of the ratio $\frac{R_1}{R_2}$ is



A. 1

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

C. 2

D. 4

Answer: A

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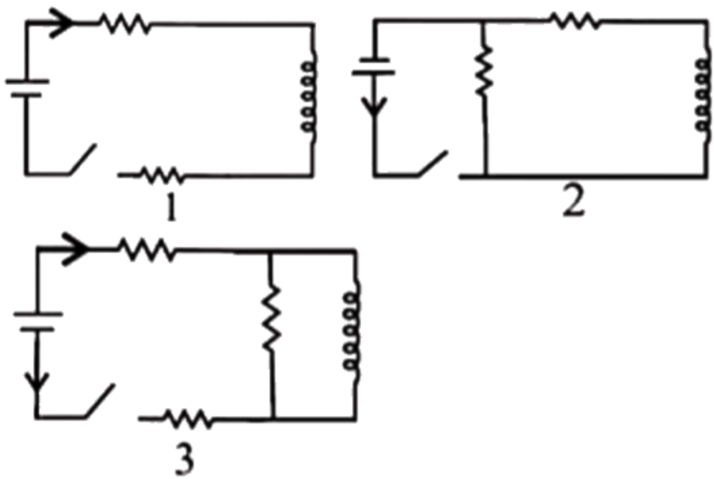
186. The figure shows three circuits with identical batteries, inductors and resistance . Rank the circuits in decreasing order, according to the current through the battery just after the switch is closed



A. $i_2 > i_3 > i_1$

B. $i_2 > i_1 > i_3$

C. $i_1 > i_2 > i_3$

D. $i_1 > i_3 > i_2$

Answer: A

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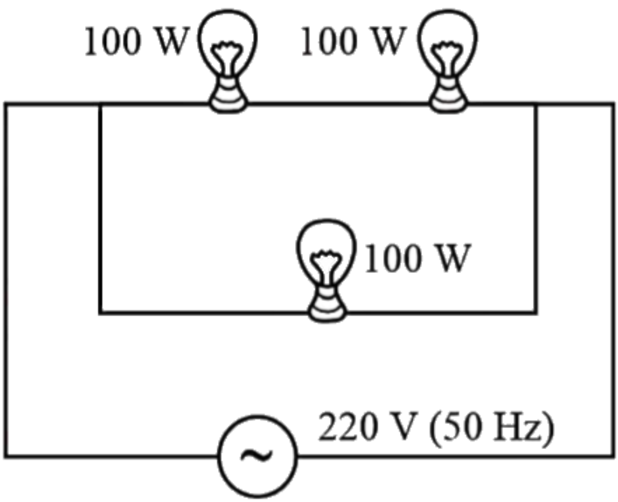
187. In the arrangement of 3 bulbs of 100 W each as shown in the figure, total power consumption will be



A. 300 W

B. 50 W

C. 150 W

D. 25 W

Answer: C

Watch Video Solution

188. A flux of $10^{-3} Wb$ passes through a strip having an area $A = 0.02m^2$. The plane of the strip is at an angle of 60° to be direction of a uniform field B. The value of B is

A. 0.1 T

B. 0.058 T

C. 4.0 mT

D. None of the above

Answer: B

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189. A dip needle vibrates in the vertical plane perpendicular to the magnetic meridian. The time period of vibration is found to be 2 sec. The same needle is then allowed to vibrate in the horizontal plane and the time period is again found to be 2 seconds. Then the angle of dip is

A. 0°

B. 30°

C. 45°

D. 90°

Answer: C

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190. A square conducting loop of side length L carries a current I.The magnetic field at the centre of the loop is (dependence on L)

A. independent of L

B. proportional to L^2

C. inversely proportional to L

D. linearly proportional to L

Answer: C

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191. If the de-Broglie wavelength is λ_0 for protons accelerated through 100 V, then the de-Broglie wavelength for alpha particles accelerated through the same voltage will be

A. λ_0

B. $\frac{\lambda_0}{2}$

C. (lambda_0)/(2sqrt2)`

D. none of these

Answer: C

Watch Video Solution

192. Two photons having

A. equal wavelengths have equal linear momenta

B. equal energies have equal linear momenta

C. equal frequencies have equal linear momenta

D. equal linear momenta have equal wavelengths

Answer: D

Watch Video Solution

193. Heavy water is used as moderator in a nuclear reactor. The function of the moderator is

A. to control the energy released in the rector

B. to absorb neutrons and stop chain reaction

C. to cool the factor reactor

D. to slow down the neutrons to thermal energies

Answer: D

Watch Video Solution

194. The half life period of a radioactive substance is 140 days. After how much time, 15 g will decay from a 16 g sample of the substance?

A. 140 days

B. 560 days

C. 420 days

D. 280 days

Answer: B

Watch Video Solution

195. 300 grams of water at $25^{\circ} C$ is added to 100 grams of ice at $0^{\circ} C$. The final temperature of the mixture is _____ $\hat{}$ $\circ C$

A. $-\frac{5}{3}.^{\circ} C$

B. $-\frac{5}{4}.^{\circ} C$

C. $-5.^{\circ} C$

D. $-0.^{\circ} C$

Answer: D

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196. A polished metal plate with a rough black spot on it is heated to about $1400K$ and quickly taken into dark room Then .

A. in comparison with the plate, the spot will shine more

B. in comparison with the plate, the spot will appear more black

C. the spot and the plate will be equally bright

D. the plate and the black spot cannot be seen in the dark room

Answer: A

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197. The temperature gradient in a rod of $0.5m$ length is $80^{\circ} C / m$. It the temperature of hotter end of the rod is $30^{\circ} C$, then the temperature of the cooler end is

A. $40^{\circ} C$

B. $-10^{\circ} C$

C. $10^{\circ} C$

D. $0^{\circ} C$

Answer: B

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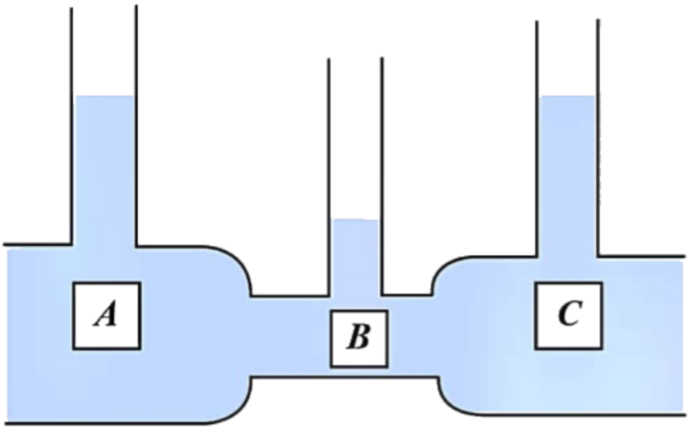
198. A non-viscous liquid is flowing through a horizontal pipe as shown in the figure. Three tube A,B and C are connected to the pipe. The radii of the tubes A, B and C at the junction are 2 cm, 1 cm and 2 cm respectively. It can be said that the



A. height of the liquid in the tube A is maximum

B. height of the liquid in the tubes A and B is the same

C. height of the liquid in all the three tubes is the same

D. height of the liquid in the tubes A and C is the same

Answer: D

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199. An object will continue moving uniformly until

A. the resultant force acting on it begins to decrease

B. the resultant force on it is zero

C. the resultant force is at right angle to its rotation

D. the resultant force on it is increased continuously

Answer: B

Watch Video Solution

200. A gas in an airtight container is heated from $25^{\circ} C$ to $90^{\circ} C$. The density of gas will

A. increase slightly

B. increase considerably

C. remain the same

D. decrease slightly

Answer: C

Watch Video Solution

201. If two tuning fork A and B are sounded together they produce 4 beats per second. A is then slightly loaded with wax, they produce 2 beats when sounded again. The frequency of A is 256. The frequency of B will be

A. 250

B. 252

C. 260

D. 262

Answer: B

Watch Video Solution

202. The superposition takes place between two waves of frequency f and amplitude a . The total intensity is directly proportional to

A. a

B. 2a

C. $2a^2$

D. $4a^2$

Answer: D

Watch Video Solution

203. Which one of the following is a simple harmonic motion

A. wave moving through a string fixed at both ends

B. earth spinning about its own axis

C. ball bouncing between two rigid vertical walls

D. particle moving in a circle with uniform speed

Answer: A

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204. Two rectangular blocks A and B of different metals have same length and same area of cross-section. They are kept in such a way that their cross-sectional area touch each other. The temperature at one end of A is $100^\circ C$ and B at the other end is $0^\circ C$. If the ratio of their thermal conductivity is $1:3$, then under steady state, the temperature of the junction in contact will be

A. $25^\circ C$

B. $50^\circ C$

C. $75^\circ C$

D. $100^\circ C$

Answer: A

Watch Video Solution

205. Equal molecules of two gases are in thermal equilibrium. If P_a, P_b and V_a, V_b are their respective pressures and volumes, then which of the following relation is true?

A. $P_a \neq P_b, V_a = V_b$

B. $P_a = P_b, V_a \neq V_b$

C. $\frac{P_a}{V_a} = \frac{P_b}{V_b}$

D. $P_a V_a = P_b V_b$

Answer: D

Watch Video Solution

206. A uniform metal rod is used as a bar pendulum. If the room temperature rises by $10^{\circ} C$, and the coefficient of linear expansion of the metal of the rod is $2 \times 10^{-6} per^{\circ} C$, the period of the pendulum will have percentage increase of

A. -2×10^{-3}

B. -1×10^{-3}

C. 2×10^{-3}

D. 1×10^{-3}

Answer: D

Watch Video Solution

207. Equal masses of water and a liquid of density 2g/cm3 are mixed together. The density of mixture is:

A. $\frac{2}{3}g/cc$

B. $\frac{4}{3}g/cc$

C. $\frac{3}{2}g/cc$

D. $3g/cc$

Answer: B

Watch Video Solution

208. Force necessary to pull a circular plate of 5 cm radius from water surface for which surface tension is 75 dynes/cm, is

A. 30 dynes

B. 60 dynes

C. 750 dynes

D. 750π dynes

Answer: D

Watch Video Solution

209. When a certain weight is suspended from a long uniform wire, its length increases by $1cm$. If the same weight is suspended from another wire of the same material and length but having a diameter half of the first one, the increases in length will be

A. 0.5 cm

B. 2 cm

C. 4 cm

D. 8 cm

Answer: C

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210. The mass and diameter of a planet have twice the value of the corresponding parameters of earth. Acceleration due to gravity on the surface of the planet is

A. $9.8ms^{-2}$

B. $4.9ms^{-2}$

C. $980ms^{-2}$

D. $19.6ms^{-2}$

Answer: B

Watch Video Solution

211. A force acts on a 3.0 gm particle in such a way that the position of the particle as a function of time is given by $x = 3t - 4t^2 + t^3$, where xx is in metres and t is in seconds. The work done during the first 4 seconds is

A. 5.28 J

B. 450 mJ

C. 490 mJ

D. 530 mJ

Answer: A

Watch Video Solution

212. A pulley fixed to the ceiling carries a string with blocks of mass m and $3m$ attached to its ends. The masses of string and pulley are negligible .When the system is released, its center of mass moves with what acceleration

A. g

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

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

D. zero

Answer: C

Watch Video Solution

213. A body of mass m collides against a wall with the velocity v and rebounds with the same speed. Its magnitude of change of momentum is

A. 2 m v

B. m v

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

D. 0

Answer: A

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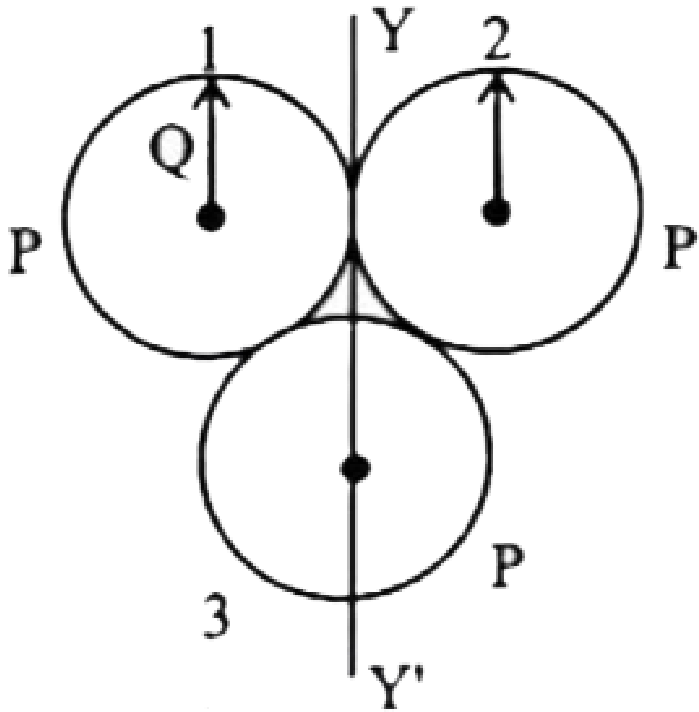
214. Three rings, each of mass P and radius Q are arranged as shown in the figure. The moment of inertia of the arrangement about YY' axis will be



A. $\frac{7}{2}PQ^2$

B. $\frac{2}{7}PQ^2$

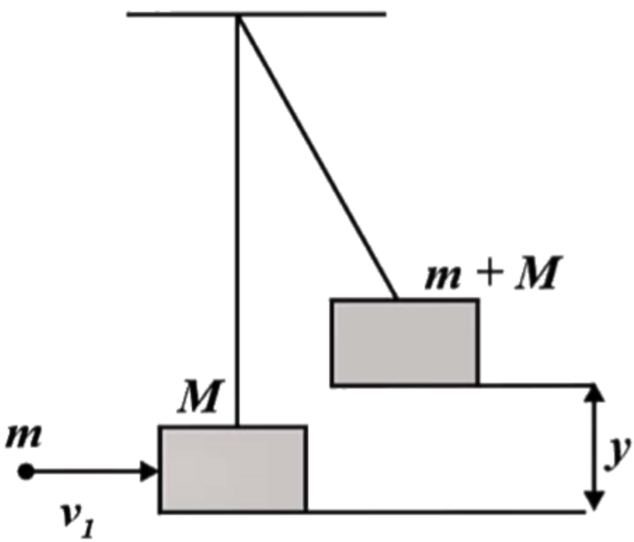
C. $\frac{2}{5}PQ^2$

D. $\frac{5}{2}PQ^2$

Answer: A

Watch Video Solution

215. A bullet of mass m moving with velocity v_1 strikes a suspended wooden block of mass M as shown in the figure and sticks to it. If the block rises to a height y. the initial of the bullet is



A. $v_1 = \frac{m+M}{m}\sqrt{2gy}$

B. $v_1 = \sqrt{2gy}$

C. $v_1 = \dfrac{M+m}{M}\sqrt{2gy}$

D. $v_1 = \dfrac{m}{m+M}\sqrt{2gy}$

Answer: A

Watch Video Solution

216. A particle is moving on a circular path with constant speed, then its acceleration will be

A. magnitude

B. direction

C. both magnitude and direction

D. neither magnitude nor direction

Answer: A

Watch Video Solution

217. Check up only the correct statement in the following.

A. a body has a constant velocity and still it can have a varying speed

B. a body has a constant speed but is can have a varying velocity

C. a body has a constant speed cannot have any acceleration

D. a body in motion under a force acting upon it must always have work done upon it

Answer: B

Watch Video Solution

218. The force required to row a boat over the sea is proportional to the speed of the boat. It is found that it takes 24 h.p. to row a certain boat at a speed of 8km/hr, the horse power required when speed is doubled -

A. 12 hp

B. 48 hp

C. 96 hp

D. 192 hp

Answer: D

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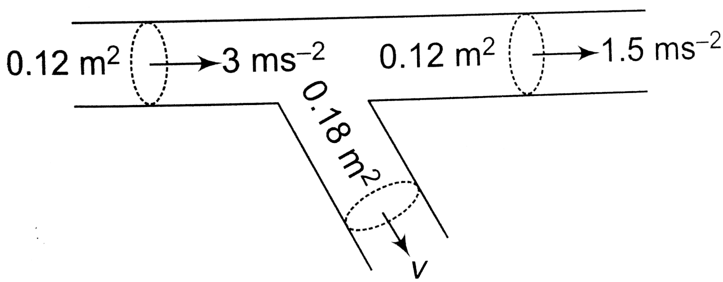
219. An incompressible liquid travels as shown in fig. The speed of the liquid branch will be



A. $1.0ms^{-1}$

B. $1.5ms^{-1}$

C. $2.5ms^{-1}$

D. $3.0ms^{-1}$

Answer: A

Watch Video Solution

220. A Newtonian fluid fills the clearance between a shaft and a sleeve. When a force of 800 N is applied to the shaft, parallel to the sleeve, the shaft attains a speed of $2cms^{-1}$. If a force of 2.4 kN is applied instead, the shaft would move with a speed of

A. $2cms^{-1}$

B. $15cms^{-1}$

C. $6cms^{-1}$

D. none of these

Answer: C

Watch Video Solution

221. The magnitude of electric field intensity at point $B(2, 0, 0)$ due to dipole of dipole moment, $\overrightarrow{p} = \hat{i} + \sqrt{3}\hat{j}$ kept at origin is (assume that the point B is at large distance from the dipole and $k = \frac{1}{4\pi\varepsilon_0}$)

A. $\frac{\sqrt{13}K}{8}$

B. $\frac{\sqrt{13}K}{4}$

C. $\frac{\sqrt{7}K}{8}$

D. $\frac{\sqrt{7}K}{4}$

Answer: C

Watch Video Solution

222. A particle of mass m is moving in a potential well, for which the potential energy is given by $U(x) = U_0(1 - \cos ax)$ where U_0 and a are positive constants. Then (for the small value of x)

A. `2pisqrt((U_0)/(ma^2))

B. $2\pi\sqrt{\frac{mU_0}{a^2}}$

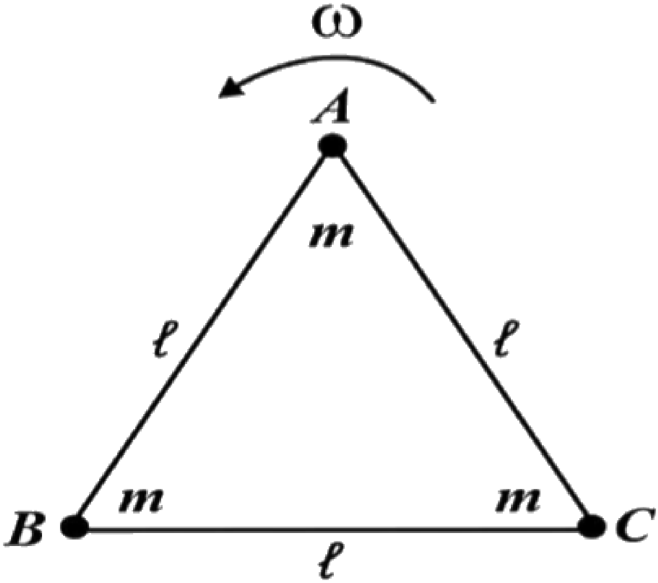
C. $2\pi\sqrt{\frac{a^2}{mU_0}}$

D. $2\pi\sqrt{\frac{m}{U_0 a^2}}$

Answer: D

Watch Video Solution

223. An equilateral triangular frame is made of three thin massless rods. Three point masses of mass m each are fixed at vertices of the frame as shown. The system is rotated with uniform angular speed ω about a fixed axis passing through A and normal to the plane of triangular frame. Neglect the effect of gravity. The tension in rod connecting mass B and C is



A. $m\omega^2 l$

B. $\frac{m\omega^2 l}{2}$

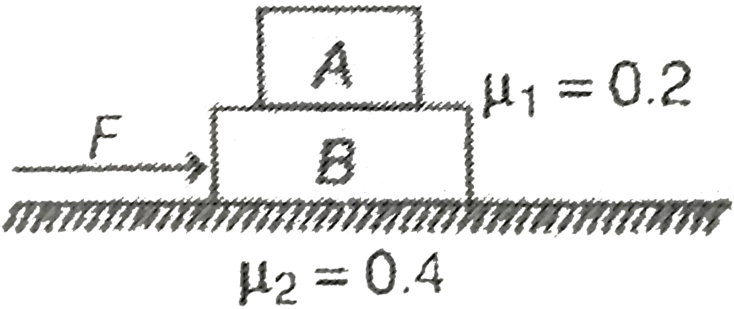
C. $\frac{\sqrt{3}}{2} m\omega^2 l$

D. zero

Answer: D

Watch Video Solution

224. In the figure, $m_A = 2kg$ and $m_B = 4kg$. For what minimum value of F,A starts slipping over B? $(g = 10m/s^2)$



A. 24 N

B. 36 N

C. 12 N

D. 20 N

Answer: B

Watch Video Solution

225. In an α -decay, the kinetic energy of α-particles is $48 MeV$ and Q value of the reaction is $50 MeV$. The mass number of the mother nucleus is (assume that daughter nucleus is in ground state)

A. 96

B. 100

C. 104

D. none of these

Answer: B

Watch Video Solution

226. Calcuate the momentum transferred to a surface when a radiation of energy E falls normally on it. Assume that the reflectivity of the surface is unity.

A. $\frac{E}{c}$

B. $\dfrac{2E}{c}$

C. Ec

D. $\dfrac{E}{c^2}$

Answer: B

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227. Taking the wavelength of first Balmer line in the hydrogen spectrum $(n = 3 \text{ to } n = 2)$ as 660 nm, then the wavelength of 2^{nd} Balmer line in the same spectrum $(n = 4 \text{ to } n = 2)$ will be

A. 488.9 nm

B. 388.9 nm

C. 889.2 nm

D. 642.7 nm

Answer: A

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228. A circular hole is cut from a disc of radius 6 cm in such a way that the radius of the hole is 1 cm and the centre of 3 cm from the centre of the disc. The distance of the centre of mass of the remaining part from the centre of the original disc is

A. 3/35 cm

B. 1/35 cm

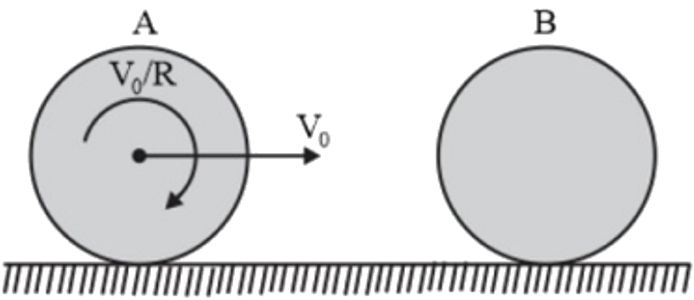
C. 3/10 cm

D. 7/35 cm

Answer: A

Watch Video Solution

229. A uniform solid sphere A of mass m is rolling without sliding on a a smooth horizontal surface. It collides elastically and head - on with another stationary hollow sphere B of the same mass and radius. Assuming friction to be absent everywhere, the ratio of the kinetic energy of B to that of A just after the collision is



A. $5:2$

B. $1:1$

C. $2:3$

D. $3:2$

Answer: A

Watch Video Solution

230. The magnitude of displacement of a particle moving in a circle of radius a with constant angular speed ω varries with time t is

A. $2a \sin \omega t$

B. $2a \sin . \frac{\omega t}{2}$

C. $2a \cos \omega t$

D. $2a \cos . \frac{\omega t}{2}$

Answer: B

Watch Video Solution

231. A ideal gas $(\gamma = 1.5)$ is expanded adiabatically. How many times has the gas to be expanded to reduce the root mean square velocity of molecules 2.0 times

A. 4 times

B. 16 times

C. 8 times

D. 2 times

Answer: B

Watch Video Solution

232. An electric field us applied to a semiconductor.Let the number of charge carriers be n and the average drift speed be v.If the temperature is increased,

A. both n and v will increase

B. n will increase and v will decrease

C. both n and v will decrease

D. n will decrease and will increase

Answer: B

Watch Video Solution

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

A. 80%

B. 90%

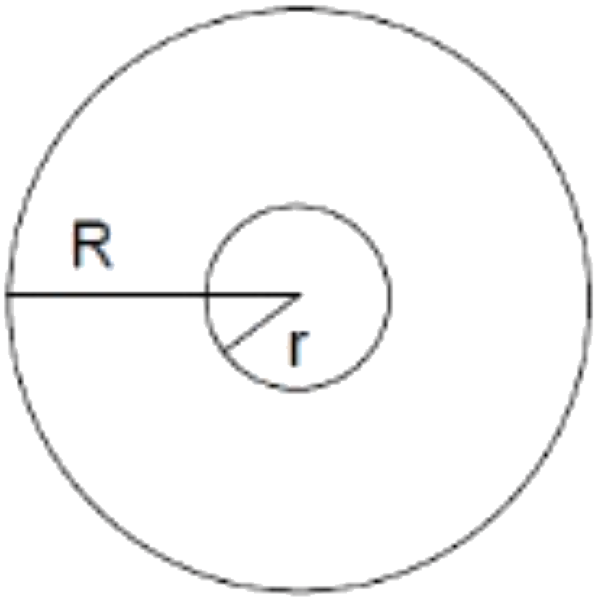
C. 87.5%

D. 82.5%

Answer: C

Watch Video Solution

234. Two concentric co - planar circular loops of radius R and $r(<<R)$ are placed as shown in the figure. The mutual inductance of the system will be



A. $\frac{\pi\mu_0 r^2}{2R}$

B. $\frac{\pi\mu_0 r^2}{4R}$

C. $\frac{\pi\mu_0 R^2}{4r}$

D. $\frac{\pi\mu_0 R^2}{2r}$

Answer: A

Watch Video Solution

235. A transformer of frequency 60 Hz and 120 V input has $8:1$ turn ratio. The frequency of the output is

A. 40 Hz

B. 480 Hz

C. 2 Hz

D. 60 Hz

Answer: D

Watch Video Solution

236. Four charges equal to $-Q$ are placed at the four corners of a square and a charge q is at its centre. If the system is in equilibrium the value of q is

A. $-\frac{Q}{4}(1+2\sqrt{2})$

B. $\frac{Q}{2}(1+2\sqrt{2})$

C. $-\frac{Q}{2}(1+2\sqrt{2})$

D. $\frac{Q}{4}(1+2\sqrt{2})$

Answer: D

Watch Video Solution

237. Consider two charged metallic spheres S_1, and S_2, of radii R_1, and R_2 respectively. The electric fields E_1, (on S_1,) and E_2, (on S_2) the ir surfaces are such that $E_1 / E_2 = R_1 / R_2$. Then the ratio V_1(on S_1)/ V_2 (on S_2) of the f electrostatic protentilas on ecah sphere is

A. $\left(\frac{R_1}{R_2}\right)^3$

B. $\frac{R_1}{R_2}$

C. $\left(\frac{R_2}{R_1}\right)$

D. $\left(\frac{R_1}{R_2}\right)^2$

Answer: D

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238. There is an unknown quantity $x = R\frac{l}{100 - l}$, here l is length (in cm) measured using a scale having least count of 1 cm and R is a quantity known accurately. Find the percentage error in measurement of x for $l = 50cm$?

A. 1%

B. 6%

C. 2%

D. 4%

Answer: D

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239. On which quantity the escape velocity for earth does not depend on

A. mass of the earth

B. mass of the projectile

C. point of projection relative to the earth

D. gravitational constant

Answer: B

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240. A simple pendulum is taken to 64 km above the earth's surface. Its new time period will

A. increase by 1%

B. decrease by 1%

C. increase by 2%

D. decrease 2%

Answer: A

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241. An iron wire AB has diameter of 0.6 mm and length 3 m at $0^\circ C$. The wire is now stretched between the opposite walls of a brass casing at $0^\circ C$. What is the extra tension that will be set up in the wire when the temperature of the system is raised to $40^\circ C$?

Givne $\alpha_{\text{brass}} = 18 \times 10^{-6} / K$

$\alpha_{\text{iron}} = 12 \times 10^{-6} / K$

$Y_{\text{iron}} = 21 \times 10^{10} N / m^{\wedge} (2)$

A. 14.2 N

B. 13.8 N

C. 16.3 N

D. 21.7 N

Answer: A

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242. Two heat engines are operating in such a way that the heat rejected by the first engine is used as the heat input of the second. If both the engines are 40% efficient, then the overall efficiency of the system is

A. 0.64

B. 0.8

C. 0.5

D. 0.9

Answer: A

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243. The change in internal energy when 5 mole of hydrogen is heated to $20^{\circ} C$ from $10^{\circ} C$, specific heat of hydrogen at constant pressure is 8 cal/mol.$^{\circ} C$ is

A. 200 cal

B. 350 cal

C. 300 cal

D. 475 cal

Answer: C

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244. Find the amount of heat energy supplied to a Carnot engine from the source in each cycle if the engine is working between 300 K and 600 K and if has a work output of 800 J per cycle.

A. 800 J

B. 1600 J

C. 3500 J

D. 6400 J

Answer: B

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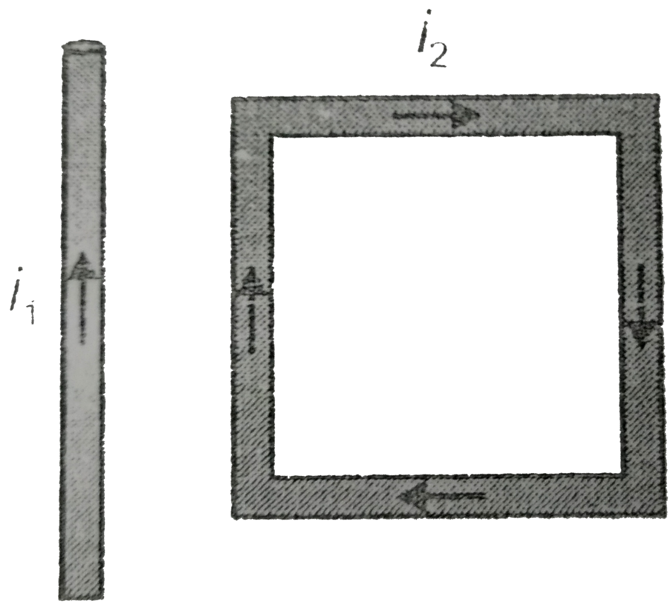
245. A rectangular loop carrying a current i_2 situated near a long straight wire carrying a steady current i_1. The wire is parallel to one of the sides of the loop and is in the plane of the loop as shown in the figure. Then the current loop will



A. move away from the wire

B. move towards the wire

C. remain stationary

D. rotate about an axis parallel to the wire

Answer: B

Watch Video Solution

246. A compass needle free to turn in a horizontal plane is placed at the centre of a circular coil of 30 turns and radius 12 cm. The coil is in a vertical plane making an angle of 45° with the magnetic meridian when the current in the coil is $0.35 amp.$, the needle points west to east.

(a) Determine the horizontal component of earth's magnetic field at the location.

(b) The current in the coil is reversed and the coil is rotated about its vertical axis by an angle of 90° in the anticlockwise sense looking from above. Predict the direction of the needle. Take the magnetic declination at the places to be zero.

A. 3.9×10^{-5}

B. 3.9×10^{-6}

C. 5×10^{-5}

D. 2.6×10^{-5}

Answer: A

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247. In ground to ground projectile motion under gravity, which of the following doesn't affect the time of flight ?

A. rotaton of earth

B. air resistance

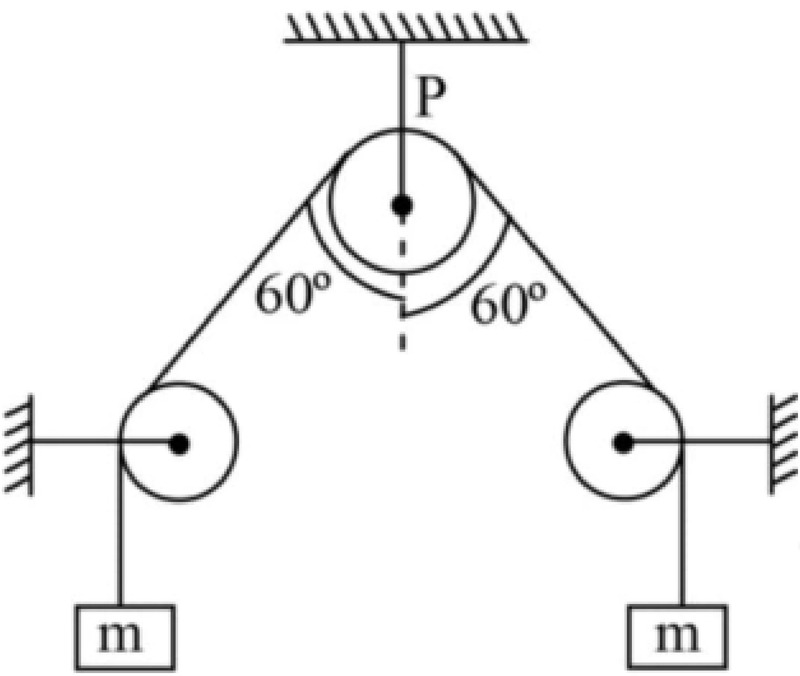
C. curvature of earth

D. all of these

Answer: A

Watch Video Solution

248. The force exerted by the ideal string on the ideal pulley P shown in the figure is



A. mg

B. 2 mg

C. $\sqrt{2}mg$

D. 4 mg

Answer: A

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249. A boy of mass 50 kg is climbing a vertical pole at a constant speed. If coefficient of fricition between his palms and the pole is 0.75, then the normal reaction between him and the pole is $\left(\text{take} \quad = 10m/s^2\right)$

A. 700 N

B. 625.67 N

C. 550 N

D. 666.67 N

Answer: D

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250. An element of mass M has Z protons and Nneutrons. Masses of proton and neutron are m_p and m_n respectively. Choose the correct relation among following options.

A. $M > Zm_p + Nm_n$

B. $M = Zm_p + Mn_n$

C. $M < Zm_p + Nm_n$

D. M may be greater than, less than or equal to $Zm_p + Nm_n$ depending on natures

Answer: C

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251. The amplitude of a simple pendulum is 10 cm. When the pendulum is at a displacement of 4 cm from the mean position, the ratio of kinetic and potential energies at that point is

A. 5.25

B. 2.5

C. 4.5

D. 7.5

Answer: A

Watch Video Solution

252. For a particle executing SHM, the kinetic energy (K) is given by $K = K_0 \cos^2 \omega t$. The equation for its displacement is

A. $\left(\frac{k_0}{m\omega^2}\right)^{1/2}\sin\omega t$

B. $\left(\frac{2k_0}{m\omega^2}\right)^{1/2}\sin\omega t$

C. $\left(\frac{2\omega^2}{mk_0}\right)^{1/2}\sin\omega t$

D. $\left(\frac{2k_0}{m\omega}\right)^{1/2}\sin\omega t$

Answer: B

Watch Video Solution

253. Light of wavelength 3000Å is incident on a metal surface whose work function is 1 eV. The maximum velocity of emitted photoelectron will be

A. $10ms^{-1}$

B. 10^3ms^{-1}

C. 10^4ms^{-1}

D. 10^6ms^{-1}

Answer: D

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254. When light of wavelength 300 nm or less falls on aphotoelectric emitter A, photoelectrons are emitted. For another emitter B, light of wavelength 600 nm is sufficient for releasing photoelectorns. The ratio of the work function of emitter A to B is

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:4$

Answer: B

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255. Flow rate of blood through a capillary of cross - sectional are of $0.25m^2$ is $100cm^3 / s$. The velocity of flow of blood iis

A. 1 mm/s

B. 0.2 mm/s

C. 0.3 mm/s

D. 0.4 mm/s

Answer: D

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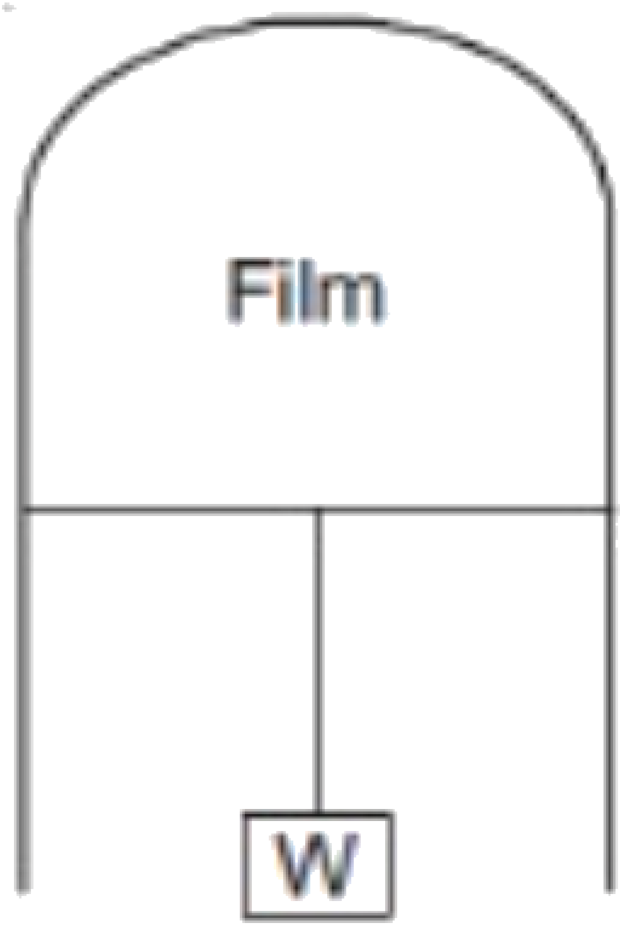
256. The surface tension of a thin liquid film formed between a U shaped wire and a light slider of length 30 cm supporing a weight of

$1.5 \times 10^{-2} N$ is



A. $0.0125 Nn^{-1}$

B. $0.1 Nm^{-1}$

C. $0.05 Nm^{-1}$

D. $0.025 Nm^{-1}$

Answer: D

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257. A vessel contains oil (density $= 0.8 gm / cm^3$) over mercury (density $= 13.6 gmcm^3$). 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

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258. If a plane glass slab is placed on letters of different colours, then red coloured letter appears to be raised minimum, why ?

A. red

B. green

C. yellow

D. violet

Answer: A

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259. Moment of inertia of a uniform circular disc about a diameter is I. Its moment of inertia about an axis perpendicular to its plane and passing through a point on its rim will be.

A. 6 I

B. 4 I

C. 2 I

D. 8 I

Answer: A

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260. A uniform disk of mass $300kg$ is rotating freely about a vertical axis through its centre with constant angular velocity ω. A boy of mass $30kg$ starts from the centre and moves along a radius to the edge of the disk. The angular velocity of the disk now is

A. $\frac{\omega_0}{6}$

B. $\frac{\omega_0}{5}$

C. $\frac{4\omega_0}{5}$

D. $\frac{5\omega_0}{6}$

Answer: D

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261. A transistor is used as a common emitter amplifier with a load resistance of $2k\Omega$. The input resistance is 150Ω. Base current is changed by $20\mu A$ which results in change in collector current by 1.5 mA. The voltage gain of the amplifier is

A. 900

B. 1000

C. 1100

D. 1200

Answer: B

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262. When LED is forward biased, then

A. electrons from the n - type side cross the p - n junction and recombine with holes in the p - type side

B. electrons and holes neutralise each other in depletion region

C. at junction electrons and holes remain at rest

D. none of these

Answer: A

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263. At what temperarture, the kinetic energy of a gas molecule is half of the value at $27^{\circ}C$. ?

A. $13.5^{\circ}C$

B. $150^{\circ} C$

C. 75 K

D. $-123^{\circ} C$

Answer: D

Watch Video Solution

264. The volume of a metal sphere increases by 0.24% when its temperature is raised by $40^{\circ} C$. The coefficient of linear expansion of the metal is .... $.^{\circ} C$

A. 2×10^{-5}

B. 6×10^{-5}

C. 2.1×10^{-5}

D. 1.2×10^{-5}

Answer: A

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265. The dimensions of $\frac{a}{b}$ in the equation $P = \frac{a - t^2}{bx}$ where P is pressure, x is distance and t is time are

A. ML^1T^{-1}

B. M^2LT^{-1}

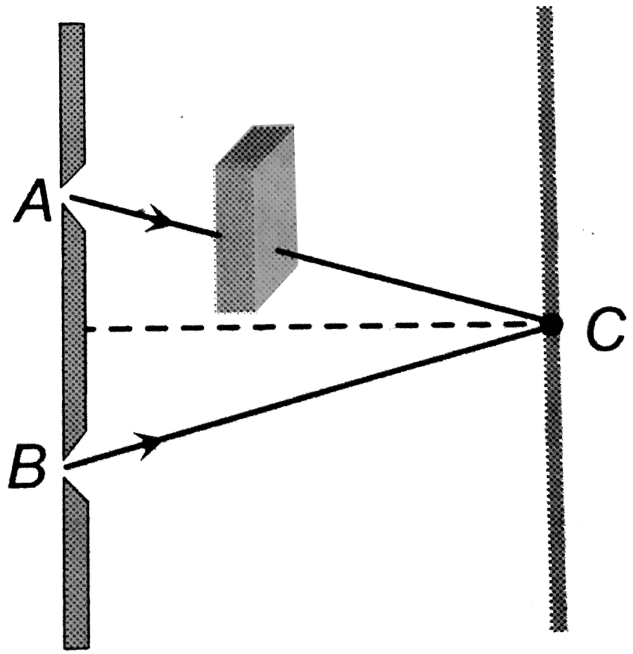
C. ML^0T^{-2}

D. M^0L^{-1}

Answer: C

Watch Video Solution

266. In Young's experiment, monochromatic light is used to illuminate the two slits A and B. Interference fringes are observed on a screen placed in front of the slits. Now if a thin glass plate is placed normally in the path of the beam coming from the slit



A. fringes will disappear

B. fringe width will increase

C. fringe width will increases

D. there will be no change in the fringe width but fringe pattern will shift

Answer: D

Watch Video Solution

267. An electromagnetic wave propagating along north has its electric field vector upwards. Its magnetic field vector point towards

A. $\overrightarrow{E} = E_0 \hat{i}, \overrightarrow{B} =_0 \hat{j}$

B. $\overrightarrow{E} = E_0 \hat{,} \overrightarrow{B} = B_0 \hat{i}$

C. $\overrightarrow{E} = E_0 \hat{j}, \overrightarrow{B} = B_0 \hat{i}$

D. $\overrightarrow{B} = E_0 \hat{j}, \overrightarrow{B} = B_0 \hat{k}$

Answer: A

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268. A wave of frequency 500 Hz has velocity 360 m/sec. The distance between two nearest points 60° out of phase, is

A. 70 cm

B. 0.7 m

C. 12.0 cm

D. 120.0 cm

Answer: C

Watch Video Solution

269. A wave is represented by the equetion

$$y = 7\sin\left(7\pi t - 0.04\pi x + \frac{\pi}{3}\right)$$

x is in metres and t is in seconds. The speed of the wave is

A. 175 m/s

B. $49\pi m / s$

C. $49 / \pi ms$

D. $0.28\pi m / s$

Answer: A

Watch Video Solution

270. Work down by static friction on an object :

A. may be positive

B. must be negative

C. must be zero

D. none of these

Answer: A

Watch Video Solution

271. A dip circle is taken to geomagnetic equator. The needle is allowed to move in a vertical plane perpendicular to the magnetic meridian. The needle will stay

A. horizontal

B. vertical

C. somewhere in between horizontal and vertical

D. none of these

Answer: B

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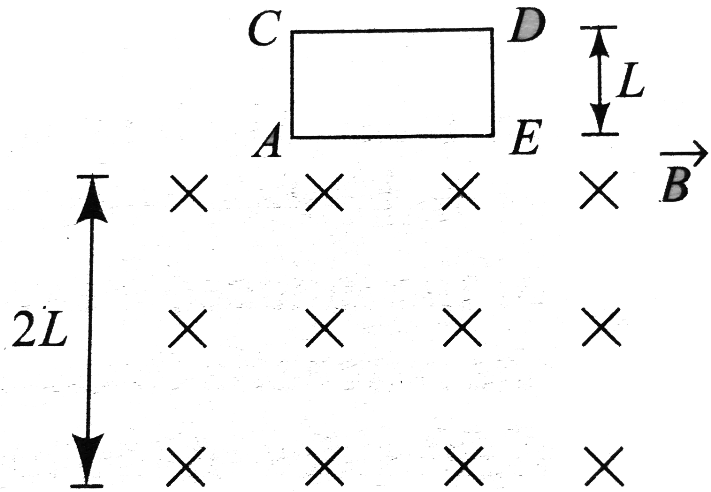
272. A square coil $ACDE$ with its plane vertically is released from rest in a horizontal uniform magnetic field $\overrightarrow{B}$ of length $2L$. The accelaration of the coilis



A. less than g for all the time till the loop crosses the magnetic

field completely

B. less than g when it enters the field and greater than g when it

comes out of the field

C. equal to g all the time

D. less than g when it enters and comes

Answer: D

Watch Video Solution

273. The magnetic flux linked with a coil is ϕ and the emf induced in it is e.

A. If $\phi - 0$, E must be 0

B. If $\phi \neq 0$, E cannot be zero

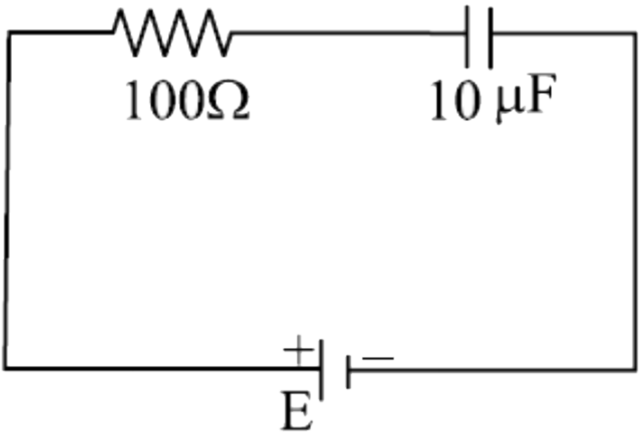
C. If E is not 0, ϕ may or may not be 0

D. none of the abvoe is correct

Answer: C

Watch Video Solution

274. The impendance of given circuit will be



A. zero

B. infinite

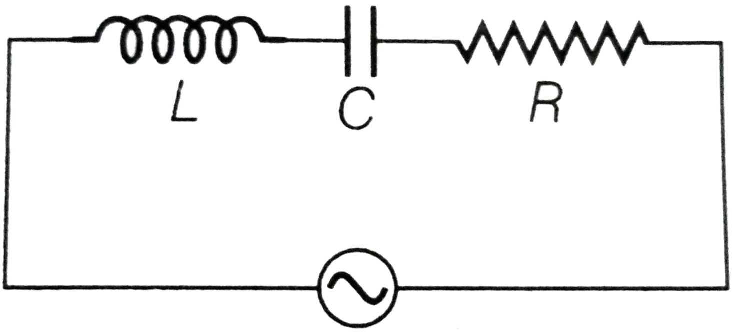
C. 110Ω

D. 90Ω

Answer: B

Watch Video Solution

275. A $100V$, AC source of frequency of $500Hz$ is connected to an L-C-R circuit with $L = 8.1mH, C = 12.5\mu F, R = 10\Omega$ all connected in series as shown in figure. What is the quality factor of circuit?



A. 2.02

B. 2.54

C. 50.54

D. 200.54

Answer: B

Watch Video Solution

276. Magnification produced by astronominal telescope for normal adjustment is 10 and length of telescope is 1.1m. The magnification when the image is formed at least distance of distinct vision $(D = 25cm)$ is-

A. 14

B. 6

C. 16

D. 18

Answer: A

Watch Video Solution

277. What happenes to the fringe pattern if in the path of one of the slits a glass plate which obsorbs 50% energy is interposed?

A. The bright fringes become brighter and dark fringes become darker

B. No fringes are observed

C. The fringe width decreases

D. None of the above

Answer: D

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278. A circular beam of light of diameter $d = 2cm$ falls on a plane refractive of glass. The angle of incidence is 60° and refractive index of glass is $\mu = 3/2$. The diameter of the refracted beam is

A. 4.0 cm

B. 3.0 cm

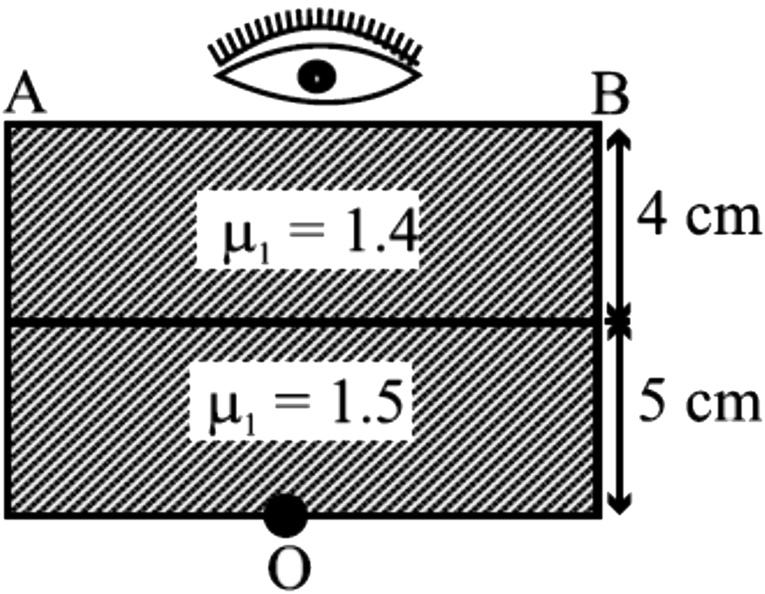
C. 3.26 cm

D. 2.52 cm

Answer: C

Watch Video Solution

279. The apparent depth of an object O from AB is



A. 4.29cm

B. 5.43 cm

C. 6.19 cm

D. 5.99 cm

Answer: C

Watch Video Solution

280. The deviation produced by a prism is

A. same for all wavelengths

B. greatest for red and least for violet

C. greatest for violet and least for red

D. the prism produces no deviation

Answer: C

Watch Video Solution

281. A transistor is used as an amplifier in CB mode with a load resistance of $5k\Omega$ the current gain of amplifier is 0.98 and the input resistance is 70Ω, the voltage gain and power gain respectively are

A. 70, 68.6

B. 80. 66.6

C. 60, 96.6

D. 9, 96.6

Answer: A

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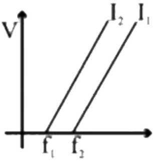
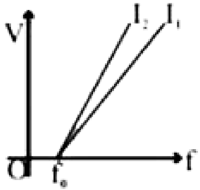
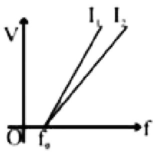
282. A photoelectric experiment is performed at two different light intensities I_1 and $I_2 (I_2 > I_1)$. Choose the correct graph showing the variation of stopping potential versus frequency of light.

A. 

B. 

C. 

D. None of these

Answer: D

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283. In a radioactive series, $._{92}U^{238}$ charges to $._{82}Pb^{206}$ through $n_1(\alpha$ -decay processes) and $n_2(\beta -$ deacy processes)

A. $n_1 = 8, n_2 = 8$

B. $n_1 = 6, n_2 = 6$

C. $n_1 = 8, n_2 = 6$

D. $n_1 = 6, n_2 = 8$

Answer: C

Watch Video Solution

284. In which of the following systems will the radius of the first orbit (n=1) be minimum?

A. Hydrogen atom

B. Deuterium atom

C. Singly ionized Helium

D. Doubly ionized Lithium

Answer: D

Watch Video Solution

285. A cyclist taking turn bends inwards while a car passenger taking same turn is thrown outwards. The reason is

A. car is heavier than cycle

B. car has four wheels while cycle has only two

C. difference in the speed of the two

D. cyclist has to counteract the centrifugal force while in the case of car only the passenger is thrown by this force

Answer: D

Watch Video Solution

286. A bird weighs 2 kg and is inside a closed cage of 1 kg. If it starts flying, then what is the weight of the bird and cage assembly

A. 1.5 kg

B. 2.5 kg

C. 3 kg

D. 4 kg

Answer: C

Watch Video Solution

287. A uniform rope of length l lies on a table . If the coefficient of friction is μ , then the maximum length l_1 of the part of this rope which can overhang from the edge of the table without sliding down is :

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

B. $\frac{l}{\mu+1}$

C. $\frac{\mu l}{1+\mu}$

D. $\frac{\mu l}{1-\mu}$

Answer: C

Watch Video Solution

288. A truck travelling due north at 20 m/s turns east and travels at the same speed. What is the change in velocity :

A. $40ms^{-1}N-W$

B. $20\sqrt{2}ms^{-1}N-W$

C. $40ms^{-1}S-W$

D. $20\sqrt{2}ms^{-1}S-W$

Answer: D

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289. A stationary object at $4^\circ C$ and weighing $3.5kg$ falls from a height of $2000m$ on a snow mountain at $0^\circ C$. If the temperature of the object just before hitting the snow is $0^\circ C$and the object comes to rest immediately? (g=$10m/s^2$ and heat of ice =3.5×10^5 joule / sec), then the object will melt

A. 2 kg of ice

B. 200 g of ice

C. 20 g ice

D. 2 g of ice

Answer: B

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290. In rainy season, on a clear night the black seat of a bicycle becomes wet because

A. it absorbs water vapour

B. black seat is good absorber of heat

C. black seat is good radiator of heat energy

D. none of the abvoe

Answer: C

Watch Video Solution

291. While measuring the thermal conductivity of liquids the upper part is kept hot and lower cooled so that .

A. convection many be stopped

B. radiation may be stopped

C. heat conduction is easier downwards

D. it is easier and more convenient to do so

Answer: A

Watch Video Solution

292. At NTP water boils at $100^{\circ} C$. Deep down the mine, water will boil at a temperature

A. $100^{\circ} C$

B. $> 100^{\circ} C$

C. $< 100^{\circ} C$

D. will not boil at all

Answer: B

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293. A tuning fork of frequency 100 when sounded together with another tuning fork of unknown frequency produces 2 beats per second. On loading the tuning fork whose frequency is not known and sounded together with a tuning fork of frequency 100 produces one beat, then the frequency of the other tuning fork is

A. 102

B. 98

C. 99

D. 101

Answer: A

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294. The equation of a transverse wave is given by

$y = 10 \sin \pi (0.01x - 2t)$

where x and y are in cm and t is in second. Its frequency is

A. $10s^{-1}$

B. $2s^{-1}$

C. $1s^{-1}$

D. $0.01s^{-1}$

Answer: C

Watch Video Solution

295. A particle executing simple harmonic motion along y -axis has its motion described by the equation $y = A\sin(\omega t) + B$. The amplitude of the simple harmonic motion is

A. A

B. B

C. $A + B$

D. $\sqrt{A+B}$

Answer: A

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296. A perfect gas contained in a cylinder is kept in vacuum. If the cylinder suddenly bursts, then the temperature of the gas

A. remains constant

B. becomes zero

C. increases

D. decreases

Answer: A

Watch Video Solution

297. The density of a gas at $27^{\circ}C$ and $760mm$ pressure is 24. Calculate the temperature at which it will be 18, the pressure remaining constant.

A. 6

B. 12

C. 18

D. 24

Answer: C

Watch Video Solution

298. A vertical column 50 cm long at $50^{\circ}C$ balances another column of same liquid 60 cm long at $100^{\circ}C$. The coefficient of absolute expansion of the liquid is

A. $0.005 / .^{\circ} C$

B. $0.0005 / .^{\circ} C$

C. $0.002 / .^{\circ} C$

D. $0.0002 / .^{\circ} C$

Answer: A

Watch Video Solution

299. The height of a mercury barometer is 75 cm at sea level and 50 cm at the top of a hill. Ration of density of mercury to that of air is 10^4. The height of the hill is

A. 250 m

B. 2.5 km

C. 1.25 km

D. 750 m

Answer: B

Watch Video Solution

300. A ball is dropped from a height h on to a floor . If the cofficient of restitution is e, calculate the height the ball first rebounds ?

A. he^{2n}

B. he^{n}

C. $\frac{e^{2n}}{h}$

D. $\frac{h}{e^{2n}}$

Answer: A

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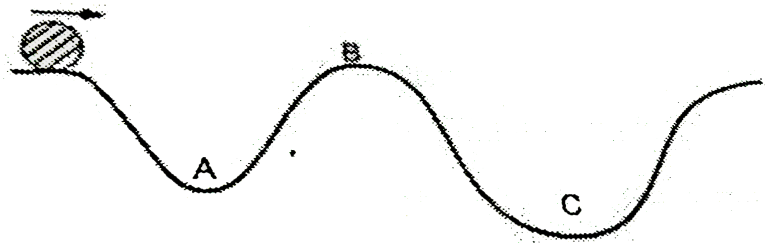
301. 

A body moves along an uneven horizontal road surface with constant speed at all points. The normal reaction of the road on the body is

A. maximum at A

B. maximum at B

C. minimum at C

D. same at A, B and C

Answer: A

Watch Video Solution

302. Two loops P and Q are made from a uniform wire. The redii of P and Q are r_1 and r_2 respectively, and their moments of inertia are I_1 and I_2 respectively, If $I_2 = 4I_1$, then $\frac{r_2}{r_1}$ equals-

A. $4^{\frac{2}{3}}$

B. $4^{\frac{1}{3}}$

C. $4^{-\frac{2}{3}}$

D. $4^{\frac{-1}{3}}$

Answer: B

Watch Video Solution

303. A ball of mass m approaches a wall of mass M (M>>m), with speed 2 ms^{-1} along the normal to the wall. The speed of wall is 1 ms^{-1} towards the ball. The speed of the ball after an elastic collision with the wall is-

A. $5ms^{-1}$ away from the wall

B. $9ms^{-1}$ away from the wall

C. $3ms^{-1}$ away from the wall

D. $6ms^{-1}$ away from the wall

Answer: D

Watch Video Solution

304. A mass of 1 kg is acted upon by a single force $F = \left(4\hat{i} + 4\hat{j}\right)N$. Under this force it is displaced from (0,0) to (1m,1m). If initially the speed of the particle was 2 ms^{-1}, its final speed should be

A. $6ms^{-1}$

B. $4.5ms^{-1}$

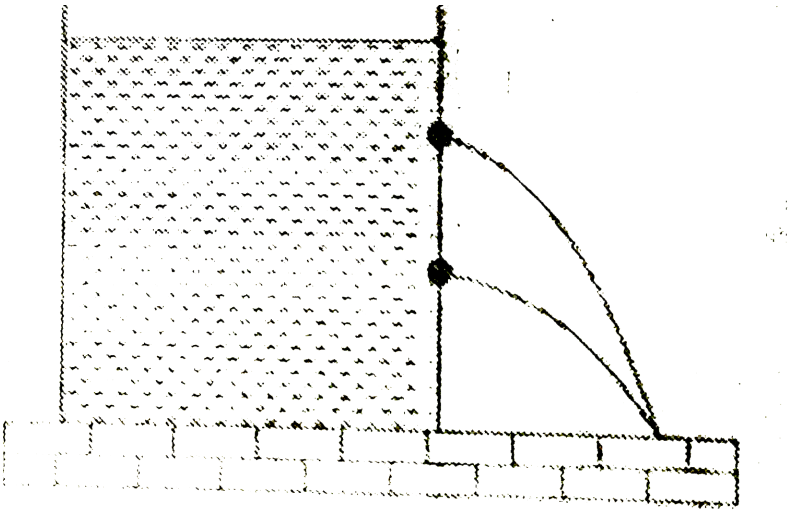
C. $8ms^{-1}$

D. $7.2ms^{-1}$

Answer: B

Watch Video Solution

305. In a cylindrical vessel containing liquid of density ρ there are two holes in the side walls at heights of h_1 and h_2 respectively such that the range of efflux at the bottom of the vessel is same. The height of a hole for which the range of efflux would be maximum, will be



A. $h_2 - h_1$

B. $h_2 + h_1$

C. $\frac{h_2 - h_1}{2}$

D. $\frac{h_2 + h_1}{2}$

Answer: D

Watch Video Solution

306. An anisotropic material has a coefficient of linear expansion $\alpha, 2\alpha$ and 3α along the three co - ordinate axis. Coefficient of cubical expansion of material will be equal to

A. 2α

B. $\sqrt[3]{6}\alpha$

C. 6α

D. None of these

Answer: C

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307. Which one of the following would raise the temperature of 20 g of water at $30^{\circ} C$ most when mixed with?

(Specific heat of water is $1cal / g - .^{\circ} C$)

A. 20 g of water at $40^{\circ} C$

B. 40 g of water at $35^{\circ} C$

C. 10 g of water at $50^{\circ} C$

D. 4 g of water at $80^{\circ} C$

Answer: D

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308. Energy is being emitted from the surface of a black body at $127^{\circ} C$ temperature at the rate of $1.0 \times 10^{6} J / \sec - m^{2}$.

Temperature of the black at which the rate of energy emission is $16.0 \times 10^6 J / \sec - m^2$ will be

A. $254^\circ C$

B. $508^\circ C$

C. $527^\circ C$

D. $727^\circ C$

Answer: C

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309. Wein's constant is 2892×10^{-6} MKS unit and the value of λ_m from moon is 14.46 microns. What is the surface temperature of moon

A. 100 K

B. 300 K

C. 400 K

D. 200 K

Answer: D

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310. Two particles are projected from a point at the same instant with velocities whose horizontal and vertical components are u_1, v_1 and u_2, v_2 respectively. Prove that the interval between their passing through the other common point of their path is

$$\frac{2(v_1u_2 - v_2u_1)}{g(u_1 + u_2)}$$

A. $\frac{2}{g}\left(\frac{v_1u_1 - v_2v_2}{u_1 + u_2}\right)$

B. $\frac{2}{g}\left(\frac{v_1^2 + v_2^2}{u_1 + u_2}\right)$

C. $\frac{2}{g}\left(\frac{u_1^2 + u_2^2}{v_1 + v_2}\right)$

D. $\frac{2}{g}\left(\frac{v_1u_2 - v_2u_1}{u_1 + u_2}\right)$

Answer: A

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311. The capacity of an isolated sphere is increased n times when it is enclosed by an earthed concentric sphere. The ratio of their radii is

A. $\dfrac{n^2}{n-1}$

B. $\dfrac{n}{n-1}$

C. $\dfrac{2n}{n+1}$

D. $\dfrac{2n+1}{n+1}$

Answer: B

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312. Capacitor C_1 of the capacitance $1\mu F$ and another capacitor C_2 of capacitance $2\mu F$ are separately charged fully by a common battery.The two capacitors are then separately allowed to discharge through equal resistors at time $t=0$.

A. At t = 0 the value of current in the circuit containing $1\mu F$ is more than current in the circuit containing $2\mu F$

B. At t = 0 the current in $2\mu F$ capacitor circuit is more than current in $1\mu F$ capacitor circuit

C. $1\mu F$ capacitior losses 50% charge sooner than $2\mu F$ capacitor

D. $2\mu F$ capacitor losses 50% charge sooner than $1\mu F$ capacitor

Answer: C

Watch Video Solution

313. A charged soap bobbe having surface charge density σ and radius r. If the pressure inside and outsides the soap bubble is the same, then the surface tension of the soap solution is

A. $T = \frac{\sigma^2 R}{8\varepsilon_0}$

B. $T = \frac{\sigma^2 R}{2\varepsilon_0}$

C. $T = \frac{\sigma^2 R}{2\varepsilon_0}$

D. $T = \frac{\sigma^2 R}{\varepsilon_0}$

Answer: A

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314. Light of wavelength $\lambda = 5000\text{Å}$ falls normally on a narrow slit. A screen is placed at a distance of $1m$ from the slit and perpendicular to the direction of light. The first minima of the diffraction pattern is situated at $5mm$ from the centre of central maximum. The width of the slit is

A. 0.1 mm

B. 1.0 mm

C. 0.5 mm

D. 0.2 mm

Answer: A

Watch Video Solution

315. How many minimum numbers of a coplanar vector having different magntidues can be added to give zero resultant

A. 2

B. 3

C. 4

D. 5

Answer: B

Watch Video Solution

316. When both the listener and source are moving towards each other, then which of the following is true regarding frequency and wavelength of wave observed by the observer?

A. More frequency, less wavelength

B. More frequency, more wavelength

C. Less frequency, less wavelength

D. More frequency, constant wavelength

Answer: A

Watch Video Solution

317. A charge of 8.0 mA in the emitter current brings a charge of 7.9 mA in the collector current. The values of α and β are

A. 0.99, 90

B. 0.96, 79

C. 0.97, 99

D. 0.99, 79

Answer: D

Watch Video Solution

318. The flux associated with coil changes from 1.35 Wb to 0.79 Wb within $\frac{1}{10}$ s. then, the charge produced by the earth coil, if resistance of coil is 7Ω is

A. 0.08 C

B. 0.8 C

C. 0.008C

D. 8C

Answer: A

Watch Video Solution

319. A vessel containing 1 g of oxygen at a pressure of 10 atm a temperature of $47^\circ C$. It is found that because of a leak, the pressure drops to $5/8th$ of its original value and the temperature falls to $27^\circ C$. Find the volume of the vessel and the mass of oxygen that is leaked out.

A. $\frac{1}{3}g$

B. $\frac{1}{48}g$

C. $1g$

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

Answer: A

Watch Video Solution

320. In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas release $20J$ of heat and $8J$ of work is done on the gas. If initial internal energy of the gas was $30J$, what will be the final internal energy?

A. 42 J

B. 18 J

C. 12 J

D. 60J

Answer: B

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321. A simple pendulum suspended from the ceiling of a trans has a time period T when the train is at rest. If the train is accelerating uniformly at a then its time period

A. increase

B. decrease

C. remain unaffected

D. become infinite

Answer: B

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322. The earth (mass $= 6 \times 10^{24} kg$) revolves round the sun with an angular velocity of $2 \times 10^{-7} \text{rad/s}$ in a circular orbit of radius

$1.5 \times 10^8 km$. The gravitational force exerted by the sun on the earth, in newtons, is

A. zero

B. 18×10^{25}

C. 27×10^{39}

D. 36×10^{21}

Answer: D

Watch Video Solution

323. The activity of a sample reduces from $A_0 \text{to} \frac{A_0}{\sqrt{3}}$ in one hour. The activity after f3 hours more will be

A. $\frac{A_0}{3\sqrt{3}}$

B. $\frac{A_0}{9}$

C. $\frac{A_0}{9\sqrt{3}}$

D. $\frac{A_0}{27}$

Answer: B

Watch Video Solution

324. From the top of a tower, a stone is thrown up and reaches the ground in time $t_1 = 9$s. a second stone is thrown down with the same speed and reaches the ground in time $t_2 = 4s$. A third stone is released from rest and reaches the ground in time t_3, which is equal to

A. 6.5 s

B. 6.0 s

C. $\frac{72}{13}s$

D. none

Answer: B

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325. A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10-divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be -

A. $1.25 \times 10^{-3} \Omega$

B. $12.5 \times 10^{-3} \Omega$

C. $125 \times 10^{-3} \Omega$

D. $0.125 \times 10^{-3} \Omega$

Answer: B

Watch Video Solution

326. When the angle of incidence on a material is 60°, the reflected light is completely polarised. The velocity of the refracted ray inside the materials is (in m//sec^(-1))

A. $3 \times 10^{8} m / s$

B. $\frac{3}{\sqrt{2}} \times 10^{8} m / s$

C. $\sqrt{3} \times 10^{8}$m/s

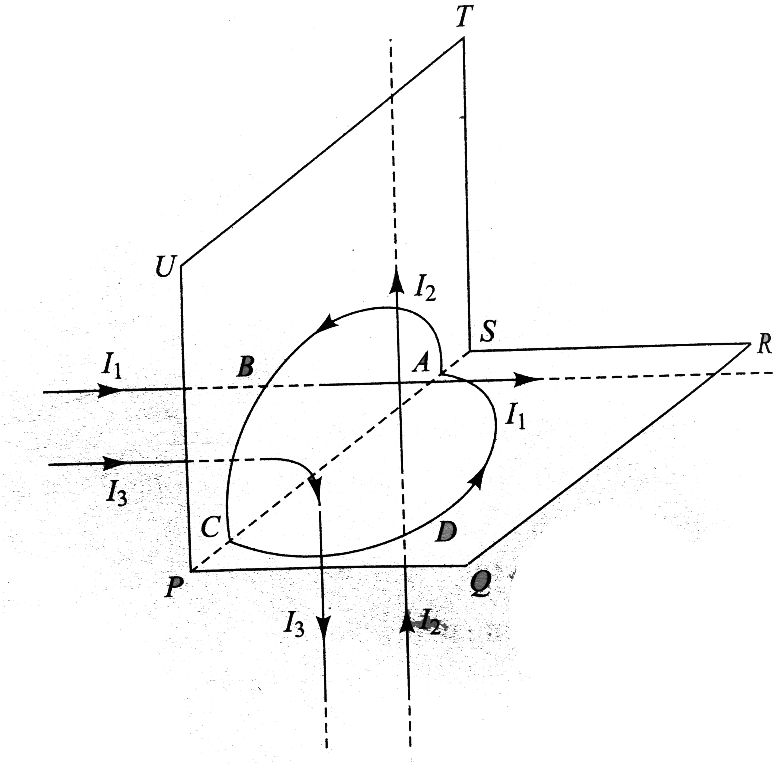
D. $\frac{1}{3} \times 10^{8}$m/s

Answer: C

Watch Video Solution

327. Figure shows an Amperian path ABCDA. Part ABC is in vertical plane PSTU while part CDA is in horizontal plane PQRS. Direction of circulation along the path is shown by an arrow near point B and at D.

$\oint \vec{B}\,.\,d\,\vec{l}$ for this path according to Ampere's law will be



A. $(i_1 - i_2 + i_3)\mu_0$

B. $(-i_1 + i_2)\mu_0$

C. $i_3\mu_0$

D. $(i_1 + i_2)\mu_0$

Answer: D

Watch Video Solution

328. An observer moves towards a stationary source of sound with a speed $\left(\frac{1}{5}\right)$th of the speed of sound. The wavelength and frequency of the source emitted are λ and f, respectively. The apparent frequency and wavelength recorded by the observer are, respectively.

A. 1.2f, 1.2λ

B. 1.2f, λ

C. f, 1.2λ

D. 0.8f, 0.8λ

Answer: B

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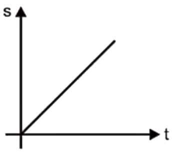
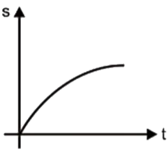
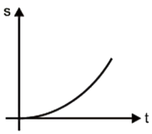
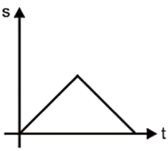
329. One stone is dropped from a tower from rest and simultaneously another stone is projected vertically upwards from the tower with some initial velocity. The graph of distance (s) between the two stones varies with time (t) as (before either stone hits the ground).

A. 

B. 

C. 

D. 

Answer: A

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330. Focal length of two lens are f and f' and dispersive powers are ω_0 and $2\omega_0$.To form achromatic combination from these-

(1) $f' = 2f$, $(2) f' = -2f$ (3) $f' = -f/2$

A. $f' = 2f$

B. $f' = -2f$

C. $f' = f/2$

D. $f' = -f/2$

Answer: B

Watch Video Solution

331. If a $30V$, $90W$ bulb is to be worked on a $120V$ line, resistance of how many ohms should be connected in series with the bulb

A. 40

B. 10

C. 20

D. 30

Answer: D

Watch Video Solution

332. Torques of equal magnitude are applied to a thin hollow cylinder and a solid sphere, both having the same mass and radius. Both of them are free to rotate about their axis of symmetry. If α_c and α_s are the angular accelerations of the cylinder and the sphere respectively, then the ratio $\frac{\alpha_c}{\alpha_s}$ will be

A. $\frac{5}{2}$

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

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

D. $\frac{2}{5}$

Answer: C

Watch Video Solution

333. Two balls of masses m and $2m$ are attached to the ends of a light rod of length L. The rod rotates with an angular speed ω about an axis passing through the center of mass of system and perpendicular to the plane. Find the angular momentum of the system about the axis of rotation.

A. $\frac{2}{3}m\omega L^2$

B. $\frac{1}{3}\omega^2 Lm$

C. $\frac{2}{3}\omega^2 Lm$

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

Answer: A

Watch Video Solution

334. Photoelectric effect supports quantum nature of light because

(a) there is a minimum frequency of light below which no photo electrons are emitted

(b) the maximum kinetic energy of photo electrons depends only on the frequency of light and not on its intensity

(c) even when the metal surface is faintly illuminated, the photo electrons leave the surface immediately

(d) electric charge of the photo electrons is quantised

A. 1,2,3

B. 1,2,4

C. 2,3,4

D. 1,3,4

Answer: D

Watch Video Solution

335. Assuming the Sun to be a spherical body of radius R at a temperature of TK, evaluate the total radiant powered incident of Earth at a distance r from the sun

where r_0 is the radius of the Earth and σ is Stefan's constant.

A. $4\pi r_0^2 R^2 \sigma T^4 / r^2$

B. $\pi r_0^2 R^2 \sigma T^4 / r^2$

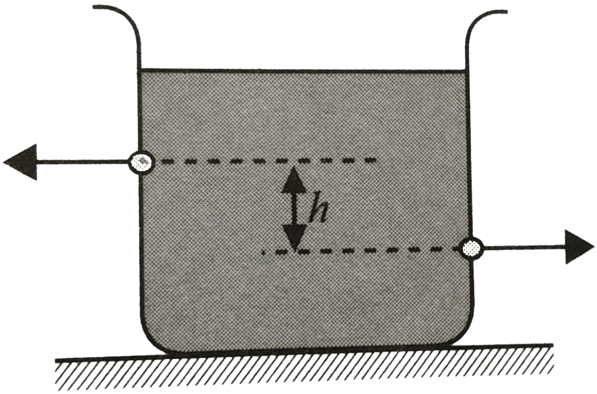
C. $r_0^2 R^2 \sigma T^4 / 4\pi r^2$

D. $R^2 \sigma T^4 / r^2$

Answer: B

Watch Video Solution

336. There are two identical small holes of area of cross section a on the opposite sides of a tank containing liquid of density ρ. The differences in height between the holes is h. The tank is resting on a smooth horizontal surface. The horizontal force which will have to be applied on the tank to keep it in equilibrium is



A. $\rho g h A$

B. $2gh / \rho A$

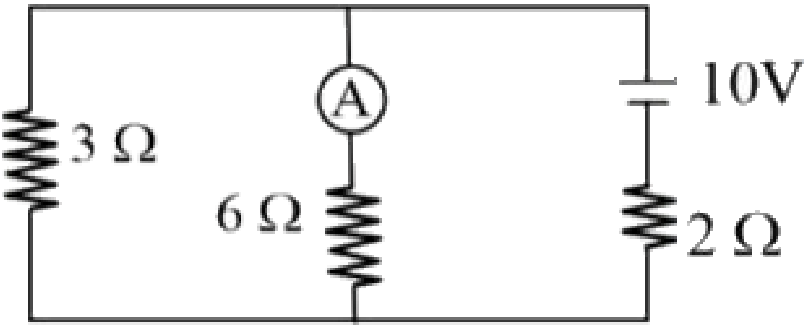
C. $2\rho g h A$

D. $\rho g h / A$

Answer: C

Watch Video Solution

337. The reading of the ideal ammeter will be (Resistance of ideal ammeters is zero)



A. 5/6 ampere

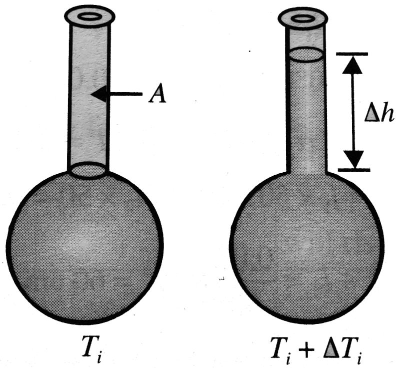
B. 6/5 ampere

C. 3/2 ampere

D. 2/3 ampere

Answer: A

Watch Video Solution



338.

A mercury thermometer is constructed as shown if Fig. 1.9. The capillary tube has a diameter of 0.004 00 cm, and the bulb has a diameter of 0.250 cm. neglecting the expansion of the glass, find the change in height of the mercury column with a temperature change of $30.0^\circ C$.

A. 3.55 cm

B. 2.60 cm

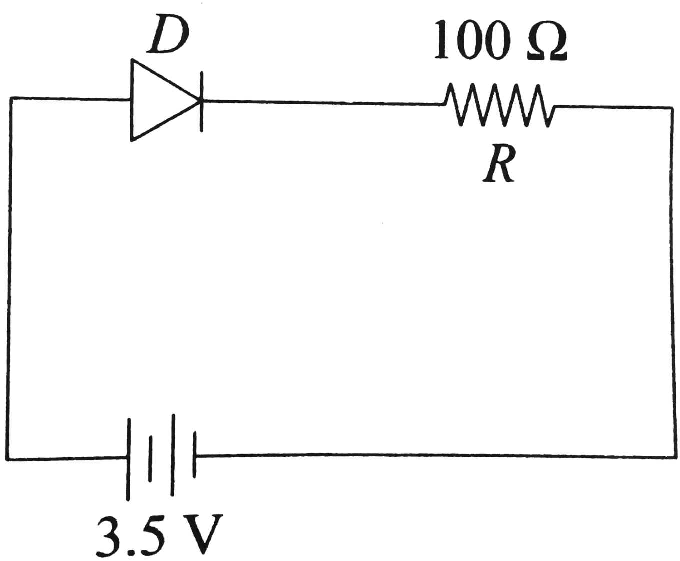
C. 4.50 cm

D. 3.33 cm

Answer: A

Watch Video Solution

339. In the given figure, a diode D is connected to an external resistance $R = 100\Omega$ and an emf of $3.5V$. If the barrier potential developed across the diode is $0.5V$, the current in the circuit will be :



A. 40 mA

B. 20 mA

C. 35 mA

D. 30 mA

Answer: D

Watch Video Solution

340. For a certain metal v is the five times of v_0 and the maximum velocity of coming out photons is $8 \times 10^6 m/s$. If $v = 2v_0$, then maximum velocity of photoelectrons will be

A. $4 \times 10^6 ms^{-1}$

B. $6 \times 10^6 ms^{-1}$

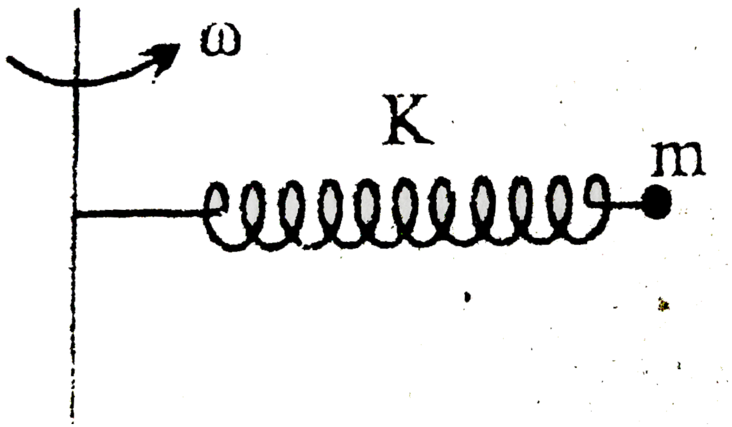
C. $8 \times 10^6 ms^{-1}$

D. $1 \times 10^6 ms^{-1}$

Answer: A

Watch Video Solution

341. A particles of mass m is fixed to one end of a light spring of force constant k and unstreatched length l. the system is rotated about the other end of the spring with an angular velocity ω in gravity free space. The increase in length of the spring is



A. $\dfrac{m\omega^2 l}{k}$

B. $\dfrac{m\omega^2 l}{k - m\omega^2}$

C. $\dfrac{m\omega^2 l}{k + m\omega^2}$

D. none

Answer: B

Watch Video Solution

342. A heavy uniform chain lies on a horizontal table-top. If the coefficient of friction between the chain and table surface is 0.25, then the maximum fraction of length of the chain, that can hang over one edge of the table is

A. 0.2

B. 0.25

C. 0.35

D. 0.15

Answer: A

Watch Video Solution

343. A, B, C and D are four different physical quantities having different dimensions. None of them is dimensionless. But we know that the equation $AD = C1n(BD)$ holds true. Then which of the combination is not a meaningful quantity :-

A. $\frac{C}{BD} - \frac{A^2D^2}{C}$

B. $A^2 - B^2C^2$

C. $\frac{A}{B} - C$

D. $\frac{A^2 - AC}{D}$.

Answer: D

Watch Video Solution

344. A canon shell fired breaks into two equal parts at its highest point. One part retraces the path to the canon with kinetic energy E_1 and the kinetic energy of the second part is E_2. Relation between E_1 and E_2 is

A. $E_2 = 15E_1$

B. $E_2 = E_1$

C. $E_2 = 4E_1$

D. $E_2 = 9E_1$

Answer: D

Watch Video Solution

345. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of $15ms^{-1}$. Then the frequency of sound that the observer hears in the echo reflected from the cliff is

(Take velocity of sound in air $= 330ms^{-1}$)

A. 765 Hz

B. 800 Hz

C. 838 Hz

D. 885 Hz

Answer: C

Watch Video Solution

346. Ground state energy of H-atom is -13.6 eV. The energy needed to ionise H-atom from its second excited state is

A. 1.51 eV

B. 3.4 eV

C. 13.6 eV

D. 12.1 eV

Answer: A

Watch Video Solution

347. A wheel is subjected to uniform angular acceleration about its axis. Initially, its angular velocity is zero. In the first $2\sec$, it rotates through an angle θ_1, in the next $2\sec$, it rotates through an angle θ_2. The ratio of θ_2/θ_1 is

A. θ

B. 2θ

C. 3θ

D. 4θ

Answer: C

Watch Video Solution

348. The tension in a wire is decreased by 19% The percentage decrease in frequency will be

A. 0.19

B. 0.1

C. 0.0019

D. none of these

Answer: B

Watch Video Solution

349. 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

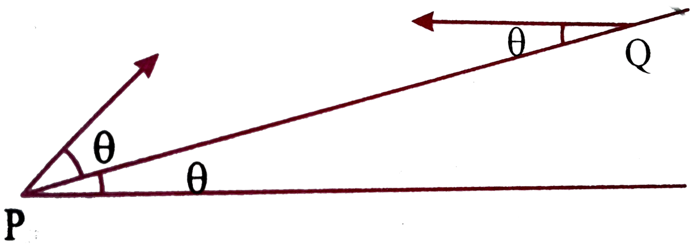
C. 30

D. 36

Answer: A

Watch Video Solution

350. From an inclined palne two particles P, Q are projected with same speed at same angle θ,one up and other down the plane as shown in figure.Which of the following statement(s) is/are correct ?



A. The time of flight of each particle is the same.

B. The particles will collide the plane with same speed

C. Both the partcle strike the plane perpendicularly

D. The particles will collide in mid air iff projected simultaneously and time of flight of each particle is less than the time of collision.

Answer: A

Watch Video Solution

351. A ball is thrown vertically downwards from a height of 20m with an intial velocity v_0. It collides with the ground, loses 50% of its energy in collision and rebounds to the same height. The intial velocity v_0 is (Take, g =10 ms^{-2})

A. 20 ms^{-1}

B. 28 ms^{-1}

C. 10 ms^{-1}

D. 14 ms^{-1}

Answer: A

Watch Video Solution

352. Two men with weights in the ratio 4:3 run up a staircase in time in the ratio 12:11. The ratio of power of the first to that of second is

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

B. $\frac{12}{11}$

C. $\frac{48}{33}$

D. $\frac{11}{9}$

Answer: D

Watch Video Solution

353. The radius vector and linear momentum are respectively given by vector $2\hat{i} + 2\hat{j} + \hat{k}$ and $2\hat{i} - 2\hat{j} + \hat{k}$. Their angular momentum is

A. $2\hat{i} - 4\hat{j}$

B. $4\hat{i} - 8\hat{k}$

C. $2\hat{i} - 4\hat{j} + 2\hat{k}$

D. $4\hat{i} - 8\hat{j}$

Answer: B

Watch Video Solution

354. The magnetic field on the axis at a distance z from the centre of the bar magnet would be ?

A. In the direction of the magnetic dipole moment $\left(\overrightarrow{M}\right)$ of the bar magnet

B. In the opposite direction of the magnetic dipole moment $\left(\overrightarrow{M}\right)$ of the bar magnet

C. In the perpendicular direction of the magnetic moment $\left(\overrightarrow{M}\right)$ of the bar magnet

D. Its direction depends on the magnitude of the magnetic moment $\left(\overrightarrow{M}\right)$ of the bar magnet

Answer: A

Watch Video Solution

355. The time period of a simple pendulum measured inside a stationary lift is found to be T . If the lift starts accelerating upwards with an acceleration $g/3$, the time period is

A. $\sqrt{2}T$

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

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

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

Answer: C

Watch Video Solution

356. The diameter of the lens of a telescope is 0.61 m and the wavelength of light used is 5000 Å. The resolution power of the telescope is

A. 2×10^6

B. 10^6

C. 2×10^4

D. 2×10^2

Answer: B

Watch Video Solution

357. A vessel contains oil (density $0.9 \text{ g } cc^{-1}$) over mercury (density $13.6 \text{ g } cc^{-1}$). A homogenous sphere floates with one-third of its volume immersed in mercury and the rest immersed in oil. The density of the material of the sphere in g cc^{-1} is-

A. 3.3

B. 6.4

C. 5.1

D. 12.8

Answer: C

Watch Video Solution

358. A refrigerator absorbs 2000 cal of heat from ice trays. If the coefficient of performance is 4, then work done by the motor is

A. 2100 J

B. 4200 J

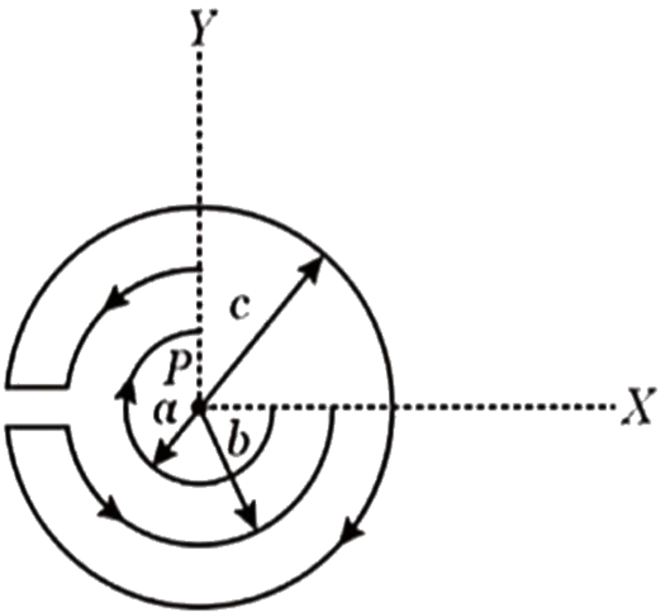
C. 8400 J

D. 500 J

Answer: A

Watch Video Solution

359. For $c = 2a$ and $c < b < c$, the magnetic field at the point P will be zero when-



A. a=b

B. $a = \frac{3}{5}$ b

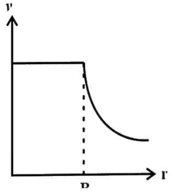
C. $a = \frac{5}{3}b$

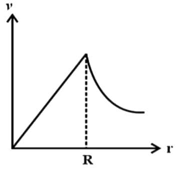
D. $a = \frac{1}{3}b$

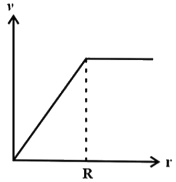
Answer: C

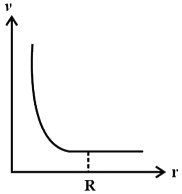
Watch Video Solution

360. A spherically symmetric gravitational system of particles has a mass density$\rho = \begin{cases} \rho_0 & f \text{ or } \quad r < \quad R \\ 0 & f \text{ or } \quad r > \quad R \end{cases}$ whereρ_0 is a constant. A test mass can undergo circular motion under the influence of the gravitational field of particles. Its speed v as a function of distahce $r(0 < r < OO)$ form the centre of the system is represented by

A. 

B. 

C. 

D. 

Answer: B

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MCQs (PHYSICS)

1. We have three beakers A , B and C containing glycerine, water and kerosene respectively. They are stirred vigorously and placed on a table. The liquid which comes to rest at the earliest is

A. glycerin

B. water

C. kerosene

D. all of them at the same

Answer: A

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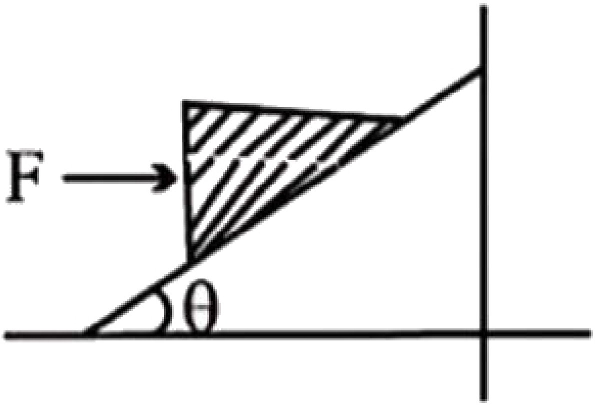
2. A block rests on a fixed rough inclined place and a horizontal force F is applied to it, as shown in the figure. Which of the following statements are correct?

(A) Normal reaction on the block is $F \sin \theta + mg \cos \theta$

(B) The friction force is zero when $F \cos \theta = mg \sin \theta$

(C) The value of limiting friction is $\mu(mg \sin \theta + F \cos \theta)$

(D) The value of limiting friction is $\mu(mg \sin \theta - F \cos \theta)$



A. 1,2

B. 3,4

C. 2,4

D. 2,3

Answer: A

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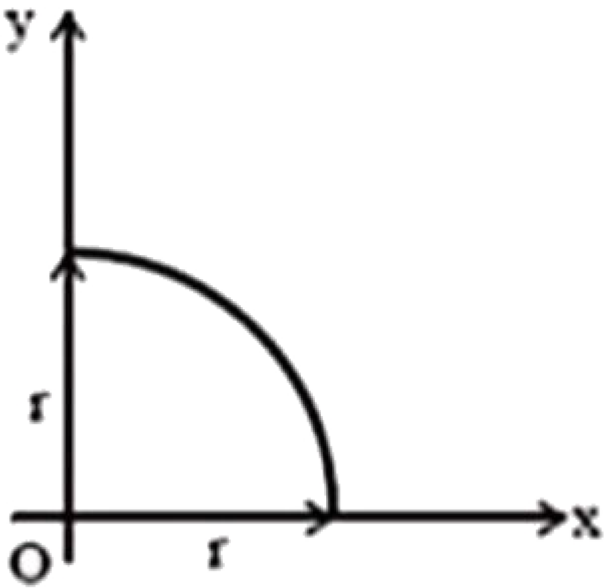
3. The coordinates of the center of mass of the following quarter circular arc are



A. $\left(\frac{r}{2}, \frac{r}{2}\right)$

B. $\left(\frac{2r}{3}, \frac{2r}{3}\right)$

C. $\left(\frac{2r}{\pi}, \frac{2r}{\pi}\right)$

D. $\left(\frac{4r}{\pi}, \frac{4r}{\pi}\right)$

Answer: C

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4. A radioactive material has mean lives of 1620 years and 660 years for α and β emissions respectively the material decays by simultaneous α and β emission. The time in which $\frac{1}{4}th$ of the material remains intact is-

A. 4675 years

B. 720 years

C. 650 years

D. 324 years

Answer: C

Watch Video Solution

5. Two wires A an dB of the same material, having radii in the ratio I : 2 and carry currents in the ratio 4: I. The ratio of drift speed of electrons in A and Bis :

A. $16:1$

B. $1:16$

C. $1:4$

D. $4:1$

Answer: A

Watch Video Solution

6. If K_1 and K_2 are maximum kinetic energies of photoelectrons emitted when light of wavelength λ_1 and λ_2 respectively are incident on a metallic surface. If $\lambda_1 = 3\lambda_2$ then

A. $K_1 > K_2/3$

B. $K_1 < K_2 / 3$

C. $K_1 = 3K_2$

D. $K_2 = 3K_1$

Answer: B

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7. In Uranium (Z=92), the K absorption edge is 0.107 Å and the K_α line is 0.126 Å. The wavelength of the L absorption edge is

A. 0.7 Å

B. 1 Å

C. 2 Å

D. 3.2 Å

Answer: A

Watch Video Solution

8. A camera objective has an aperture diameter d . If the aperture is reduced to diameter $d/2$ the exposure time under identical conditions of light should be made

A. $\sqrt{2}$ fold

B. 2 fold

C. $2\sqrt{2}$ fold

D. 4 fold

Answer: D

Watch Video Solution

9. When an object is at distances x and y from a lens, a real image and a virtual image is formed respectively having same magnification. The focal length of the lens is

A. $\frac{x+y}{2}$

B. $x - y$

C. $\sqrt{xy}$

D. $x + y$

Answer: A

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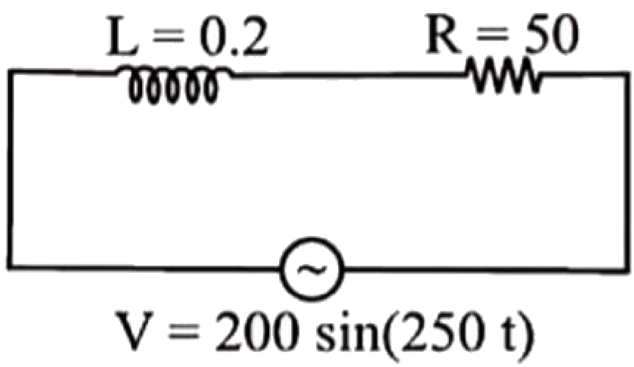
10. In the given circuit the average power developed is:



A. $50\sqrt{2}$ watt

B. 200 watt

C. $150\sqrt{2}$ watt

D. $200\sqrt{2}$ watt

Answer: B

Watch Video Solution

11. A current $I = 10\sin(100\pi t)$ amp. Is passed in first coil, which induces a maximum e.m.f of 5π volt in second coil. The mutual inductance between the coils is-

A. 5 mH

B. 10 mH

C. 15 mH

D. 20 mH

Answer: A

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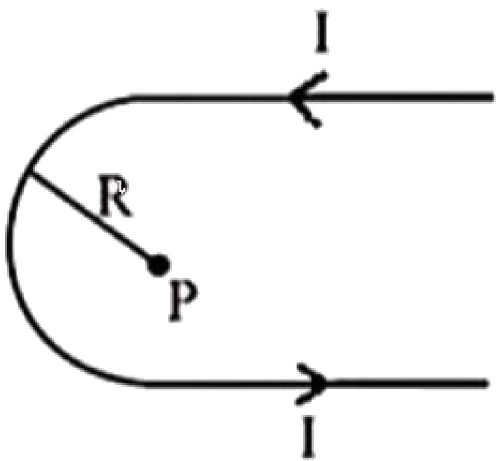
12. What will be the magnetic field at point P in the figure below?



A. $\frac{\mu_0 i}{4R} \frac{3}{4}$

B. $\frac{\mu_0 i}{4R}\left(\frac{2}{\pi}+1\right)$

C. $\frac{\mu_0 i}{2R}\left(\frac{2}{\pi}+1\right)$

D. $\frac{2\mu_0 i}{2R}\left(\frac{2}{\pi}+1\right)$

Answer: B

Watch Video Solution

13. The time of vibration of a dip needle in the vertical plane is 3 sec the magnetic needle is made to vibrate in the horizontal plane, the time of vibration is $3\sqrt{2}s$. Then angle of dip will be-

A. 90°

B. 60°

C. 45°

D. 30°

Answer: B

Watch Video Solution

14. If only one hundredth part of total current flowing in the circuit is to be passed through a galvanometer of resistance $G\Omega$, Then the value of shunt resistance required will be-

A. $\frac{G}{10}$

B. $\frac{G}{100}$

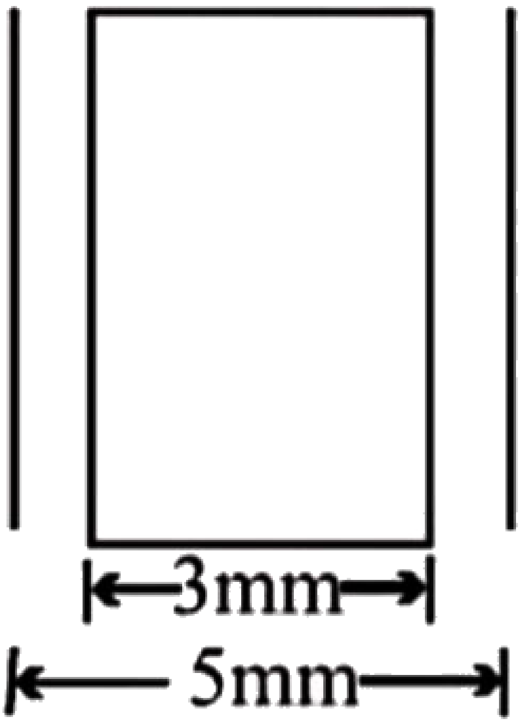
C. $\frac{G}{99}$

D. $\frac{G}{999}$.

Answer: C

Watch Video Solution

15. Separation between the plates of parallel plate capacitor is 5 mm. this capacitor, having air as the dielectric medium between the plates, is charged to a potential difference 25 V using a battery. The battery is then disconnected and a dielectric slab of thickness 3mm and dielectric constant K=10 is placed between the plates as shown. potential difference between the plates after the dielectric slab has been introduced is-



A. 18.5V

B. 13.5V

C. 11.5V

D. 6.5V

Answer: C

Watch Video Solution

16. A capacitor of capacitance $100(\mu)F$ is charged by connecting it to a battery of emf 12 V and internal resistance $2(\Omega)$. (a) Find the time constant of the circuit. (b) Find the time taken before 99% of maximum charge is stored on the capacitor.

A. 0.92 ms

B. 0.4ms

C. 0.8ms

D. 0.1ms

Answer: A

Watch Video Solution

17. Positive charge q is given to each plate of a parallel plate air capacitor having area of each plate A and seperation between them, d. Then find

(i) Capacitance of the system. (ii) Charges appearing on each surface of plates

(iii) Electric field between the plates (iv) Potential diffrence between the plates

(v) Energy stored between hte plates

A. since both the plates are identically charged, therefore, capacitance becomes equal to zero

B. energy stored in the space between the capacitor plates is equal to $\frac{q^2}{\varepsilon_0 A^2}$.

C. no charge appears on inner surface of the plates

D. potential difference between the plates is equal to $\frac{2qd}{\varepsilon_0 A}$

Answer: C

Watch Video Solution

18. Which of the following statements is correct?

A. When a lens is dipped in water, magnitude of its focal length increases.

B. When a lens is dipped in water, magnitude of its focal length decreases

C. When a spherical mirror is dipped in water, magnitude of its focal length increases.

D. None of these.

Answer: A

Watch Video Solution

19. A 25 W, 220V bulb and 100W, 220V bulb are joined in series and connected to the mains. Which bulb will glow brighter-

A. 25 W bulb

B. 100 W bulb

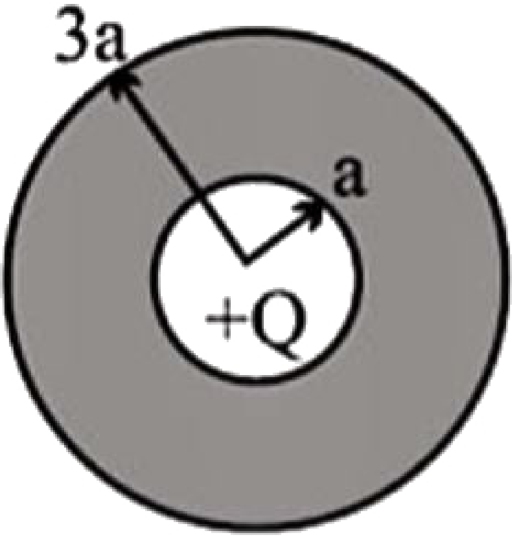
C. first 25 W bulb and then 100 W bulb

D. Both will glow with same brighteness

Answer: A

Watch Video Solution

20. A solid, uncharged conducting sphere of radius 3a contains a concentric hollowed spherical cavitiy of radius a.



A point charge +Q is placed at the center of the spheres. Taking V=0 at $r \rightarrow \infty$, the potential at positiion r=2a from the center is-

A. $\frac{KQ}{a}$

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

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

D. $\frac{2KQ}{3a}$

Answer: C

Watch Video Solution

21. Two point charges placed at a distance r in air exert a force f on each other. The value of distance R at which they experience force 4F when placed in a medium of dielectric constant K = 16 is :

A. r

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

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

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

Answer: B

Watch Video Solution

22. The root-mean-square (rms) speed of oxygen molecules (O_2) at a certain absolute temperature is v.If the temperature is double and the oxygen gas dissociated into atomic oxygen, the rms speed would be

A. v

B. $\sqrt{2}v$

C. $2v$

D. $2\sqrt{2}v$

Answer: C

Watch Video Solution

23. The pressure and volume of a given mass of gas at a given temperature are P and V respectively. Keeping the temperature constant, the pressure is increased by 10% and the system is allowed to achieve a steady-state, then the pressure is decreased by 10% what cann be said about the final volume?

A. less than V

B. more than V

C. equal to V

D. less than V for diatomic and more than V for monoatomic

Answer: B

Watch Video Solution

24. Four spheres A, B, C and D of different metals but all same radius are kept at same temperature. The ratio all their densities and specific heats are $2:3:5:1$ and $3:6:2:4$. Which sphere will show the fastest rate all cooling (initially) (assume black body radiation for all of them)

A. A

B. B

C. C

D. D

Answer: D

Watch Video Solution

25. A man is standing between a stationary source and cliff. When he starts moving along line joining him and source, he hears 10 beats per second. The velocity of mas is [frequency of source=600Hz, velocity of sound=330ms^{-1}]

A. 5.5 m/s

B. 11m/s

C. 16/5m/s

D. 2.75m/s

Answer: D

Watch Video Solution

26. An earthquake generates both transverse (S) and longitudinal (P) sound waves in the earth. The speed of S waves is about 6 km s^{-1} and that of P waves is about 9 km s^{-1}. A seismograph records P and S waves from an earthquarke. The first P wave arrives 5 minutes before the first S wave. the epicenter of the earth quake is located at a distance

A. 54 km

B. 540 km

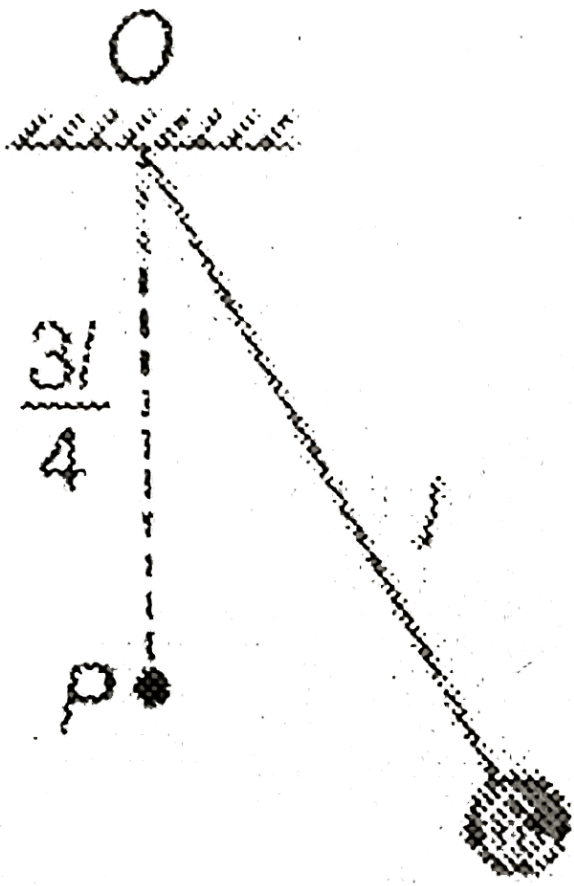
C. 5400 km

D. 72 km

Answer: C

Watch Video Solution

27. A pendulum has time period T for small oscillations. An obstacle P is situated below the point of suspension O at a distance $\frac{3l}{4}$. The pendulum is released from rest. Throughout the motion, the moving string makes small angle with vertical. Time after which the pendulum returns back to its initial position is



A. T

B. $3T/4$

C. $3T/5$

D. $4T/5$

Answer: B

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28. A body is projected up with a velocity equal to $3/4th$ of the escape velocity from the surface of the earth. The height it reaches is (Radius of the earth is R)

A. 10R/9

B. $9\frac{R}{7}$

C. 9R?8

D. 10R/3

Answer: B

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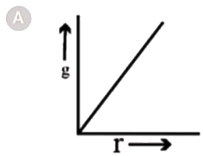
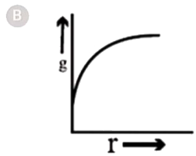
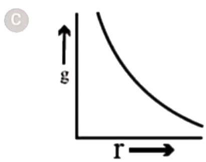
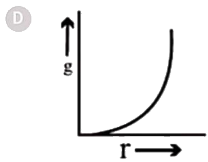
29. If the density of a planet is constant, then the curve between value of g on its surface and its radius r will be-

A. 

B. 

C. 

D. 

Answer: A

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30. Why are electric field lines perpendicular at a point on an equipotential surface of a conductor ?

A. perpendicular to the surface

B. parallel to the surface

C. in all directions

D. zero

Answer: A

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31. Three rods each of length L and mass M are placed along X, Y and Z axis in such a way that one end of each of the rod is at the origin. The moment of inertia of this system about Z axis is

A. $\dfrac{ML^2}{3}$

B. $\dfrac{2ML^2}{3}$

C. $\dfrac{2ML^2}{6}$

D. ML^2

Answer: B

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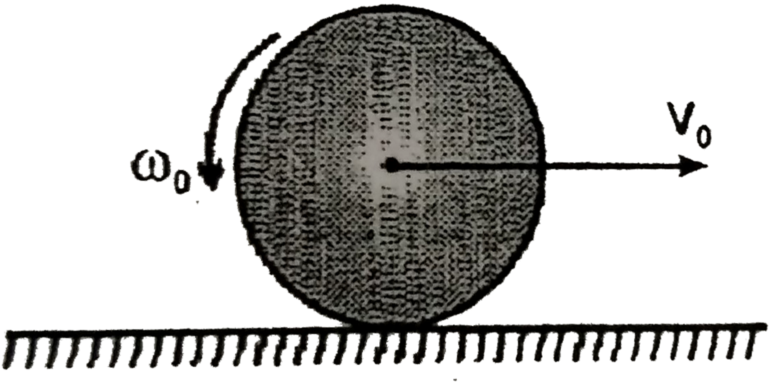
32. A uniform circular disc placed on a horizontal rough surface has initially a velocity v_0 and an angular velocity ω_0 as shown in the figure. The disc comes to rest after moving some distance in the direction of motion. Then v_0 / ω_0 is :



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

B. 2

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

D. 3

Answer: A

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33. A ball of mass m approaches a wall of mass M (M>>m), with speed $2\ ms^{-1}$ along the normal to the wall. The speed of wall is $1\ ms^{-1}$

towards the ball. The speed of the ball after an elastic collision with the wall is-

A. $2ms^{-1}$ away from the wall

B. $3ms^{-1}$ away from the wall

C. $4ms^{-1}$ away from the wall

D. $5ms^{-1}$ away from the wall

Answer: C

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34. Consider the nuclear reaction $X^{200} \rightarrow A^{110} + B^{80} + 10n^{1}$. If the binding energy per nucleon for X, A and B are 7.4 MeV, 8.2 MeV and 8.1 MeV respectively, then the energy released in the reaction:

A. 70 MeV

B. 200 MeV

C. 190 MeV

D. 10 MeV

Answer: A

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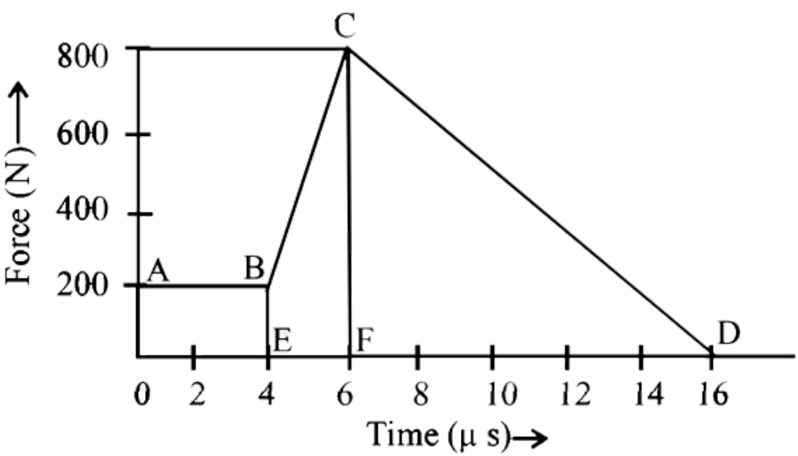
35. The magnitude of the force (in newtons) acting on a body varies with time t (in micro seconds) as shown in the fig AB, BC and CD are straight line segments. The magnitude of the total impulse of the force on the body from $t = 4 \mu s$ to $t = 16 \mu s$ is ....Ns



A. $6 \times 10^{-3} Ns$

B. $5.0 \times 10^{-3} Ns$

C. $8.4 \times 10^{-3} Ns$

D. $7.6 \times 10^{-3} Ns$

Answer: B

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36. Mass is non-uniformly distributed over the rod of length l, its linear mass density varies linearly with length as $\lambda = kx^2$. The position of centre of mass (from lighter end) is given by-

A. $2l/5$

B. $3/l$

C. $3l/4$

D. $2l/3$

Answer: C

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37. A hydrogen atom moving at a speed v absorbs a photon of wavelength 122 nm and stops. The value of v is (mass of hydrogen atom $= 1.67 \times 10^{-27}$ kg)

A. 2.75 m/s

B. 3.25m/s

C. 4.85m/s

D. 5.65 m/s

Answer: B

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38. In a common emitter amplifier, using output reisistance of 5000 ohm and input resistance fo 2000ohm, if the peak value of input signal voltage is $10mV$ and $\beta = 50$, then the peak value of output voltage is

A. $5 \times 10^{-6}V$

B. $2.5 \times 10^{-4}V$

C. $1.25V$

D. 125V

Answer: C

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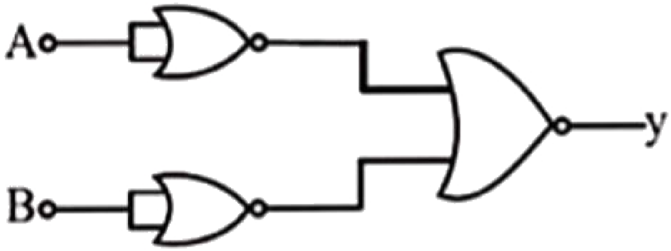
39. Identify the operation performed by the circuit given below-



A. NOT

B. AND

C. OR

D. NAND

Answer: B

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40. The electric field and the electric potential at a point are E and V respectively.

A. If E=0, V must be zero

B. If V=0, E must be zero

C. If $E \neq 0$, V may be zero

D. If $V \neq 0$, E cannot be zero

Answer: C

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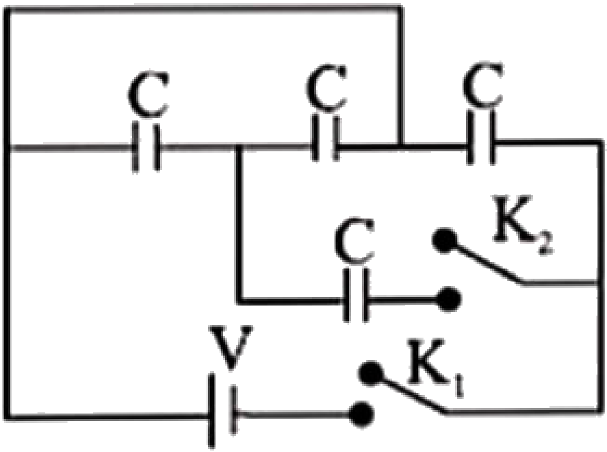
41. Initially K_1 is closed, now if K_2 is also closed, find heat dissipated in the resistances of connecting wires



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

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

C. $\frac{1}{3}CV^2$

D. $\frac{1}{4}CV^2$

Answer: C

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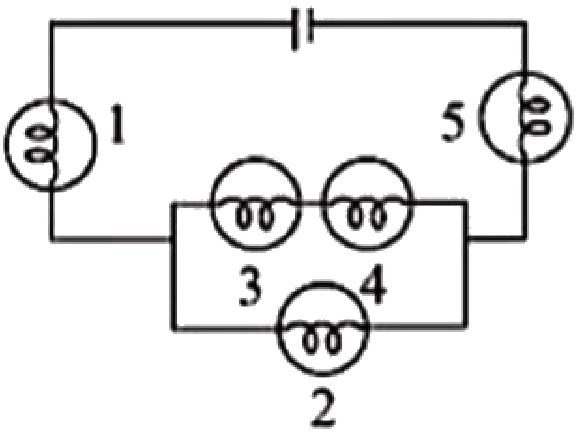
42. All the bulbs below are identical. Which bulb(s) shine(s) most brightly?



A. 1 only

B. 2 only

C. 3 and 4

D. 1 and 5

Answer: D

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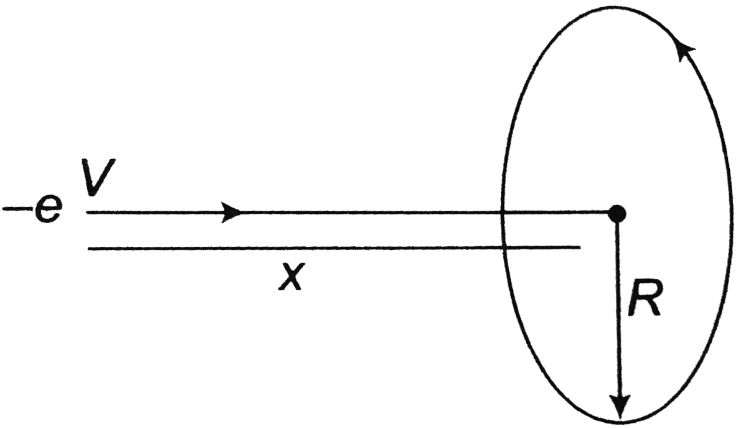
43. An electron moving with a velocity v along the positive x-axis approaches a circular current carrying loop as shown in the fig. the magnitude of magnetic force on electron at this instant is



A. $\frac{\mu_0}{4} \frac{eviR^2x}{(x^2+R^2)^{3/2}}$

B. $\mu_0 \frac{eviR^2x}{(x^2+R^2)^{3/2}}$

C. $\frac{\mu_0}{4\pi} \frac{eviR^2x}{(x^2+R^2)^{3/2}}$

D. None of these.

Answer: D

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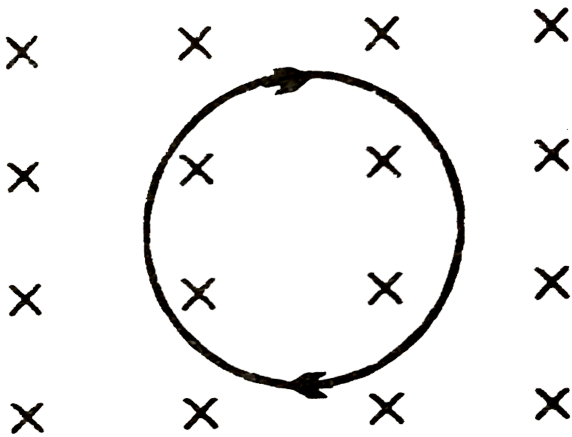
44. A circular coil carrying current I is placed in a region of uniform magnetic field acting perpendicular to a coil as shown in te Mark correct option



A. coil exapands

B. coil contracts

C. coil moves left

D. coil moves right

Answer: A

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45. The material suitable for making electromagnets should have

A. high retentivity and low coercivity

B. low retentivity and low coercivity

C. high retentivity and high coercivity

D. low retentivity and high coercivity

Answer: B

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