PHYSICS

AAKASH INSTITUTE ENGLISH

TEST 2

Exercise

1. A quantity y is given by $y = \varepsilon_0 L \frac{dV}{dt}$, where ε_0 is the permittivity of free space, L is length, dV is small potential difference and dt is small time interval. The dimensional formula for y is same as that of

A. Electric charge

B. Electric field

C. Electric current

D. Velocity

Answer:

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2. Two particles of masses 2 kg and 4 kg are placed along x-axis at positions x = 1 m and x = 4 m respectively. The moment of inertia of the system about an axis passing through centre of mass and parallel to y-axis is

A. $3kgm^2$

B. $12kgm^2$

C. $13.5kgm^2$

D. $6kgm^2$

Answer:

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3. Percentage errors in measurement of mass and speed are 1% and 2.5% respectively. The maximum percentage error in the calculation of linear momentum will be

A. 0.035

B. 0.045

C. 0.06

D. 0.015

Answer:

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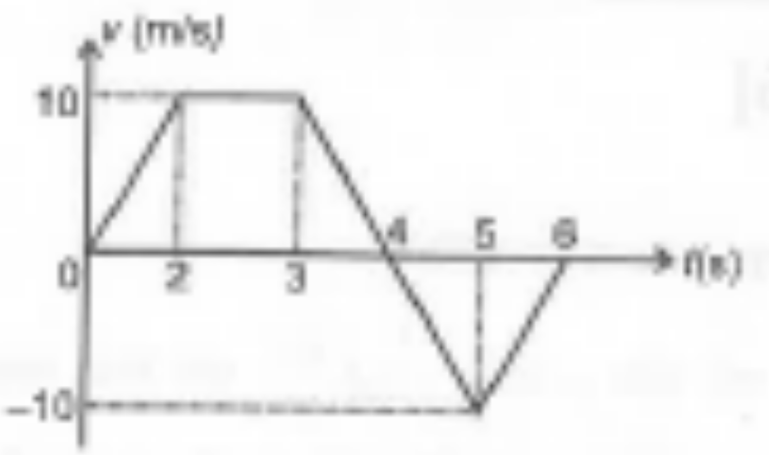
4. The velocity (v)-time (t) graph of a partide moving along a straight line is as shown in the figure. The displacement of the particle from t = 0 to t =



4 is

A. 15 m

B. 35 m

C. 25 m

D. 30 m

Answer:

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5. A particle of unit mass is moving along x-axis. The velocity of particle varies with position x as v(x). $= \alpha x^{-\beta}$ (where α and β are positive

constants and $x > 0$). The acceleration of the particle as a function of x is given as

A. $-\alpha\beta^2 x^{-(2\beta-1)}$

B. $-\alpha^2\beta x^{-(2\beta-1)}$

C. $-\alpha^2\beta x^{-(2\beta+1)}$

D. $-\alpha^2\beta x^{-(\beta+1)}$

Answer:

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6. A particle moves along a path $y = ax^2$ (where a is constant) in such a way that x-component of its velocity (u_x) remains constant. The acceleration of the particle is

A. $2a^2u_x\hat{j}$

B. $a^2u_x\hat{j}$

C. $2au_x^2\hat{j}$

D. $au_x^2\hat{j}$

Answer:

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7. A bus appears to move northwards at a speed of $20\sqrt{3}\ \mathrm{km\ h^{-1}}$ to a man driving his car eastwards with speed $20\ \mathrm{km\ h^{-1}}$. Find the velocity of the bus w.r.t ground.

A. $40ms^{-1}, 30^\circ NofE$

B. $40ms^{-1}45^\circ EofN$

C. $40ms^{-1}, 60^\circ NofE$

D. $40ms^{-1}. 30^\circ WofN$

Answer:

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8. The horizontal acceleration a that should be given to a smooth inclined plane of angle $\theta = \sin^{-1}\left(\frac{1}{z}\right)$ where z > 1, to keep a block stationary relative to the inclined plane as shown in the figure, is

A. $\frac{g}{\sqrt{z^2-1}}$

B. $g\sqrt{z^2-1}$

C. $g\sqrt{1+z^2}$

D. `g/sqrt(z^2+1)

Answer:

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9. Two blocks are connected by a long inextensible string passing over an ideal pulley as shown in the figure. If the system is released from rest then the common speed of blocks when block m_2 moves a distance I will be

A. $\frac{\sqrt{(\mu m_1 - m_2)gL}}{m_1+m_2}$

B. $\frac{\sqrt{(m_1 - m_2)gL}}{\mu(m_1 + m_2)}$

C. $\frac{\sqrt{2(m_2 - \mu m_1)gL}}{m_1 + m_2}$

D. Zero

Answer:

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10. A ball of mass m moving with velocity v collides head on elastically with another identical ball moving with velocity - V. After collision

A. Both the balls come to rest

B. One ball comes to rest and other ball travels back with velocity 2v.

C. Both balls move at right angles to their respective original directions of motion

D. Both balls move at an angle of π to their respective original direction of motion

Answer:

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11. Two identical solid cylinders are released from the top of two inclined planes of equal angles. If one cylinder is in pure rolling and other is in pure sliding motion then

A. The sliding cylinder will reach the bottom later with lower speed

B. The rolling cylinder will reach the bottom later with lower speed

C. Both reach the bottom simultaneously with different speed

D. Both reach the bottom simultaneously with same speed

Answer:

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12. If angular velocity of a point object is $\overrightarrow{\omega} = \left(\hat{i} + \hat{2}j - \hat{k}\right)$ rad/s and its position vector $\overrightarrow{r} = \left(\hat{i} + \hat{j} - 5\hat{k}\right)$m then linear velocity of the object will be

A. $\left(-9\hat{i} + 4\hat{j} - \hat{k}\right)\frac{m}{s}$

B. $\left(9\hat{i} + 4\hat{j} + \hat{k}\right)\frac{m}{s}$

C. $\left(9\hat{i} - 4\hat{j} - \hat{k}\right)\frac{m}{s}$

D. Zero

Answer: A

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13. Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by

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14. When a force of 100 N is applied on a wire of uniform cross-section as shown in figure then length of wire is increased by 1 mm. Energy stored in the wire will be

A. 0.05 J

B. 0.5 J

C. 0.1 J

D. Data is insufficient

Answer:

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15. A current I is flowing through a long straight solid conductor of radius R = 4 cm. Magnetic field at a distance 2 cm from the axis of conductor is B_0 The distance from the axis, where magnetic field is 1.5 B_0 is (current density is uniform)

A. 3 cm

B. $\frac{16}{3}$ cm

C. 6 cm

D. Both (1) and (2)

Answer:

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16. A capillary tube is dipped in water as shown in the figure. If P_0 is the atmospheric pressure, P_A and P_B are pressure at A and B respectively

then

A. $P_A = P_B = P_0$

B. $P_A < P_0, P_B > P_0$

C. $P_A < P_0, P_B = P_0$

D. $P_A = P_0, P_B > P_0$

Answer:

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17. Triple point temperature of water is

A. 273 K

B. 273.15 K

C. 373.16 K

D. 273.16 K

Answer:

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18. Water is filled up to same level in two identical flasks at 4° If one (say A) is heated while other (B) is cooled, then (Neglect expansion or contraction of flasks)

A. Water level in both flask A and 8 will rise

B. Water level in both flask A and B will fall

C. Water level will rise in flask A and fall in flask B

D. Water level will fail in flask A and rise in flask B

Answer:

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19. A Camot refrigerator has freezer at temperature -8°C. The coefficient of performance of refrigerator is 5. The temperature of surrounding in which heat is rejected, will BE

A. 65°C

B. 45°C

C. 300°C

D. 320°C

Answer:

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20. A gaseous mixture consists of 16 g of O_2 and 16 g of He at temperature T. Neglecting the vibrational modes, total internal energy of the system is

A. 24 RT

B. 17 RT

C. 29 RT

D. $\frac{29}{4}RT$

Answer:

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21. A particle executing SHM has potential energy $U_0 \sin^2 \omega t$. The maximum kinetic energy and total energy respectively are

A. U_0 and $2U_0$

B. $\frac{U_0}{2}$ and U_0

C. U_0 and U_0

D. 0 and $2U_0$

Answer:

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22. When an oscillator completes 50 oscillations its amplitude reduced to half of initial value (A_0). The amplitude of oscillation, when it completes 150 oscillations is

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

B. $\frac{A_0}{6}$

C. $\frac{A_0}{8}$

D. $\frac{A_0}{0}$

Answer:

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23. The equation of a travelling wave is given as $y = A\sin 2\pi(\alpha t - \beta x).\, Theratioof\ \max\ i\mu mpartic \leq speed \rightarrow wavespee$ alpha, beta` are constants)

A. $2\pi\beta A$

B. $\frac{2\pi\alpha A}{\beta}$

C. $\frac{2\pi A}{\beta}$

D. $2\pi\alpha\beta A$

Answer:

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24. A car travelling with speed $\frac{V}{50}$ towards a hill, (where v is speed of sound in air), sounds a horn of frequency 196 Hz. The number of beats heard per second by the driver when reflected sound reaches the driver is

A. 8

B. 4

C. 2

D. 6

Answer:

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25. An electric dipole of dipole moment $p = 6 \cdot 10^{-4} Cm$ is placed in a uniform external electric field of intensity $2 \cdot 10^5 \left(\frac{N}{C} \right)$ as shown in the figure, The anglebetween net electric field with external electric field at point A will be `(epsilon<

A. A. 45°

B. B. 37°

C. C. 53°

D. D. 60°

Answer:

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26. In a region the potential is represented by V(x, y, z) = 8x - 6xyz - 6yz + 2xz, where V is in volts and x, and z are in metre. The magnitude of electric force y experienced by a charge of $1\mu C$ situated at point (1, 0, 1) is

A. $2\sqrt{31}\mu N$

B. $2\sqrt{62}\mu N$

C. $2\sqrt{47}\mu N$

D. $12N\mu N$

Answer:

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27. A parallel plate capacitor is charged to a potential difference of 10 volts. After disconnecting the battery, distance between the plates of capacitor is decreased by using nonconducting handles. The potential difference between the plates will

A. Become zero

B. Remain same

C. Decrease

D. Increase

Answer:

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28. A conductor having cubold shape has dimensions in ratio 1: 2:5, the ratio of maximum to minimum resistance across two opposite faces is

A. A. 0

B. B. $5:1$

C. C. $25:1$

D. D. $10:1$

Answer: C

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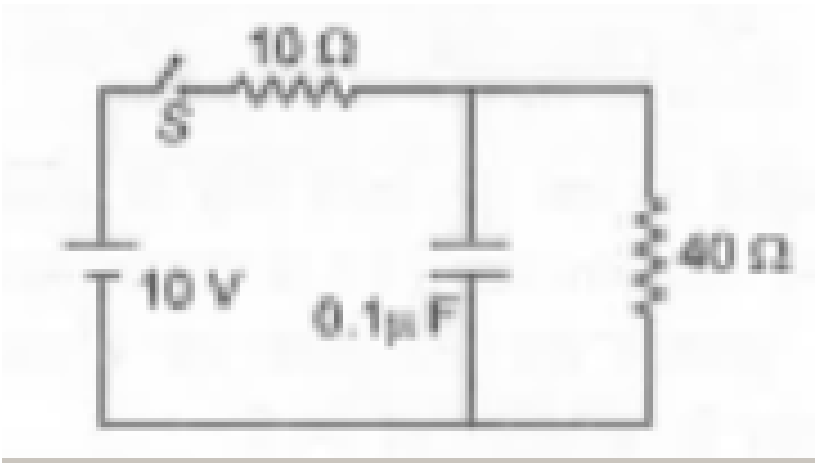
29. Two resistors of resistances 10Ω and 40Ω are connected with a capacitor of capacitance $0.1\mu F$ and ideal battery of emf 10 V. When switch (S) is closed, then initial current and current in steady state through the battery respectively are



A. 1A, 1A

B. 0.1A, 0.2 A

C. 1 A, 0.2 A

D. 0.2 A, 1A

Answer:

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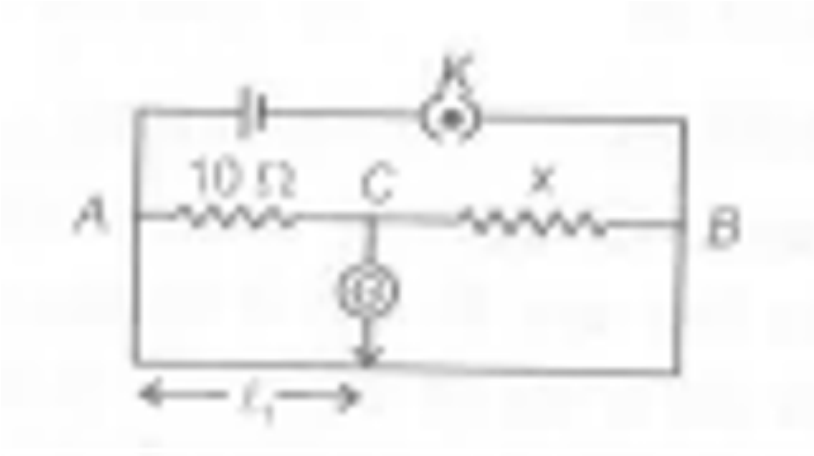
30. The resistance in two arms of the meter bridge is 10Ω and x respectively. The balance length is l_1 from left. Now the resistance of 10Ω is shunted with another resistor of resistance equal to unknown

resistance x then new balance point is $0.75l_1$ The value of resistance x is



A. 10Ω

B. 30Ω

C. 20Ω

D. 5Ω

Answer:

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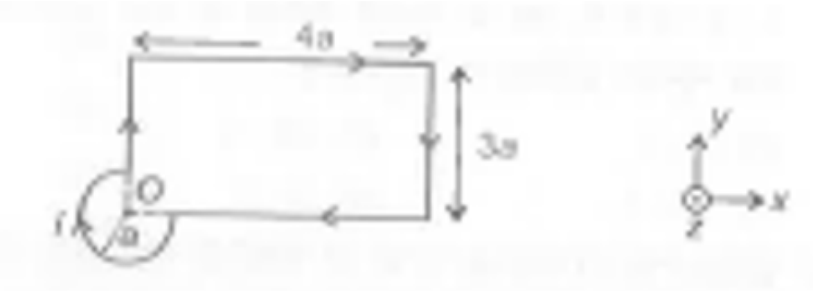
31. The magnetic field Intensity at the point o of a loop carrying current i as shown in the figure is



A. $\frac{-\mu_0 i(18\pi+5)}{48\pi a}\hat{k}$

B. $\frac{\mu_0 i}{48\pi a}(18\pi+5)\hat{k}$

C. $\frac{\mu_0 i}{24\pi a}(18\pi+5)\hat{k}$

D. $\frac{-\mu_0 i}{4\pi a}(3\pi+5)\hat{k}$

Answer:

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32. A beam of electrons is moving with uniform velocity in a region having transverse uniform electric and magnetic field of strength. 100 V/m and

0.1 T respectively at right angles to the direction of beam. The velocity of the electrons is

A. 100 m/s

B. 10 m/s

C. 1000 m/s

D. 500 m/s

Answer:

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33. A bar magnet hung by a insulating thread In a uniform horizontal magnetic field and magnet is in equilibrium Initially. The torque required to keep the magnet at angle by 30° with the direction of magnetic field is t. Then the work done to rotate it by same angle from initial position is

A. $\left(2-\sqrt{3}\right)t$

B. $\sqrt{3}t$

C. t

D. $\frac{t\left(\sqrt{3}+2\right)}{2}$

Answer:

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34. Area under magnetic field induction and magnetizing field intensity (B-H) loop gives the

A. Energy loss per cycle

B. Intensity

C. Current density

D. Energy loss per unit volume per cycle

Answer:

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35. An objective of a telescope has diameter 250 cm. The limit of resolution of telescope for wavelength 600 nm is nearly

A. A. $2.0 \cdot 10^{-7} rad$

B. B. $2.9 \cdot 10^{-7} rad$

C. C. $4.0 \cdot 10^{-7} rad$

D. D. $2.9 \cdot 10^{-8}$

Answer:

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36. In the given resonating circuit the reading of voltmeter V is 314 volt. The value of inductance L and resistance R respectively will be about

A. $1H, 220\Omega$

B. $0.1H, 200\Omega$

C. $1H, 100\Omega$

D. $0.001H2k\Omega$

Answer:

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37. The rms value of electric field of a light at a point coming from the Sun is 800 N/C. The average total energy density of light at that point is

A. $4.23 \cdot 10^{-6} Jm^{-3}$

B. $2.48 \cdot 10^{-6} Jm^{-3}$

C. $5.67 \cdot 10^{-6} Jm^{-3}$

D. $1.42 \cdot 10^{-6} Jm^{-3}$

Answer:

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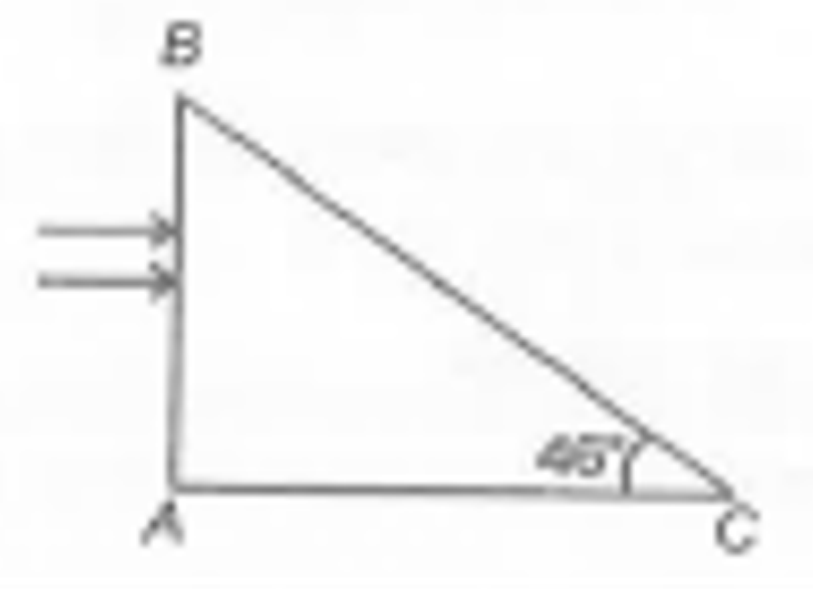
38. A parallel beam of light consisting of red and blue colour is incident on a prism as shown in the figure. The refractive indices of the prism for red is 1.40 and for blue is 1.47. The prism will $\left(\sin 44^{\circ} = \frac{1}{1.44}\right)$



A. Separate both colours and both emerges from surface BC

B. Separate both colours and only blue light emerges from surface BC

C. Separate both colours and both are reflected back from surface BC

D. Separate both colours and red colour light emerges from surface BC

Answer:

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39. The interference pattern is obtained with two coherent light sources of intensity ration n. In the interference pattern, the ratio $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ will be

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

B. $\frac{n^2 + 1}{2} n$

C. $\frac{n + 1}{n - 1}$

D. $\frac{n^2 + 1}{n^2 - 1}$

Answer: C

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40. The photoelectric threshold wavelength of a metal is 300 nm. The maximum kinetic energy of electrons ejected from the metal surface by ultraviolet light of wavelength 250 nm is nearly $\left(givenh = 4.14 \cdot 10^{-15} eVs \text{ and } c = 3 \cdot 10^{8} ms^{-1}\right)$

A. 0.828 eV

B. 4.14 eV

C. 4.968 eV

D. 1.288 eV

Answer:

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41. The hydrogen atom in ground state is excited by a monochromatic radiation of wavelength $\lambda = 1025A$. The possible number of emmision spectral lines in the spectrum will be (hc = 12400 eV A)

A. 4

B. 6

C. 5

D. 3

Answer: D

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42. A radioactive element, U_{92}^{238} undergoes successive radioactive decay and decays into Pb_{82}^{206} The number of α and β particles emitted respectively are

A. 8 and 8

B. 4 and 10

C. 8 and 6

D. 6 and 6

Answer:

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43. A radioactive sample is decayed 20% in one day. After next two days, the undecayed percentage of nuclei will be

A. A. 0.512

B. B. 0.4

C. C. 0.488

D. D. 0.6

Answer: B

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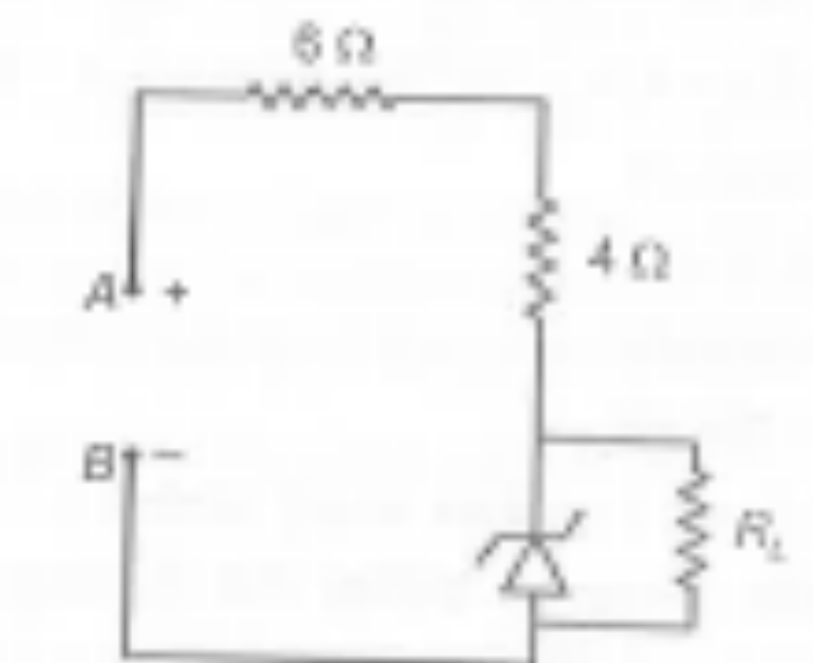
44. If the voltage between terminals A and B is 20 V and Zener breakdown voltage is 7 V then the potential difference across 6Ω resistance is



A. 6.5 V

B. 7.8 V

C. 5.2 V

D. Zero

Answer:

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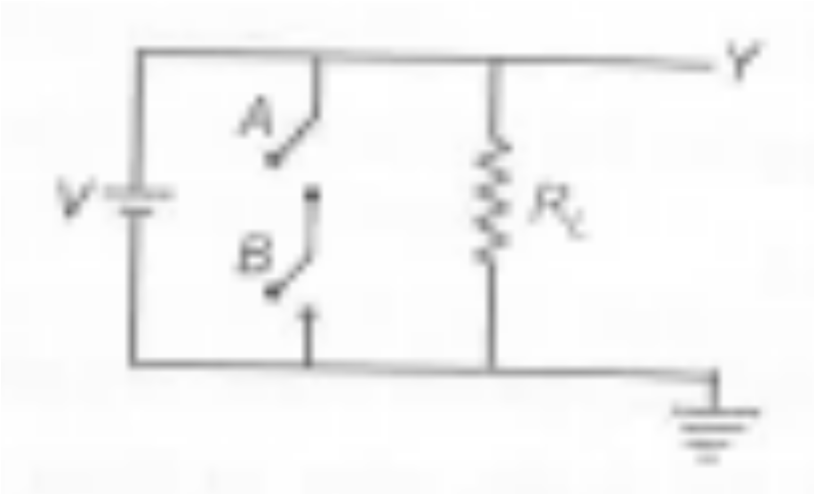
45. The logic gate realised from the circuit as shown in the figure is (A and B are inputs and Y is output)



A. OR Gate

B. AND Gate

C. NOR Gate

D. NAND Gate

Answer:

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46. A ball is dropped from a height of 20 m in the floor and rebounds to 1.25 m after second collision, then coefficient of restitution e is

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

B. $\frac{1}{5}$

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

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

Answer:

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47. If all the particles of a body is situated at distance d from origin, then the distance of CM of the body from origin is

A. gtd

B. $(\geq d)$

C. $= d$

D. $\leq d$

Answer:

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48. A particle of mass m, hits another particle in rest of mass m_2, obliquely If both the particles after elastic collision moves perpendicular to each other then $\frac{m_1}{m_2}$

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

B. 3

C. 1

D. 2

Answer:

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49. Two identical blocks A and B are connected with a spring of constant k as shown in ligure. If block B s moving rightward with speed V_0 maximum extension of spring is

A. $\left[V_0\left\{\sqrt{\frac{m}{k}}\right\}\right]$

B. Zero

C. $\left[V_0\left\{\sqrt{2\frac{m}{k}}\right\}\right]$

D. $\left[V_0\left\{\sqrt{\frac{m}{2}k}\right\}\right]$

Answer:

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50. A bomb of mass 4m explodes into two parts of mass ratio 1 : 3. If k be the kinetic energy of larger part then K.E. of small part

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

B. B. 4K

C. C. 3K

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

Answer:

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51. A ring of mass m and radius R is being rotated about its axis with angular velocity o. If o increases then tension in ring

A. Remains same

B. Zero

C. Decreases

D. Increases

Answer:

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52. The potential energy of 1 kg particle is $\left[U(x) = \left(0.25x^4\right) - \left(0.5x^2\right)\right]$ J If total mechanical energy is 2 J, then maximum KE is

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

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

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

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

Answer:

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53. A ball dropped from a height of 2 m rebounds to a height of 1.5 m after hitting the ground. Then fraction of energy lost is

A. 0.25

B. 0.4

C. 0.75

D. 0.2

Answer:

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54. When a spring is stretched by 2 cm, it stores 100J of energy. If it is further stretched by 2 cm, the increase in energy is

A. 300 J

B. 150 J

C. 100 J

D. 450 J

Answer:

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55. What is the power of an engine which can lift 600 kg of water per minute from 20 m deep well?

A. 4 kW

B. 5 kW

C. 2 kW

D. 3 kW

Answer:

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56. The component of the vector $\overline{\overline{\mathrm{A}}} = \left(2\hat{i} + 3\hat{j}\right)$ along the vector $\overline{B} = \left(\hat{i} + \hat{j}\right)$ is

A. $5\sqrt{2}$

B. $10\sqrt{2}$

C. 5

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

Answer:

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57. A vector $\overline{P}$ is along positive x axis, if $\overline{Q}$ is another vector such that $\left(\overline{P} \cdot \overline{Q}\right)$ is zero, then Q should be

A. $\left(\hat{j} + \hat{k}\right)$

B. $-4\hat{i}$

C. $-4\hat{j}$

D. $-\left(\hat{i} + \hat{j}\right)$

Answer:

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58. A solid sphere has combined linear and rotation motion as shown in figure. The velocity of its centre of mass when it starts pure rolling is (R = radius of sphere)

A. $\frac{5v_0}{6}$

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

C. $\frac{6v_0}{7}$

D. $\frac{v_0}{7}$

Answer:

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59. A sphere cannot roll on

A. Rough horizontal surface

B. Smooth inclined plane

C. Smooth horizontal surface

D. All of these

Answer:

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60. A body is rolling down an inclined plane. If kinetic energy of rotation is $40\ \%$ of kinetic energy in translatory state then the body is a.

A. Solid sphere

B. Hollow sphere

C. Ring

D. Disc

Answer:

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61. Two masses m_1 and m_2 are connected by a light rod of length I. If rod is rotating about an axis with angular speed Ω. Such that its kinetic energy is minimum then its K.E. is

A. $\left[\frac{1}{2}\frac{m_1 m_2 l^2}{m_1+m_2}\omega^2\right]$

B. $\left[\frac{1}{2}\left(m_1\omega^2 l^2\right)\right]$

C. $\left[\frac{1}{2}(m_1+m_2)\frac{l^2}{m_1 m_2}\omega^2\right]$

D. $\left[\frac{1}{2}(m_1+m_2)\omega^2 l^2\right]$

Answer:

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62. A horizontal disc is rotating about a vertical axis passing through its centre. If an insect moves from centre to rim then the angular momentum of the system

A. First decrease and then increase

B. Remains constant

C. Decreases

D. Increases

Answer:

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63. For black body radiations.Maximum radiation of 2 micrometer wavelegth is emitted at 1600K . if tempertaure is 2000K then wavelenth of spectrum is ?

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64. Four thin rods of same mass and same length L form a square Radius of gyration of this system about an axis which is perpendicular to plane of square and passes through its centre is

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

B. $\sqrt{3}L$

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

D. L

Answer:

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65. A disc of radius R has a concentric hole of radius R /2 and its mass is M. Its moment of inertia about an axis through its centre and perpendicular to its plane, is

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

B. MR^2

C. $\frac{3}{8}MR^2$

D. $\frac{5}{8}MR^2$

Answer:

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66. Consider a uniform sqare plate of side 'a' and mass 'm'. The moment of inertia of this plate about an axis perpendicular to its plane and passing through one of its corners is

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

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

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

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

Answer:

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67. If a solid cylinder rolls without slipping on an inclined plane of inclination '0' then the minimum coefficient of friction required to support pure rolling is

A. A. $\frac{1}{\sqrt{3}}\tan$

B. B. $3\sqrt{3}\tan$

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

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

Answer:

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68. A hollow sphere is released from top of an inclined plane of inclination 30 and length of inclined plane is /. If sphere rolls without slipping then its speed at bottom is

A. $\sqrt{g\frac{l}{5}}$

B. $\sqrt{3g\frac{l}{5}}$

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

D. $\sqrt{3gl}$

Answer:

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69. If a particle of mass m is thrown with speed at an angle 60° with horizontal, then angular momentum of particle at highest point about point of projection is

A. $\frac{mv_0^3}{16}g$

B. $\frac{3mv_0^3}{8}g$

C. $\frac{3mv_0^3}{16}g$

D. $\left[\frac{\sqrt{3}(mv_0^3)}{16g}\right]$

Answer:

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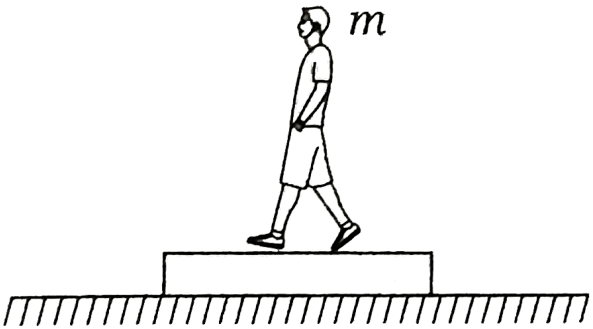
70. A man of mass m is standing on a plank of equal mass m resting on a smooth horizontal surface. The man starts moving on the plank with speed u relative to the plank. The speed of the man relative to the ground is



A. $m\frac{L}{M}$

B. ML/m

C. ml/m+M

D. ML/(m + M)

Answer:

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71. The centre of mass of a non-uniform rod of length L whose mass per unit length λ is proportional to x^2, where x is distance from one end

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

B. $\frac{5L}{4}$

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

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

Answer:

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72. A particle of mass m_1, makes a head on elastic collision with another stationary body of mass m_2 If m_1, rebounds with half of its original speed then $\left(\frac{m_1}{m_2}\right)$ is

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

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

C. 3

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

Answer:

Watch Video Solution

73. A sphere of mass m moving with a constant velocity u hits another stationary sphere of the same mass. If e is the coefficient of restitution, then ratio of velocities of the two spheres after collision will be

A. $\left[\frac{1+e^2}{1-e^2}\right]$

B. 1

C. $\left[\frac{1-e}{1+e}\right]$

D. $\left[\frac{(1-e)^2}{(1+e)^2}\right]$

Answer:

Watch Video Solution

74. Internal forces can change

A. The kinetic energy but not linear momentum of the system

B. Neither linear momentum nor kinetic energy of the system

C. Both kinetic energy and linear momentum of the system

D. The linear momentum but not the kinetic energy of system

Answer:

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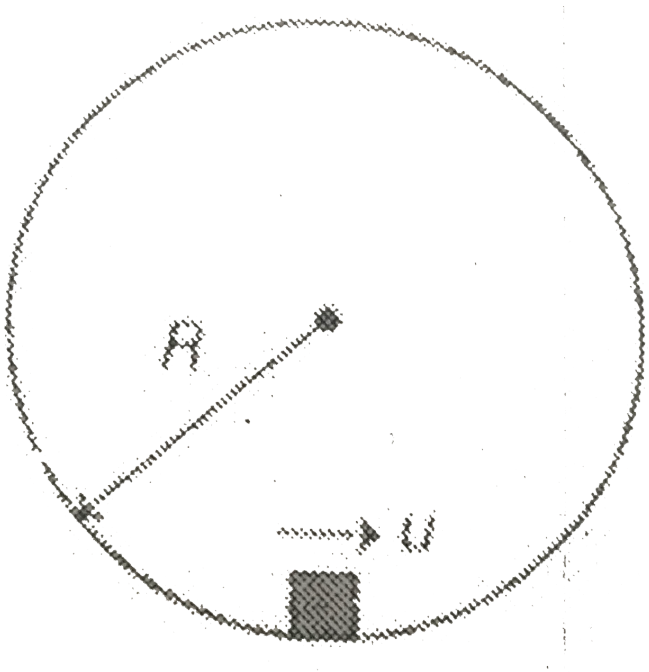
75. A particle is given an initial speed u inside a smooth spherical shell of radius $R = 1$ m such that it is just able to complete the circle.

Acceleration of the particle when its velocity is vertical is



A. $\sqrt{2}g$

B. $\sqrt{5}g$

C. $\sqrt{10}g$

D. g

Answer:

Watch Video Solution

76. Half length of the chain of mass m and length / is overhanging. What is speed of chain when it just slips off the smooth table?

A. $\sqrt{7gl}$

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

C. $\frac{1}{2}\sqrt{5gl}$

D. $\frac{1}{2}\sqrt{3gl}$

Answer:

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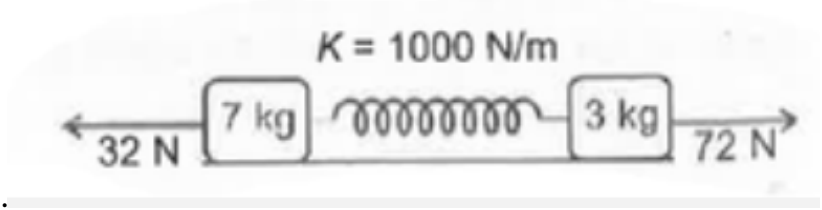
77. If both the blocks moving with constant accelerattion then extension in spring.



A. 3 cm

B. 2 cm

C. 6 cm

D. 12 cm

Answer:

Watch Video Solution

78. Which of the following statement(s) is/are incorrect regarding an elastic collision?

A. In an elastic collision, the final kinetic energy is equal to initial kinetic energy of the system

B. In an elastic collision, the final linear momentum is equal to initial linear momentum of the system

C. In an elastic collision, the linear momentum of system remains constant

D. In an elastic collision, the kinetic energy remains constant

Answer:

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79. Engine of car of mass m supplies a constant power P. Starting from rest at an instant of time, then

A. $Velocity \propto t^{\frac{3}{2}}$

B. $Velocity \propto t^{\frac{1}{2}}$

C. $Displacement \propto t^{\frac{3}{2}}$

D. Both (2) & (3)

Answer:

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80. If a solid cylinder of area of cross-section A is moving with velocity V in medium of density p then power loss of cylinder is

A. pAV^2

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

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

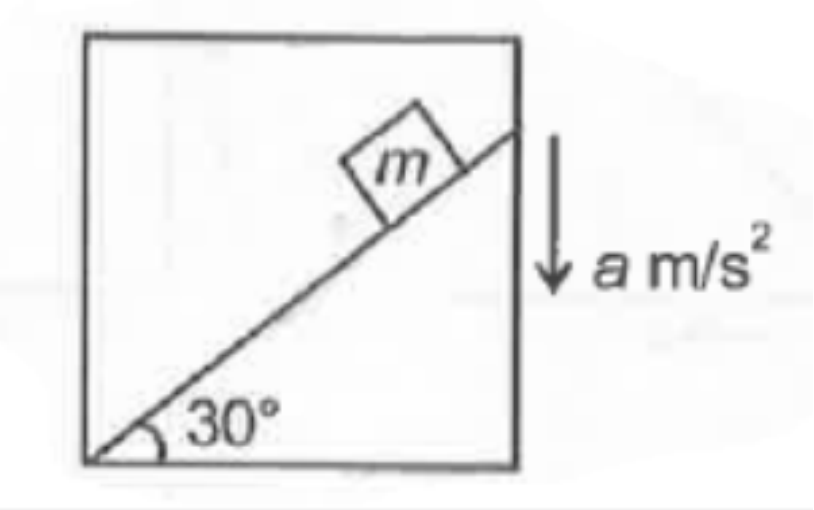
D. $\frac{1}{2}pav^2$

Answer:

Watch Video Solution

81. Friction coefficient between block and inclined plane is $\left[\mu = \frac{1}{\sqrt{3}}\right]$ if lift is moving vertically down with constant acceleration a then the value

of acceleration a so that block moves down with constant velocity is



A. $4\frac{m}{S^2}$

B. $2\frac{m}{S^2}$

C. $1\frac{m}{S^2}$

D. All of these

Answer:

Watch Video Solution

82. Two blocks M_1. and M_2, are tied with string and kept at rough surface as shown in figure. If F = (2t)N is applied on the block of mass M_1, then the friction force on the blocks at t = 2 s. is 

A. 4 N ,0 N

B. 4 N. 4 N

C. 6 N, 10 N

D. 6 N. 0 N

Answer:

Watch Video Solution

83. A balloon of mass m is descending down with an acceleration How much mass should be $\frac{g}{2}$ removed from it so that it starts moving up with same acceleration?

A. 2m/3

B. m/2

C. 3m

D. 4/3 m

Answer:

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84. A rope of length L is pulled by a constant force F. What is the tension in the rope at a distance x from the end where the force is applied ?

A. 

B. 

C. 

D. 

Answer:

Watch Video Solution

85. A person is standing at the floor of lift drops a coin The coin reaches the floor of lift in time t_1. if elevator is stationary and in time t_2, if it is moving uniformly then

A. A. $t_1 > t_2$

B. B. $t_1 = \frac{t_2}{2}$

C. C. $t_1 = t_2$

D. D. $t_1 < t_2$

Answer:

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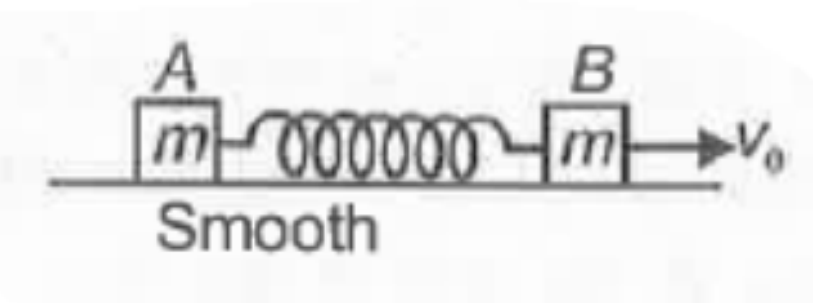
86. If a monkey moves upward with respect to the rope with acceleration g/2 then acceleration of block, if masses of block and monkey are same



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

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

C. 3g/4

D. 3g/2

Answer:

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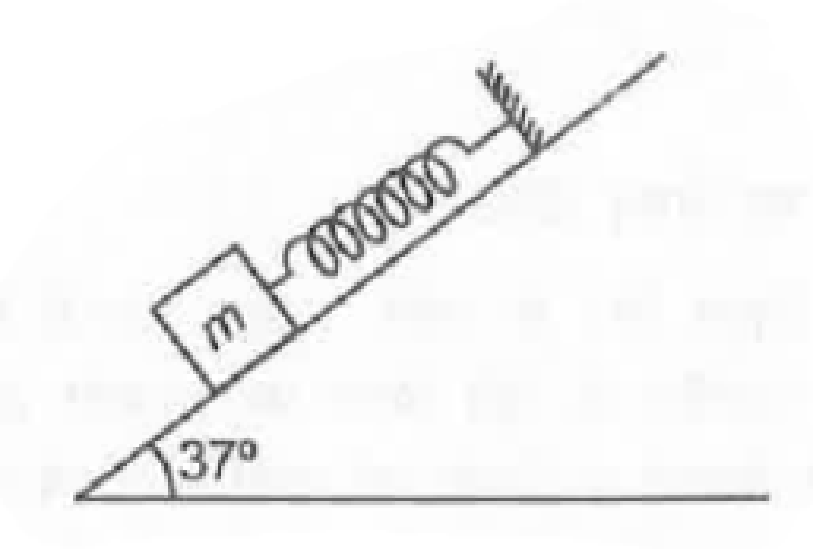
87. If extension in the spring at equilibrium position is 6 cm then acceleration of block if it is released by further stretching 4 cm.



A. $4\frac{m}{S^2}$

B. $1\frac{m}{S^2}$

C. $6\frac{m}{S^2}$

D. $2\frac{m}{S^2}$

Answer:

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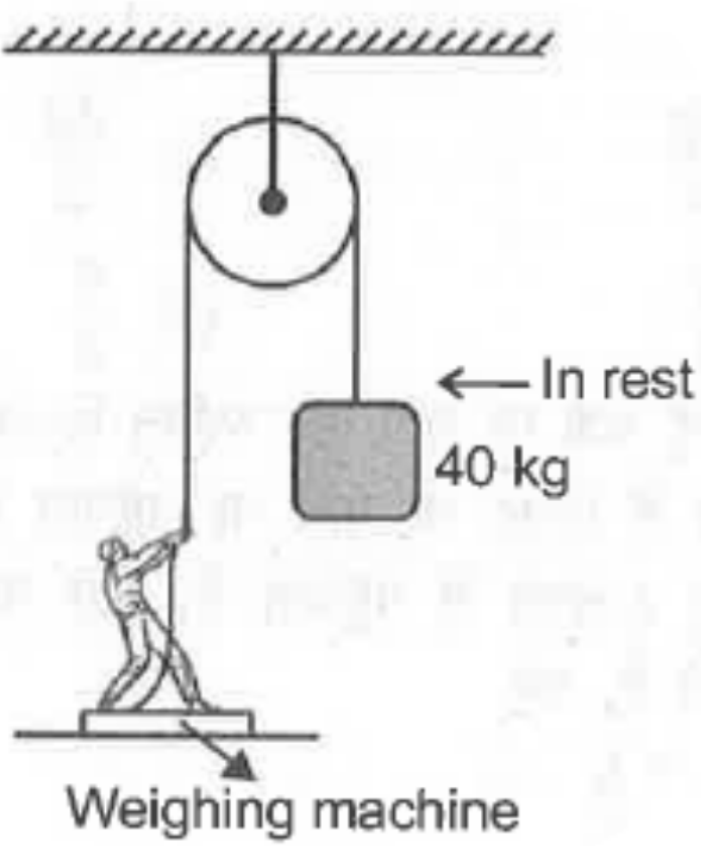
88. A 80 kg man is standing on a weightless weighing machine as shown in the figure if mass of hanging block is 40 kg, then reading of weighing



machine, is

A. 80 kg wt

B. 20 kg wt

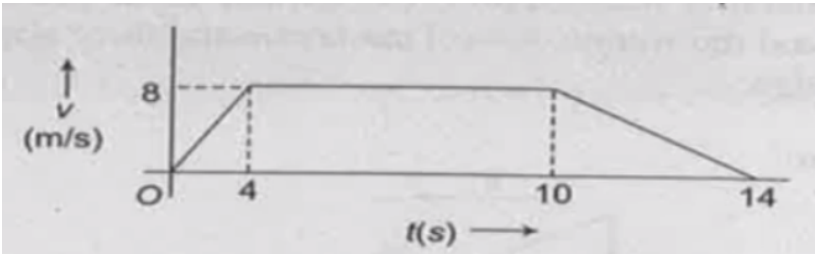
C. 40 kg wt

D. 120 kg wt

Answer:

Watch Video Solution

89. A lift is going up with variable velocity as shown in figure if mass of the lift is 2000 kg Then tension in the rope of lift at t = 5 second is



A. 20 kN

B. Zero

C. 24 kN

D. 16 KN

Answer:

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90. Which of the following waves has the longest wavelength?

A. Television and FM radio

B. Infrared

C. X-rays

D. Gamma rays

Answer:

Watch Video Solution

91. Electromagnetic wave cannot be produced by

A. A. Stationary charge

B. B. Uniformly moving charge

C. C. Accelerating charge

D. D. Both (1) and (2)

Answer:

Watch Video Solution

92. Which of the following statements is correct about the electromagnetic wave?

A. Both electric and magnetic field vectors are in opposite phase

B. Electromagnetic wave always requires a medium for propagation

C. The energy in the electromagnetic wave is divided equally between electric and magnetic fields

D. Both (2) and (3)

Answer:

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93. An electromagnetic wave is radiated by a 100 W bulb. If efficiency of the bulb is 20% then the amplitude of magnetic field at a distance of 1 m is (consider bulb as a point source)

A. $\sqrt{\frac{4}{3}} \cdot 10^{-7}\mathrm{T}$

B. $\sqrt{\frac{2}{3}} \cdot 10^{-7}\mathrm{T}$

C. $2 \cdot 10^{-7}\mathrm{T}$

D. $5 \cdot 10^{-7}\mathrm{T}$

Answer:

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94. A parallel plate capacitor consist of two circular plates of area $0.04m^2$ each. They are separated by a distance 0.4 mm. If displacement current between the plates is 6A then rate of change in electric field between the plate w.r.t. time will be

A. $1.7x10^{10}Vm^{-1}{}'s^{-1}$

B. $1.7x10^{13}Vm^{-1}{}'s^{-1}$

C. $3.7x10^{11}Vm^{-1}{}'s^{-1}$

D. $4.7x10^{12}Vm's - 1Vm^{-1}{}'s^{-1}$

Answer:

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95. The poynting vector in vaccum is represented by (where symbols have their usual meanings)

A. $\vec{S} = \frac{\vec{B} x \vec{E}}{\mu_0}$

B. $\vec{S} = \frac{\vec{E} x \vec{B}}{\mu_0}$

C. $\vec{S} = \frac{\vec{E} . \vec{B}}{\mu_0}$

D. $\vec{S} = \frac{\leftrightarrow \vec{B} . \vec{E}}{\mu_0}$

Answer:

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96. If the electric field component of an electromagnetic wave moving in positive x direction is given by $\vec{E} = 6\cos\left[1.2x - 3.6 \cdot 10^8 t\right]\hat{j}\frac{N}{C}$ then the equation of magnetic field of the electromagnetic wave will be

A. $\vec{B} = 2 \cdot 10^{-8}\cos\left(1.2x + 3.6 \cdot 10^8 t\right)T\hat{k}$

B. $\vec{B} = 2 \cdot 10^{-8}\cos\left(1.2x - 3.6 \cdot 10^8 t\right)T\hat{k}$

C. $\vec{B} = 2 \cdot 10^{7}\cos\left(1.2x + 3.6 \cdot 10^8 t\right)T\hat{i}$

D. $\vec{B} = 2 \cdot 10^{7}\cos\left(1.2x - 3.6 \cdot 10^8 t\right)T\hat{i}$

Answer:

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97. Choose the correct statement about the choke coil

A. A. It has high resistance and low inductance

B. B. It has high inductance and low resistance

C. C. It has high capacitance and low resistance

D. D. Both (1) and (2)

Answer:

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98. In an L-C oscillation maximum charge on capacitor can be Q_0 . If at any instant electrical energy is th $\frac{3}{4}$ of the magnetic energy then the charge on capacitor at that instant is

A. $\frac{2Q_0}{3}$

B. $\sqrt{\frac{3}{7}}Q_0$

C. $\frac{3}{7}Q - 0$

D. $\sqrt{\frac{2}{3}}Q_0$

Answer:

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99. A current of 2A is flowing at 220 V in the primary coil of a transformer. If current in the secondary coil is 1 A and efficiency of the transformer is 80% then the voltage produced in the secondary coil will be

A. 176 V

B. 352 V

C. 528 V

D. 220 V

Answer:

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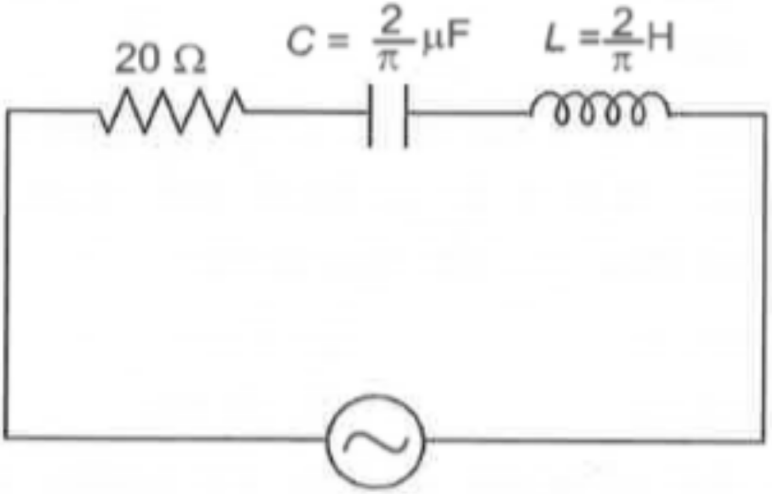
100. In an AC circuit as shown in the figure, the source is of r.m.s voltage 200 V and variable frequency. At resonance, the circuit



A. Has a r.m.s current 10 A

B. Has a resonant frequency 250 Hz

C. Has voltage across capacitor, inductor and resistor in same phase

D. Both (1) and (2)

Answer:

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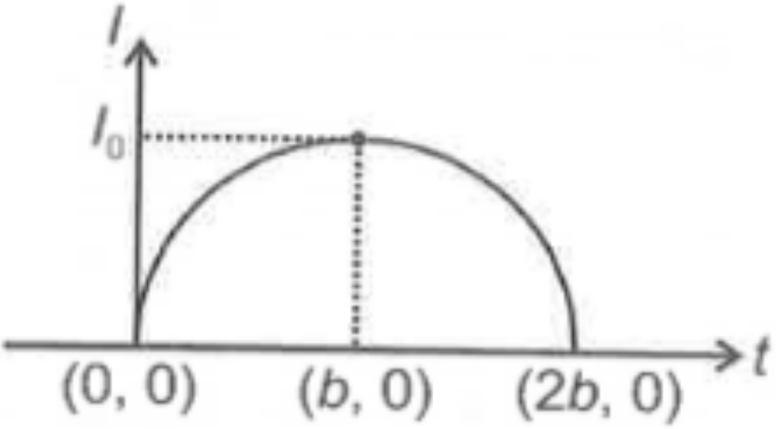
101. The mean value of semi-circular current wave form as shown in figure for time interval t = 0 to t = 2b is



A. $\frac{(\pi)I_0}{4}$

B. $(\pi)I_0$

C. $\frac{(\pi)I_0}{2}$

D. $2(\pi)I_0$

Answer:

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102. A capacitor of capacitance 2 mF and resistor of resistance 12 Ω are connected in series with voltage source

$V = (195\sqrt{2}(V))\left[\sin\left(100\frac{rad}{s}\right)t\right]$ - The average power dissipated in the circuit will be

A. 2700 W

B. 1170 W

C. 1500 W

D. 1080 W

Answer:

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103. The current in an AC circuit is given by$I = I_0$ sin (50 π)/t` where t is in second. The time interval in which it will reach from zero to its peak value is

A. 10 ms

B. 5 ms

C. 20 ms

D. 15 ms

Answer:

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104. In a series AC circuit containing a capacitor and a resistor only

A. Voltage must lead current

B. Voltage may lead current

C. Voltage must lag current

D. Voltage and current must be in same phase

Answer:

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105. A current is given by I= (3 + 2 sin ωt) A. Its root mean square value over one time period will be

A. $\sqrt{7}A$

B. $\sqrt{11}A$

C. $5A$

D. $7A$

Answer:

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106. An inductor of reactance $X_L = 4\Omega$ and resistor of resistance $R = 3\Omega$ are connected in series with a voltage source of emf $\varepsilon = (20V)\left[\sin\left(100\pi\left(\frac{rad}{s}\right)\right)t\right]$. The current in the circuit at any time t will be

A. $I = (4A)\left[\sin\left(100\pi\left(\frac{rad}{s}\right)\right)t + 37^\circ\right]$

B. $I = (4A)\left[\sin\left(100\pi\left(\frac{rad}{s}\right)\right)t - 37^{\circ}\right]$

C. $I = (4A)\left[\sin\left(100\pi\left(\frac{rad}{s}\right)\right)t + 53^{\circ}\right]$

D. $I = (4A)\left[\sin\left(100\pi\left(\frac{rad}{s}\right)\right)t - 53^{\circ}\right]$

Answer:

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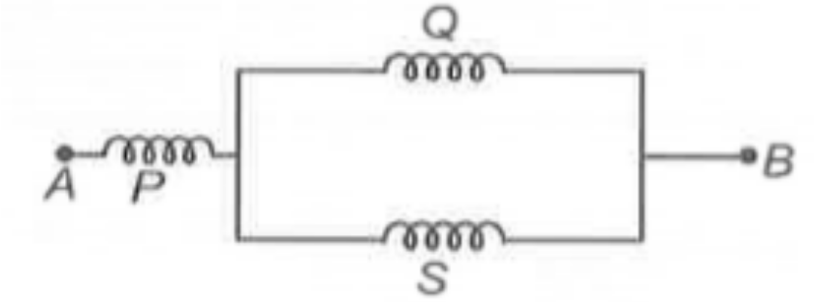
107. Three identical inductors are connected as shown in the figure. At the instant when current in inductor P is increasing at the rate of 0.0320 As^{-1} then magnitude of induced emf in it is 0.080 V. The equivalent inductance between the points A and B will be



A. $\frac{15}{2}H$

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

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

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

Answer:

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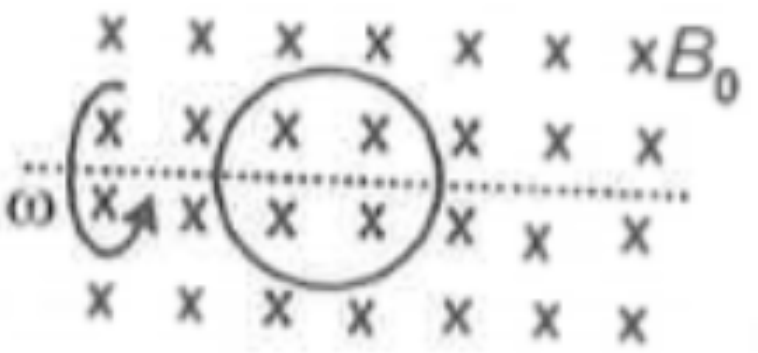
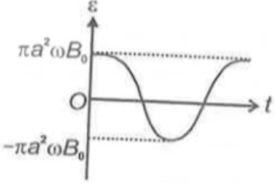
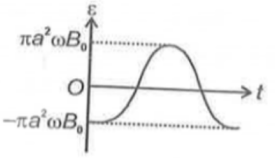
108. A circular loop of radius 'a' is rotated in a uniform magnetic field B, with constant angular velocity o about diameter as shown in the figure. Choose the correct graph of induced emf & versus time t. (consider at t = 0 area vector of loop is in the direction of magnetic field)



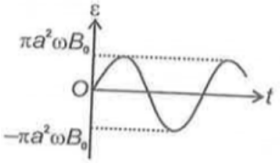
A.



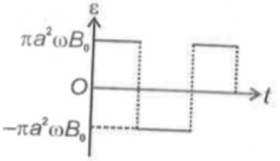
B.



C.



D.



Answer:

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109. An inductor of inductance L = 8 H and a resistor of resistance R = 2Ω are connected in series with a battery of emf E = 10 V as shown in the

figure. If the switch is closed at t = 0, then the voltage drop across the inductor at t = 1 s will be in volts)

A. $\frac{5}{2}e^{-\frac{1}{2}}$

B. $5e^{-\frac{1}{4}}$

C. $\frac{5}{8}e^{-\frac{1}{2}}$

D. $10e^{-\frac{1}{4}}$

Answer:

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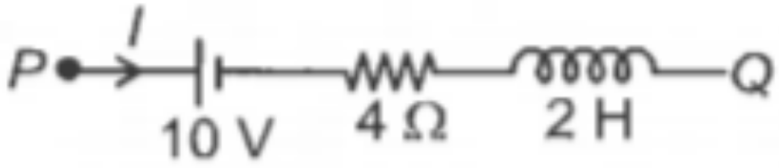
110. In the given branch PQ of a circuit, a current / = (2+ + 3) A is flowing where t is time in second. Then the value of potential difference $(V_p - V_q)$ at t = 2 s will be



A. 24 V

B. 42 V

C. 34 V

D. Zero

Answer:

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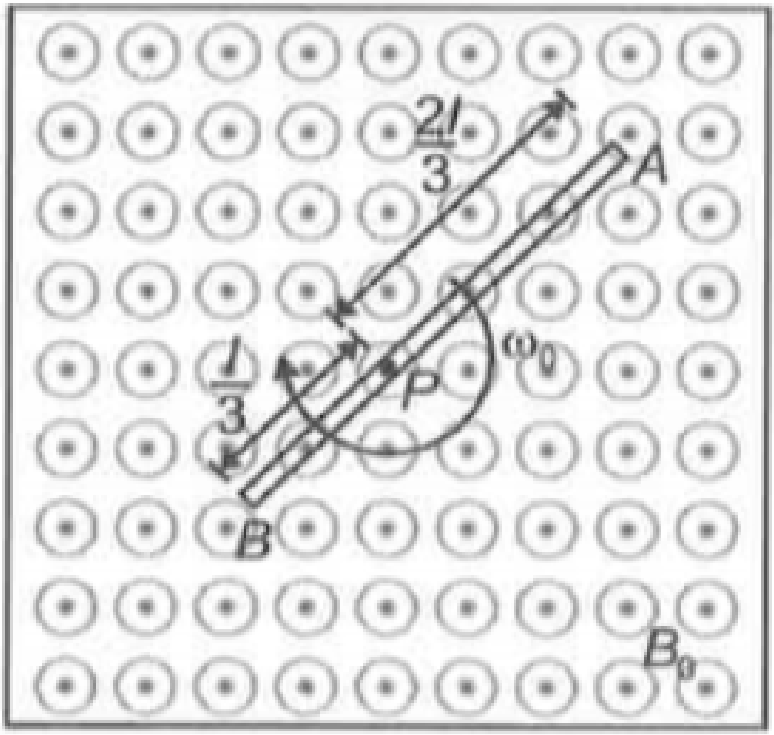
111. A conducting rod of length / is rotating about point Pin a uniform transverse magnetic field B_0 as shown in the figure. If angular speed of the rod is ω_0 then the magnitude of induced emf across the ends of the

rod will be $\left(PA = 2\frac{l}{3} \text{ and } PB = \frac{l}{3}\right)$



A. $\frac{B_0\omega_0 l^2}{6}$

B. $\frac{B_0\omega_0 l^2}{12}$

C. $\frac{B_0\omega_0 l^2}{2}$

D. $\frac{5B_0\omega_0 l^2}{18}$

Answer:

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112. A circular loop of radius r is placed at the center of current carrying conducting square loop of side a. If both loops are coplanar and a >> r, then the mutual inductance between the loops will be

A. A. $\frac{\mu_0 r^2}{2\sqrt{2}(a)}$

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

C. C. $\frac{2\sqrt{2}\mu_0 r^2}{\pi a}$

D. D. $\frac{\mu_0 r^2}{4\sqrt{2}(a)}$

Answer:

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113. A uniform conducting rod of length I is moving with speed v_0 in a uniform transverse magnetic field B_0 as shown in figure. The emf developed across the two ends of the rod will be

A. $B_0 l v_0$ and A is at higher potential

B. $\frac{B_0 l v_0}{2}$ and A is at higher potential

C. $B_0 l v_0$ and B is at higher potential

D. $\frac{B_0 l v_0}{2}$ and B is at higher potential

Answer:

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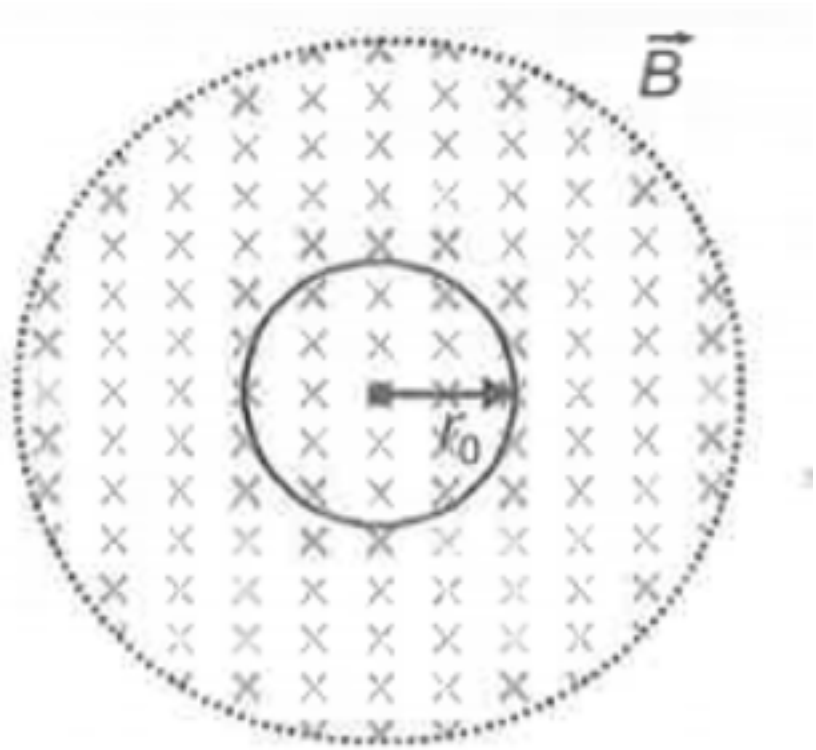
114. A circular conducting coil of radius r_0, having resistance R is placed in a time varying transverse uniform magnetic field $B = 4t^2$ as shown in the

figure. The current in the coil at time t = 2 s is (consider all quantities are



in Si units)

A. $\frac{16\pi r_0^2}{R}$

B. $\frac{4\pi r_0^2}{R}$

C. $\frac{8\pi r_0^2}{R}$

D. $\frac{\pi r_0^2}{R}$

Answer:

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115. A bar magnet of magnetic moment M is gently placed inside the two mutually perpendicular magnetic field $B_V = 6T$ and $B_H = 2T$. The net torque on the bar magnet will be zero

A. When it makes angle$\Theta = \tan^{-1}\left(\frac{3}{2}\right)$ with the vertical field

B. When it makes angle$\Theta = \tan^{-1}\left(\frac{1}{3}\right)$ with the vertical field

C. When it makes angle$\Theta = \tan^{-1}\left(\frac{1}{3}\right)$ with the horizontal field

D. When it makes angle$\Theta = \tan^{-1}\left(\frac{2}{3}\right)$ with the horizontal field

Answer:

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116. At a place true dip angle is 60°. The apparent dip when plane of dip circle is at an angle of 30° with the magnetic meridian is

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

B. $\tan^{-1}(4)$

C. 45°

D. $\tan^{-1}(2)$

Answer:

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117. A bar magnet of magnetic moment M is hung by a thin cotton thread in a uniform magnetic field B. Work done by the external agent to rotate the bar magnet from stable equilibrium position to 120° with the direction of magnetic field is (consider change in angular speed is zero)

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

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

C. C. MB

D. D. $\frac{-MB}{2}$

Answer:

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118. A magnetising field intensity of 1000 $\frac{A}{m}$ produces a magnetic flux density 0.25 $\frac{Wb}{m^2}$ in a ferromagnetic substance. The relative permeability of ferromagnetic substance is (Approximately)

A. A. $2.0 \cdot 10^4$

B. B. $2.0 \cdot 10^2$

C. C. $4.0 \cdot 10^3$

D. D. $1.0 \cdot 10^5$

Answer:

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119. Choose the correct graph of variation of magnetic susceptibility X_m of paramagnetic substance versus absolute temperature T.

A. 

B. 

C. 

D. 

Answer:

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120. Orientation of two identical small bar magnet of magnetic moment 'M' is as shown in figure. The magnitude of magnetic field at the point which lies on equatorial line of one magnet and axial line of another magnet is (r >> size of magnet)

A. $\left(\frac{\mu_0 M}{4\pi r^3}\right)$

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

C. $\frac{\sqrt{5}\mu_0 M}{4\pi r^3}$)

D. $\frac{\mu_0 M}{2\pi r^3}$)

Answer:

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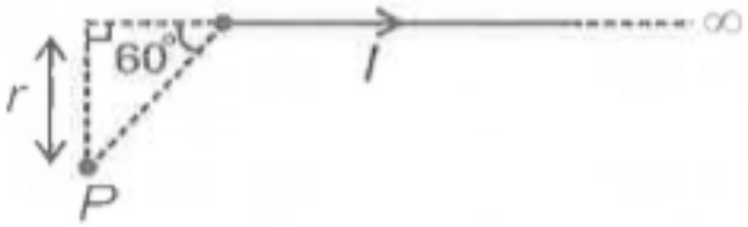
121. A conducting wire carrying current I is shown in the figure. The magnitude of magnetic field at the point P will be



A. $\frac{\mu_0 I}{2\pi r}$)

B. $\frac{\mu_0 I}{4\pi r}$)

C. $\frac{\mu_0 I}{8\pi r}$)

D. Zero

Answer:

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122. Two co-axial hollow cylinders of radius a and 2a having current I and $3\frac{I}{2}$ in opposite directions respectively as shown in the figure. The ratio of the magnitude of magnetic field at the point P and point Q will be $\left(OP = 3\frac{a}{2} \text{ and } OQ = 5\frac{a}{2}\right)$

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

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

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

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

Answer:

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123. Current sensitivity of a moving coil galvanometer is independent of

A. The number of turns in the coil

B. The magnitude of magnetic field

C. The current in the coil

D. The area of the coil

Answer:

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124. A uniformly charged ring having linear charge density λ is rotating in X-Y plane with uniform angular speed o about its own axis inside the uniform magnetic field B along the y direction. The magnitude of maximum torque acting on the ring about its diameter is

A. $\lambda\omega B\pi R^3$

B. $\frac{\lambda\omega B\pi R^3}{2}$

C. $2\lambda\omega B\pi R^3$

D. $3\lambda\omega B\pi R^3$

Answer:

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125. A positively charged particle is moving along the positive x-axis in a unifom electric field $\overrightarrow{E} = E_0\hat{j}$ and magnetic field $\overrightarrow{B} = B_0\hat{k}$ (where E_0 and B_0 are positive constants), then

A. Particle must deflect towards positive y-axis

B. Particle may deflect towards positive z-axis

C. Kinetic energy of the particle must remain same

D. Particle may pass undeflected

Answer:

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126. The magnetic field at a distance X from the centre, on the axis of a circular coil of radius R is $\frac{1}{27}$ th of that at the center. The value of X is

A. $\sqrt{2}R$

B. $2\sqrt{2}R$

C. 2 R

D. $\sqrt{3}R$

Answer:

Watch Video Solution

127. The magnetic dipole moment of a current carrying conducting loop depends on

A. Magnetic field in which it is lying

B. Area of the loop

C. Current in the loop

D. Both (2) and (3)

Answer:

Watch Video Solution

128. A long straight conducting solid cylindrical wire of radius R carries a steady current / that is uniformly distributed throughout the cross section of the wire. Draw graph of magnetic field B versus r (where r is distance from the axis of the wire)

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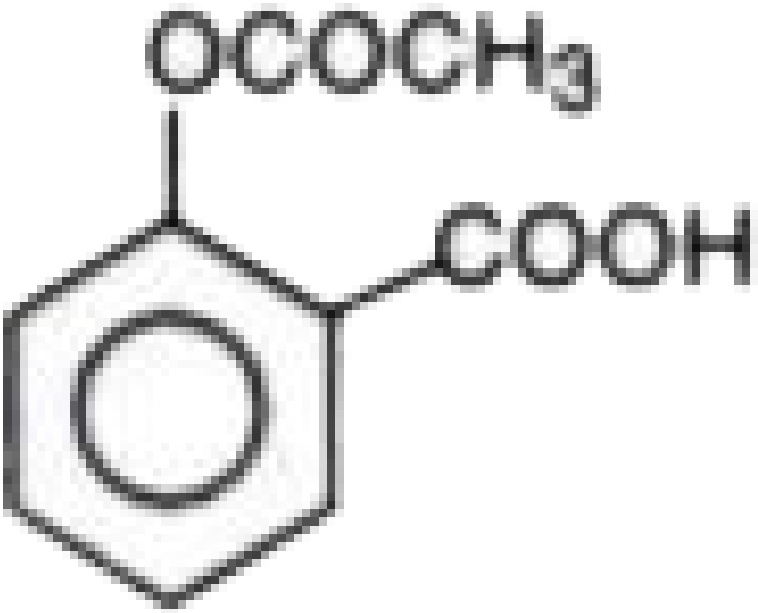
129. The compound



is used as

A. $\frac{\mu_0 I}{4\pi R}\left(\left(\frac{\pi}{2}\right)+1\right)$

B. $\frac{\mu_0 I}{4R}\left(\left(\frac{\pi}{2}\right)+1\right)$

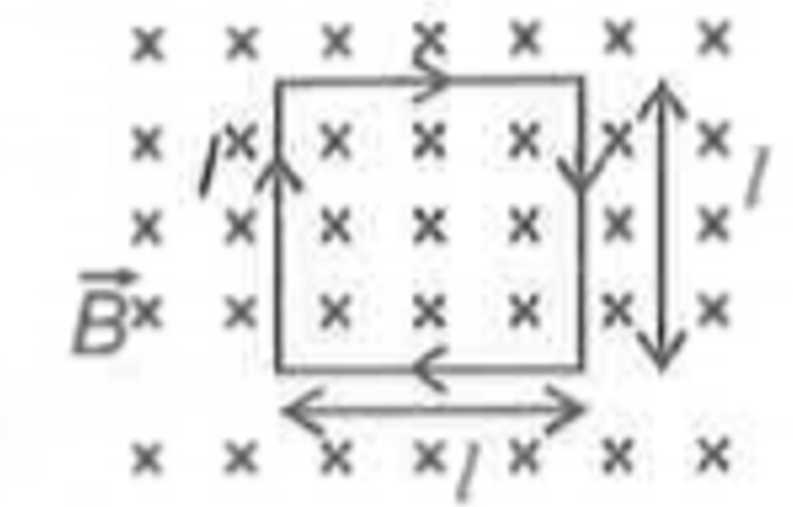
C. $\frac{\mu_0 I}{4\pi R}\left(\left(\frac{\pi}{4}\right)+1\right)$

D. $\frac{\mu_0 I}{8R}\left(\left(\frac{\pi}{2}\right)+1\right)$

Answer:

Watch Video Solution

130. A current carrying conducting square frame of side I carrying current I is placed in a uniform transverse magnetic field $\vec{B}$ as shown in the figure. Choose the incorrect statement.



A. Magnitude of force on the frame is 4IlB

B. Magnitude of torque on the frame II^2B

C. Torque on the frame is zero

D. Both (1) and (2)

Answer:

Watch Video Solution

131. A current carrying conducting circular arc which is making an angle 60^{o} at its geometrical center is placed in a uniform transverse magnetic field B as shown in the figure. If radius of the arc is 50 cm, current in the wire is 2A and magnetic filed intensity is 2T, then the magnitude of magnetic force on the arc will be

A. 1 N

B. 4 N

C. 2 N

D. Zero

Answer:

Watch Video Solution

132. A proton and an alpha particle projected with same velocity in uniform transverse magnetic field then

A. Proton will have greater frequency than alpha particle

B. Alpha particle will have greater frequency than proton

C. Both the particles will have same frequency

D. Their frequencies cannot be compared

Answer:

Watch Video Solution

133. A point charge $+q_0$ is projected in a magnetic field $\overrightarrow{B} = \left(\hat{i} + 2\hat{j} - 3\hat{k}\right)$. If acceleration of the particle is $\overrightarrow{a} = \left(2\hat{i} + b\hat{j} + \hat{k}\right)$ then value of b will be

A. 1

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

C. 2

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

Answer:

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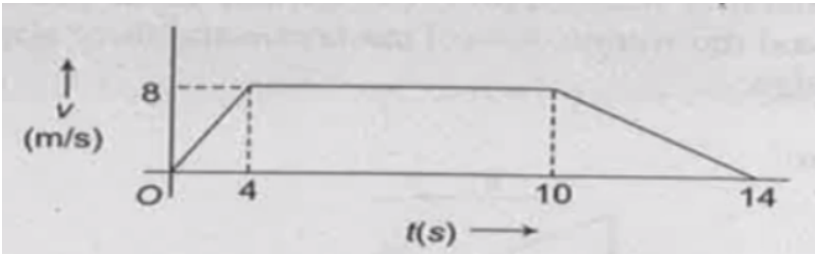
134. A lift is going up with variable velocity as shown in figure if mass of the lift is 2000 kg Then tension in the rope of lift at t = 5 second is



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

B. $\frac{1}{5}$

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

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

Answer:

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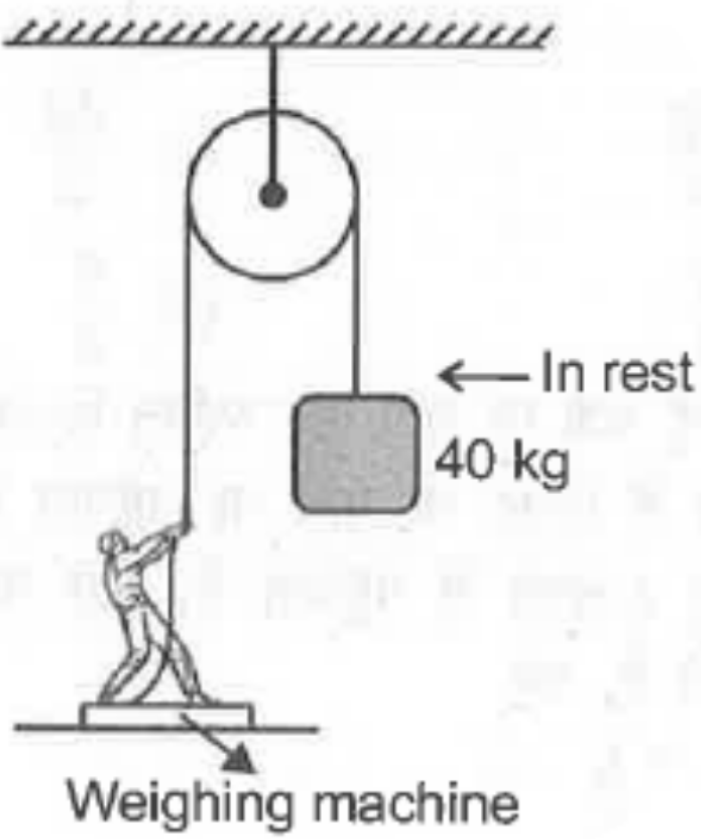
135. A 80 kg man is standing on a weightless weighing machine as shown in the figure if mass of hanging block is 40 kg, then reading of weighing machine, is



A. gtd

B. $(\geq d)$

C. $= d$

D. $\leq d$

Answer:

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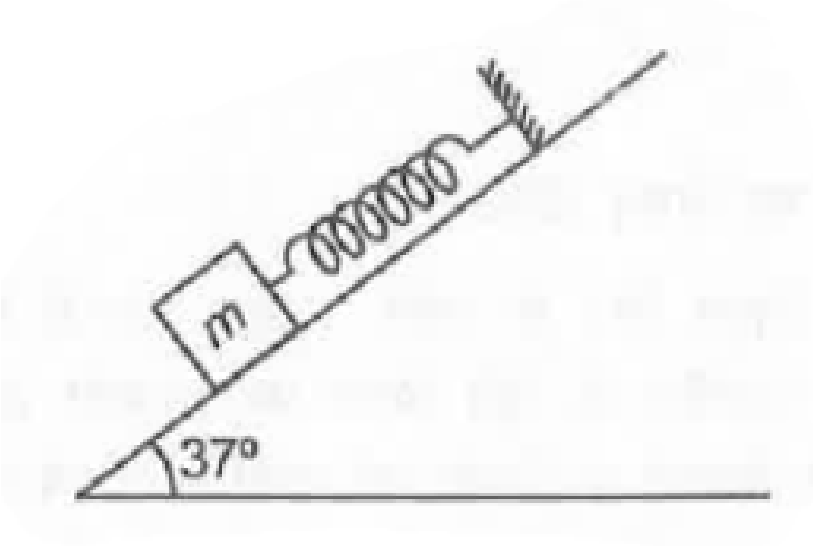
136. If extension in the spring at equilibrium position is 6 cm then acceleration of block if it is released by further stretching 4 cm.



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

B. 3

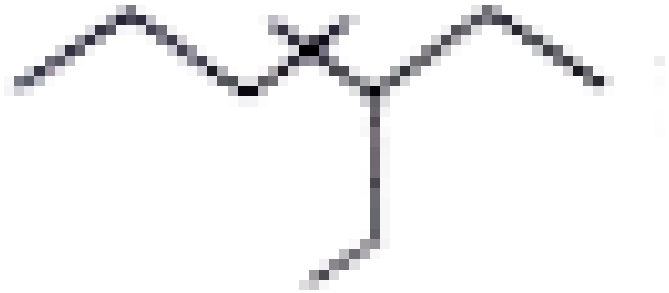
C. 1

D. 2

Answer:

Watch Video Solution

137. The IUPAC name of



is

A. $\left[V_0\left\{\sqrt{\frac{m}{k}}\right\}\right]$

B. Zero

C. $\left[V_0\left\{\sqrt{2\frac{m}{k}}\right\}\right]$

D. $\left[V_0\left\{\sqrt{\frac{m}{2}k}\right\}\right]$

Answer:

Watch Video Solution

138. A person is standing at the floor of lift drops a coin The coin reaches the floor of lift in time t_1. if elevator is stationary and in time t_2, if it is moving uniformly then

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

B. 4K

C. 3K

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

Answer:

Watch Video Solution

139. A rope of length L is pulled by a constant force F. What is the tension in the rope at a distance x from the end where the force is applied ?

A. Remains same

B. Zero

C. Decreases

D. Increases

Answer:

Watch Video Solution

140. A balloon of mass m is descending down with an acceleration How much mass should be $\frac{g}{2}$ removed from it so that it starts moving up with same acceleration?

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

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

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

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

Answer:

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141. Two blocks M_1. and M_2, are tied with string and kept at rough surface as shown in figure. If F = (2t)N is applied on the block of mass M_1, then the friction force on the blocks at t = 2 s. is 

A. 0.25

B. 0.4

C. 0.75

D. 0.2

Answer:

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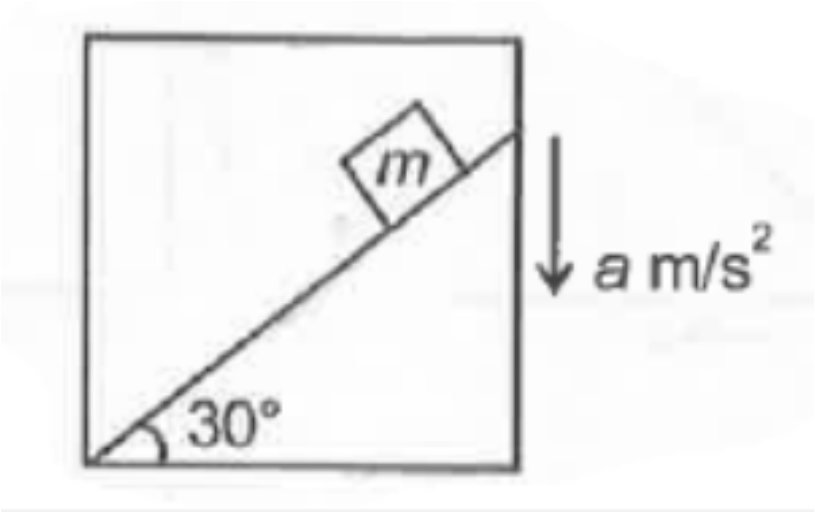
142. Friction coefficient between block and inclined plane is $\left[\mu = \frac{1}{\sqrt{3}}\right]$ if lift is moving vertically down with constant acceleration a then the value of acceleration a so that block moves down with constant velocity is



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143. If an electron is moving with velocity v produces a magnetic field $\vec{B}$, then

A. 4 kW

B. 5 kW

C. 2 kW

D. 3 kW

Answer:

Watch Video Solution

144. Engine of car of mass m supplies a constant power P. Starting from rest at an instant of time, then

A. $5\sqrt{2}$

B. $10\sqrt{2}$

C. 5

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

Answer:

Watch Video Solution

145. Which of the following statement(s) is/are incorrect regarding an elastic collision?

A. $\left(\hat{j}+\hat{k}\right)$

B. $-4\hat{i}$

C. $-4\hat{j}$

D. $-\left(\hat{i}+\hat{j}\right)$

Answer:

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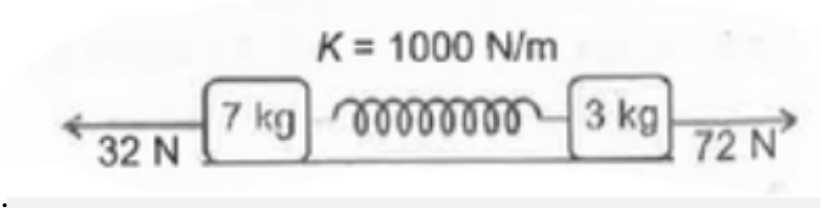
146. If both the blocks moving with constant accelerattion then extension in spring.



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147. Half length of the chain of mass m and length / is overhanging. What is speed of chain when it just slips off the smooth table?

A. Rough horizontal surface

B. Smooth inclined plane

C. Smooth horizontal surface

D. All of these

Answer:

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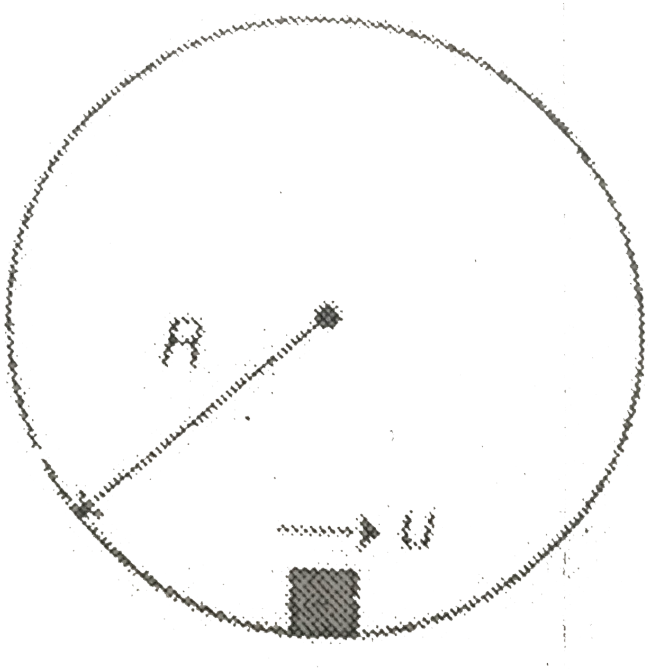
148. A particle is given an initial speed u inside a smooth spherical shell of radius $R = 1$ m such that it is just able to complete the circle.

Acceleration of the particle when its velocity is vertical is



A. Solid sphere

B. Hollow sphere

C. Ring

D. Disc

Answer:

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149. Internal forces acting within a system of particles can alter

A. $\left[\frac{1}{2}\frac{m_1 m_2 l^2}{m_1+m_2}\omega^2\right]$

B. $\left[\frac{1}{2}\left(m_1\omega^2 l^2\right)\right]$

C. $\left[\frac{1}{2}(m_1+m_2)\frac{l^2}{m_1 m_2}\omega^2\right]$

D. $\left[\frac{1}{2}(m_1+m_2)\omega^2 l^2\right]$

Answer:

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150. A sphere of mass m moving with a constant velocity u hits another stationary sphere of the same mass. If e is the coefficient of restitution, then ratio of velocities of the two spheres after collision will be

A. First decrease and then increase

B. Remains constant

C. Decreases

D. Increases

Answer:

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151. A particle of mass m_1, makes a head on elastic collision with another stationary body of mass m_2 If m_1, rebounds with half of its original speed then $\left(\frac{m_1}{m_2}\right)$ is

A. Rolling

B. Linear and rotational

C. Pure linear motion

D. Pure rotational motion

Answer:

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152. The centre of mass of a non-uniform rod of length L whose mass per unit length λ is proportional to x^2, where x is distance from one end

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

B. $\sqrt{3}L$

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

D. L

Answer:

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153. A man of mass m is standing at one end of a trolley of mass Mand length L placed at rest on a smooth horizontal surface. The man starts moving towards the other end and covers distance L, then distance moved by man w.r.t ground is

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

B. MR^2

C. $\frac{3}{8}MR^2$

D. $\frac{5}{8}MR^2$

Answer:

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154. If a particle of mass m is thrown with speed at an angle 60° with horizontal, then angular momentum of particle at highest point about point of projection is

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

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

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

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

Answer:

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155. A disc is in the condition of pure rolling on the horizontal surface. The velocity of center of mass is V_0 If radius of disc is R then the speed of point P is $\left(OP = \frac{R}{3}\right)$

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

B. $3\sqrt{3}$

C. $\frac{\sqrt{13}}{3}$

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

Answer:

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156. A hollow sphere is released from top of an inclined plane of inclination 30 and length of inclined plane is /. If sphere rolls without slipping then its speed at bottom is

A. $\sqrt{g\frac{l}{5}}$

B. $\sqrt{3g\frac{l}{5}}$

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

D. $\sqrt{3gl}$

Answer:

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157. If a solid cylinder rolls without slipping on an inclined plane of inclination 45°, then the minimum coefficient of friction required to support pure rolling is

A. $\frac{\sqrt{7}}{3}$

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

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

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

Answer:

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158. Consider a uniform sqare plate of side 'a' and mass 'm'. The moment of inertia of this plate about an axis perpendicular to its plane and passing through one of its corners is

A. $\frac{mv_0^3}{16}g$

B. $\frac{3mv_0^3}{8}g$

C. $\frac{3mv_0^3}{16}g$

D. $\left[\frac{\sqrt{3}(mv_0^3)}{16g}\right]$

Answer:

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159. A disc of radius R has a concentric hole of radius R /2 and its mass is M. Its moment of inertia about an axis through its centre and perpendicular to its plane, is

A. $m\frac{L}{M}$

B. ML/m

C. ml/m+M

D. ML/(m + M)

Answer:

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160. Four thin rods of same mass and same length L form a square Radius of gyration of this system about an axis which is perpendicular to plane of square and passes through its centre is

A. L/2

B. 5L/4

C. 3L/4

D. L/4

Answer:

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161. Match the following columns

(*i*) Primary amine + HNO_2	(*a*) Soluble complex
(*ii*) Nitroethane + $LiAlH_4$	(*b*) Insoluble compound
(*iii*) Dimethylamine +Hinsberg's reagent+KOH	(*c*) Amines
(*iv*) Silver chloride + Methylamine	(*d*) Methanamine
(*v*) Ethanamide + Br_2 + KOH	(*e*) Ethanamine
(*vi*) Hinsberg's reagent	(*f*) Primary alcohol
(*vii*) Alkyl cyanides and isocyanides	(*g*) Isocyanides
(*viii*) Soluble in water	(*h*) Functional isomers
(*ix*) Insoluble in water	(*i*) Benzene
(*x*) Benzenediazonium salt + H_3PO_2	(*j*) Coupling
(*xi*) Phenol + benzene-diazonium salt	(*k*) Cyanides

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

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

C. 3

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

Answer:

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162. A horizontal disc is rotating about a vertical axis passing through its centre. If an insect moves from centre to rim then the angular momentum of the system

A. $\left[\frac{1+e^2}{1-e^2}\right]$

B. 1

C. $\left[\frac{1-e}{1+e}\right]$

D. $\left[\frac{(1-e)^2}{(1+e)^2}\right]$

Answer:

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163. Two masses m_1 and m_2 are connected by a light rod of length I. If rod is rotating about an axis with angular speed Ω. Such that its kinetic energy is minimum then its K.E. is

A. The kinetic energy but not linear momentum of the system

B. Neither linear momentum nor kinetic energy of the system

C. Both kinetic energy and linear momentum of the system

D. The linear momentum but not the kinetic energy of system

Answer:

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164. A body is rolling down an inclined plane. If kinetic energy of rotation is $40\ \%$ of kinetic energy in translatory state then the body is a.

A. $\sqrt{2}g$

B. $\sqrt{5}g$

C. $\sqrt{10g}$

D. g

Answer:

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165. A sphere cannot roll on

A. $\sqrt{7gl}$

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

C. $\frac{1}{2}\sqrt{5gl}$

D. $\frac{1}{2}\sqrt{3gl}$

Answer:

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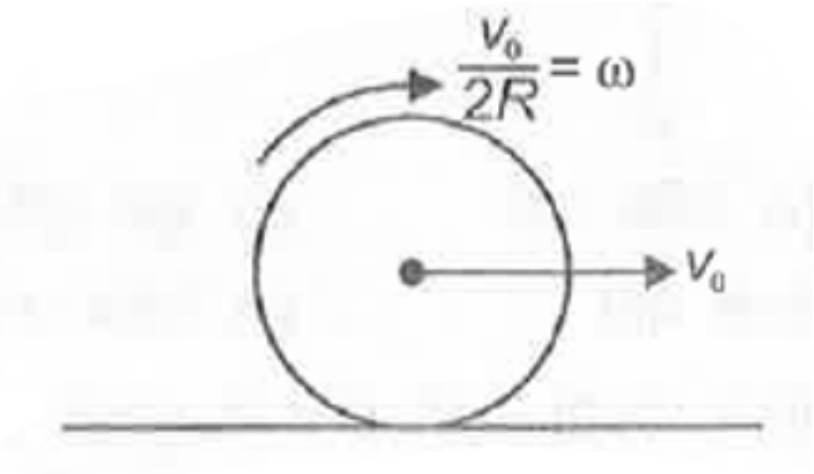
166. A solid sphere has combined linear and rotation motion as shown in figure. The velocity of its centre of mass when it starts pure rolling is (R = radius of sphere)



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167. A vector $\overline{P}$ is along positive x axis, if $\overline{Q}$ is another vector such that $\left(\overline{P} \cdot \overline{Q}\right)$ is zero, then Q should be

A. In an elastic collision, the final kinetic energy is equal to initial kinetic energy of the system

B. In an elastic collision, the final linear momentum is equal to initial linear momentum of the system

C. In an elastic collision, the linear momentum of system remains constant

D. In an elastic collision, the kinetic energy of system remains constant

Answer:

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168. The component of the vector $\overline{\mathrm{A}} = \left(2\hat{i} + 3\hat{j}\right)$ along the vector $\overline{B} = \left(\hat{i} + \hat{j}\right)$ is

A. $Velocity \propto t^{\frac{3}{2}}$

B. $Velocity \propto t^{\frac{1}{2}}$

C. $Displacement \propto t^{\frac{3}{2}}$

D. Both (2) & (3)

Answer:

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169. What is the power of an engine which can lift 600 kg of water per minute from 20 m deep well?

A. PAV^2

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

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

D. $\frac{1}{2}pav^2$

Answer:

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170. When a spring is stretched by 2 cm, it stores 100J of energy. If it is further stretched by 2 cm, the increase in energy is

A. $4\frac{m}{S^2}$

B. $2\frac{m}{S^2}$

C. $1\frac{m}{S^2}$

D. All of these

Answer:

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171. A ball dropped from a height of 2 m rebounds to a height of 1.5 m after hitting the ground. Then fraction of energy lost is

A. 4 N ,0 N

B. 4 N. 4 N

C. 6 N, 10 N

D. 6 N. 0 N

Answer:

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172. The potential energy of 1 kg particle is $\left[U(x) = \left(0.25x^4\right) - \left(0.5x^2\right)\right]$ J If total mechanical energy is 2 J, then maximum KE is

A. 2m/3

B. m/2

C. 3m

D. 4/3 m

Answer:

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173. A ring of mass m and radius R is being rotated about its axis with angular velocity o. If o increases then tension in ring

A. 

B. 

C. 

D. 

Answer:

Watch Video Solution

174. A bomb of mass 4m explodes into two parts of mass ratio 1 : 3. If k be the kinetic energy of larger part then K.E. of small part

A. $t_1 > t_2$

B. $t_1 = \frac{t_2}{2}$

C. $t_1 = t_2$

D. $t_1 < t_2$

Answer:

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175. Two identical blocks A and B are connected with a spring of constant k as shown in ligure. If block B s moving rightward with speed V_0 maximum extension of spring is

A. g/4

B. g/2

C. 3g/4

D. 3g/2

Answer:

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176. A particle of mass m_1, hits another particle in rest of mass m_2, obliquely, If both the particles after elastic collision moves perpendicular to each other then $\frac{m_1}{m_2}$ is

A. $4\frac{m}{S^2}$

B. $1\frac{m}{S^2}$

C. $6\frac{m}{S^2}$

D. $2\frac{m}{S^2}$

Answer:

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177. If all the particles of a body is situated at distance d from origin, then the distance of CM of the body from origin is

A. 80 kg wt

B. 20 kg wt

C. 40 kg wt

D. 120 kg wt

Answer:

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178. A ball is dropped from a height of 20 m in the floor and rebounds to 1.25 m after second collision, then coefficient of restitution e is

A. 20 kN

B. Zero

C. 24 kN

D. 16 KN

Answer:

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179. If a current carrying loo experiences a force $\overline{F} = \left[F_0\hat{k}\right]$ (where F_0 is positive constant) then nature of magnetic field should be

A. Uniform parallel to xy-plane

B. Uniform along positive z-direction

C. Uniform along negative z-direction

D. Radially outward and symmetric

Answer:

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180. A charge particle of mass m and charge q is projected with velocity v along plane a distance a from a long straight current carrying conductor as shown in figure. The radius of curvature of the path traced by the particle at the given position does not depend on 

A. θ

B. q

C. j

D. m

Answer:

Watch Video Solution

181. In cyclotron, dees are perforated so that the stream of particles move in spiral path before emerging by the deflector. So, the angular momentum of an accelerating charge depends on radius r as

A. r^2

B. r^{-1}

C. r^0

D. r

Answer:

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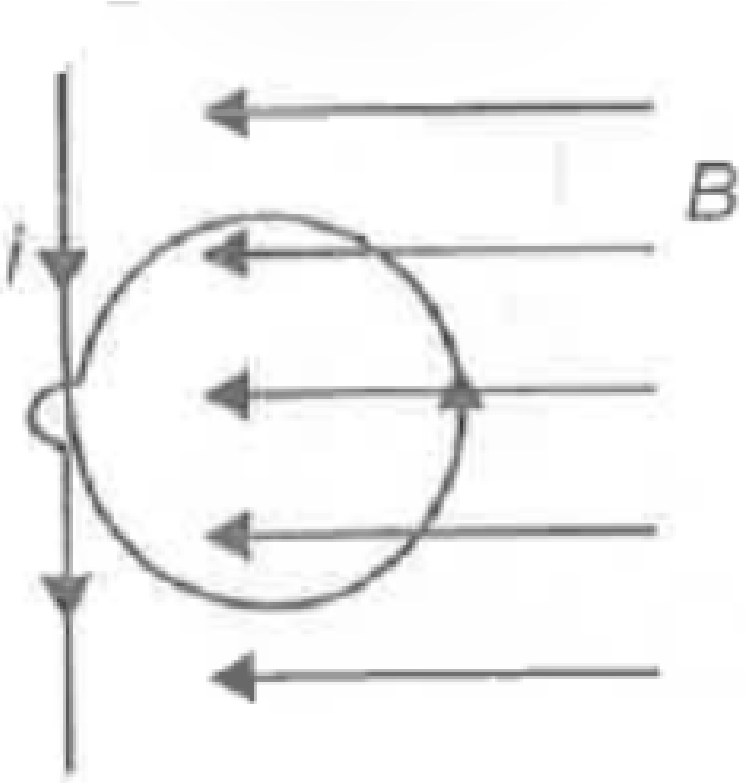
182. As shown in diagram, a current carrying conductor is subjected to steady uniform magnetic field. Then



A. Torque T = 0, force F= 0

B. T or $queT \neq 0$,f or $ceF \neq 0$

C. Torque T = 0 , f or $ceF \neq 0$

D. T or $queT \neq 0$, force F= 0

Answer:

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183. Electric field and magnetic field in a region of space are given by $\left(\bar{\mathrm{E}} = E_0\hat{j}\right)$. and $\left(\overline{B} = B_0\hat{j}\right)$. A charge particle is released at origin with velocity $\left(\bar{v} = v_0\hat{k}\right)$ then path of particle is

A. A. Straight line

B. B. Helical with uniform pitch

C. C. Circular path

D. D. Helical with increasing pitch

Answer:

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184. A circular flexible loop of wire of radius r carrying a current I is placed in a uniform magnetic field B perpendicular to the plane of the circle, so that wire comes under tension. If B is doubled, then tension in the loop

A. Is zero

B. Is more than iBR

C. Is less than iBR

D. Does not dead on rotation

Answer:

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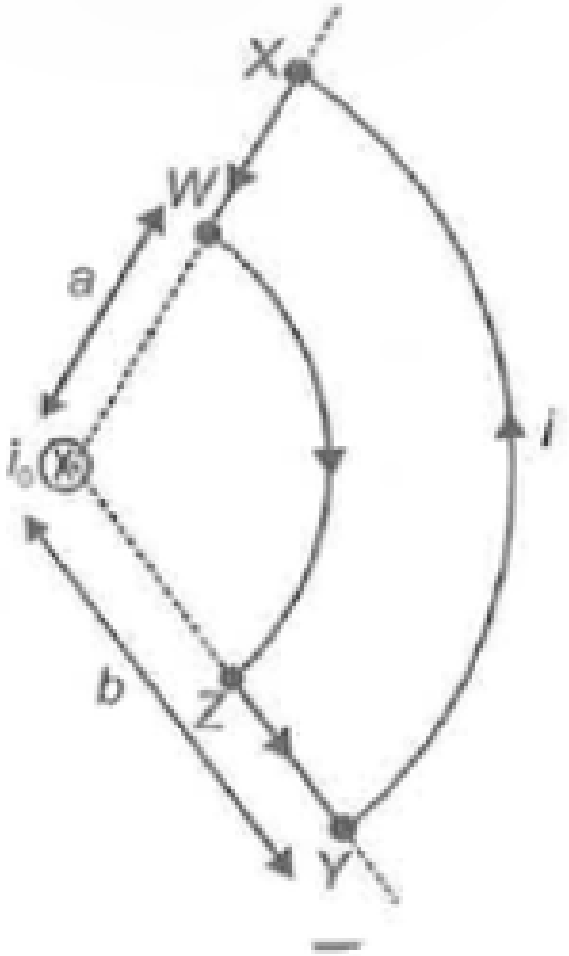
185. A closed loop carrying current is placed so that its plane is perpendicular to the long current carrying straight conductor as shown in the figure. The net force acting on the loop is [where WZ and XY are

circular arcs)



A. Zero

B. $\left[\frac{\mu_0 i i_0 (b-a)}{2\pi\sqrt{ab}}\right]$

C. $\left[\frac{\mu_0 i i_0}{\pi(a+b)}(b-a)\right]$

D. $\left[\frac{\mu_0 i i_0}{2\pi(a+b)}(b-a)\right]$

Answer:

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186. An electron with mass m, velocity v and charge e describe half a revolution in a circle of radius r in a magnetic field B. It will acquire energy equal to

A. $\frac{1}{4}mv^2$

B. $\pi Brev$

C. $\frac{1}{8}mv^2$

D. Zero

Answer:

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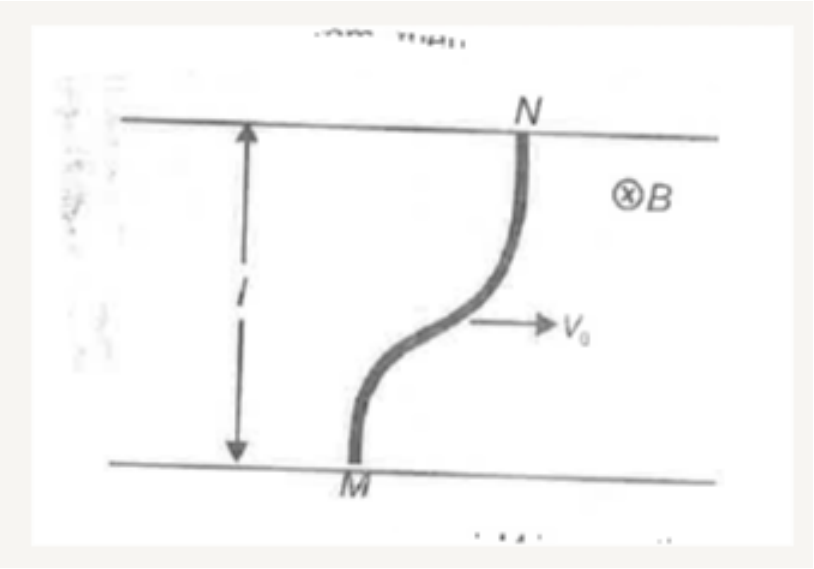
187. A conducting wire MN moves with velocity V_0 along +X-axis in a uniform magnetic field $\left(\overline{B} = -B_0\hat{k}\right)$ as shown in the diagram then



A. End N is positive and end M is negative

B. End M is positive and end N is negative

C. The emf induced along the rod does not depend on its shape, whether it is curved or straight

D. Both (1) & (3) are correct

Answer:

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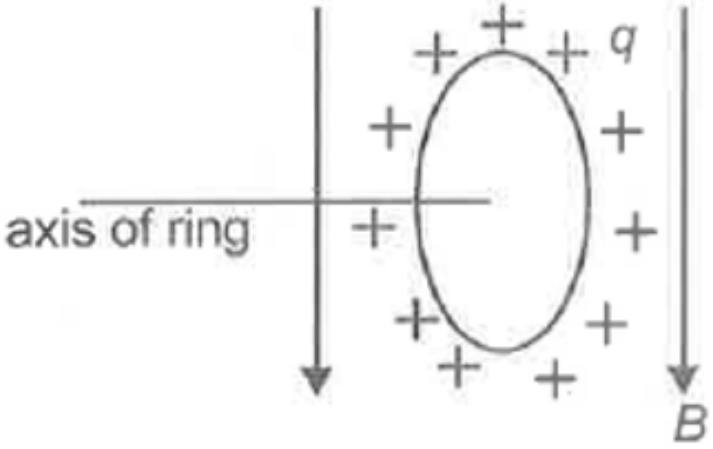
188. As shown in figure there is a ring having radius R and charge q distributed uniformly over it. If ring is rotated with a constant angular velocity @, then torque acting on the ring due to magnetic force is (Assume that magnetic field B is parallel to plane of ring)



A. $\left[\frac{q\omega R^2 B}{2}\right]$

B. $\left(q\omega BR^2\right)$

C. $\left[\frac{q\omega BR^2}{2}\pi\right]$

D. Zero

Answer:

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189. Two non-interacting inductor L_1 = 2 mH and L_2 = 5 mH are connected in parallel then respective ratio of

A. Flux is 1:1

B. Current is 5 : 4

C. Energy is 25 : 4

D. Energy is 4 : 25

Answer:

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190. A square loop of side 10 cm with its side parallel to X, and y axis is kept in a uniform magnetic field pointing towards positive z-direction. If

magnetic field changes at the rate of 0.1 T/s, then induced emf is

A. 1.0 mV

B. 0.5 mV

C. 1.5 mV

D. 03 mV

Answer:

Watch Video Solution

191. A conducting rod PQ is rotated in a magnetic field B about an axis passing through point O as shown in figure. Then potential difference between P&Q is (ω : angular speed)

A. $\left[B\omega\left(b^2 - a^2\right)\right]$

B. $\frac{B\omega b^2}{2}$

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

D. $\left[\frac{B\omega}{2}\left(b^2-a^2\right)\right]$

Answer: D

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192. A magnet is suspended in the magnetic meridian with an untwisted wire. The upper end of wire is rotated through 181° to deflect magnet by 37° from magnetic meridian. Now this magnet is replaced by another magnet and upper end of wire has to be rotated by 273° to deflect magnet by 53° from magnetic meridian. The ratio of magnetic moment of the two magnets respectively is

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

B. $\frac{48}{55}$

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

D. $\frac{181}{273}$

Answer:

Watch Video Solution

193. A bar magnet has a coercivity of $\left(4000Am^{-1}\right)$ It is desired to demagnetize by inserting it inside a solenoid 10 cm long and having 500 turns. The current which should be carried by solenoid is Consider ideal solenoid)

A. $0.8\mu_0 A$

B. $0.4\mu_0 A$

C. $0.8A$

D. $\left(\frac{0.8}{M}U_3\right)A$

Answer:

Watch Video Solution

194. A short bar magnet of magnetic moment $1.5Am^2$ is placed along x-axis at origin. If the magnetic field along line joining origin to point

$[P(2\sqrt{3}, 2, 0)]$m is $\left[\frac{\sqrt{n} \cdot 10^{-7}}{128}(T)\right]$, Then n should be

A. 3

B. 27

C. 9

D. 16

Answer:

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195. A parallel plate capacitor made of circular plates each of radius 6 cm has a capacitance 100 pF. The capacitor is connected to a 230 V ac supply with a angular frequency of 300 rad/s. The amplitude of magnetic field at point 3 cm from the axis between the plates is

A. $\left(1.63 \cdot 10^{-11}\right)$T

B. $\left(1.63 \cdot 10^{-8}\right)$T

C. $\left(3.26 \cdot 10^{-10}\right)$T

D. $\left(2.30 \cdot 10^{-14}\right)$T

Answer:

Watch Video Solution

196. A coil in the shape of square is placed in a variable magnetic field, which varies at the rate of dB /dt shown in figure. The magnitude of emf between points a and d along path abcd will be

A. $\left[\left(\frac{L^2}{2}\right)\left(d\frac{B}{dt}\right)\right]$

B. $\left[L^2\left(d\frac{B}{dt}\right)\right]$

C. $\left[-2L^2\left(d\frac{B}{dt}\right)\right]$

D. $\left[3\left(\frac{L^2}{2}\right)\left(d\frac{B}{dt}\right)\right]$

Answer:

Watch Video Solution

197. A uniform magnetic field along a long cylindrical rod varies with time as $(B = \alpha t)$, where α is positive constant. The electric field inside the rod as a function of radial distance r from the central axis is proportional to

A. A. r^2

B. B. 1/r

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

D. D. None of these

Answer:

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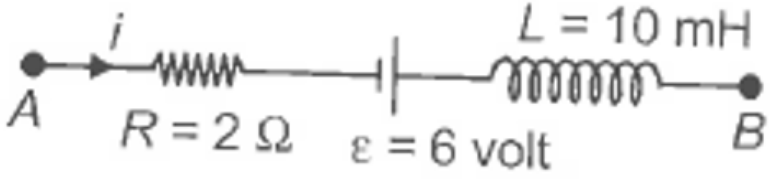
198. The network shown in the figure is a part of a complete circuit. If at a certain notant, the current i = 1 A and potential at point A and B are

equal, then the value of $\left|\frac{di}{dt}\right|$



A. 400 A/S

B. 300 A/S

C. 800 A/S

D. 200 A/s

Answer:

Watch Video Solution

199. The time constant for LR circuit between the terminals a and b as shown in diagram is

A. $4\frac{L}{R}$

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

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

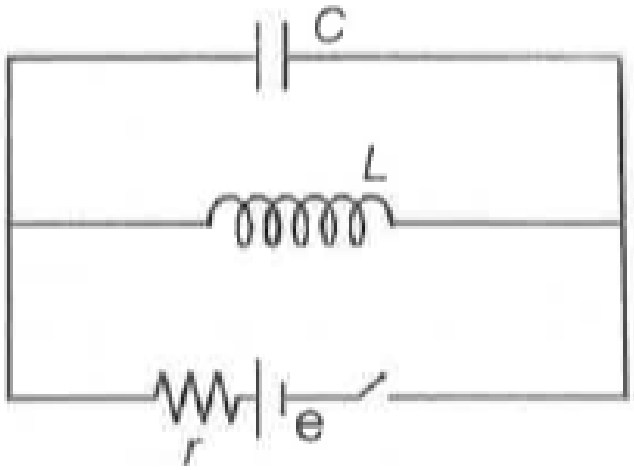
D. `2L/R

Answer:

Watch Video Solution

200. A capacitor C and inductor L are connected in parallel with a battery of emf e and internal resistance r. At time t=0, current through the cell be i_0 and at t=0, current through the cellbe i_0 and at $t \to \infty$ let the current

be i. then $\frac{i_0}{i}$ is equal to



A. 1

B. Zero

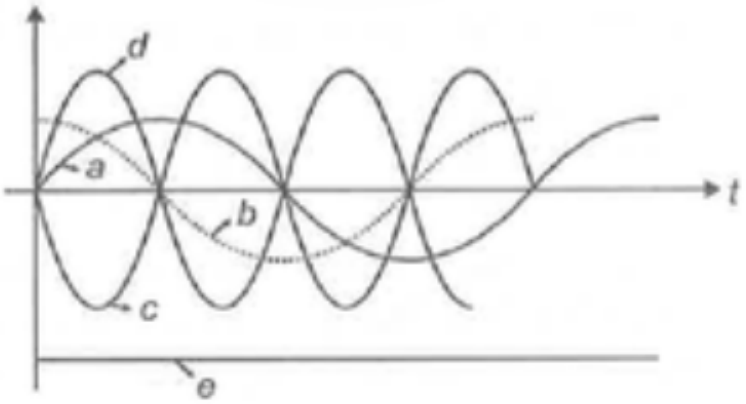
C. Infinite

D. Cannot be determined

Answer:

Watch Video Solution

201. If an ac source is connected across ideal capacitor and current passing through it is denoted by curve (a) then instantaneous power is denoted by curve



A. c

B. b

C. e

D. d

Answer:

Watch Video Solution

202. A series R-L circuit is subjected to an alternating voltage given as $(v = v_0 \sin \omega t)$. Then the variation of peak current (i) with frequency (v) is denoted by

A. 

B. 

C. 

D. 

Answer:

Watch Video Solution

203. An a.c. voltage of $(V = 100 \sin \omega t)$ volt is connected across the parallel combination of inductor and capacitor having$(X_L = 5\Omega)$ and (X_C = 10 Omega)` then current supplied by source is (in ampere) 

A. $(- 20 \cos \omega t)$

B. $(10 \cos \omega t)$

C. $(10 \sin \omega t)$

D. $(-10 \cos \omega t)$

Answer:

Watch Video Solution

204. The dimensional formula of $\left[E_0 \frac{d\phi_E}{dt}\right]$ is (where ϕ_E electric flux and e_0 is permittivity of air)

A. $\left[M^{-1} L^3 T^{-2} A^{-1}\right]$

B. $\left[M^{-1} L^2 T^0 A^{-1}\right]$

C. $\left[M^0 L^0 T^0 A\right]$

D. $\left[M^0 L T^0 A^{-1}\right]$

Answer:

Watch Video Solution

205. A choke coil of resistance R and inductance is connected to an ac. source of frequency f and peak voltage V If angular frequency will increase then, the average power dissipated in the choke

A. Will increase

B. Will decrease

C. Does not depend on co

D. Does depend on co

Answer:

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206. When two AC generators of emf having peak voltage V_1 and V_2 and same frequency are connected in series, then the peak emf across A and B is

A. $(V_1 - V_2)$

B. $(V_1 + V_2)$

C. $\left[\sqrt{V_1^2 + V_2^2}\right]$

D. Any of these

Answer:

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207. The resonant frequency of L-C circuit is f_0 before insertion of dielectric of (dielectric constant) $(E_r = 4)$. After inserting the dielectric, the resonant frequency will be

A. $\frac{f_0}{2}$

B. $4f_0$

C. $2f_0$

D. f_0

Answer:

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208. If the input A contains both AC and DC and the inputs and C gets only AC components, then the device B is?

A. Capacitor

B. Inductor

C. Resistor

D. Both resistor and capacitor in series

Answer:

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209. in series R-L-C circuit at resonance, which of the following is correct?

A. $\left(4f^2LC = 0.5\right)$

B. $(X_L - X_C)$=0

C. Minimum power dissipation occurs at resonance

D. Both (1) & (2) are correct

Answer:

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210. Two 1000 watt hair dryers are connected parallel to 200 volt peak (sinusoidal) A.C. supply Total rms current drawn from supply should be

A. $10\sqrt{2}A$

B. $5\sqrt{2}A$

C. $5A$

D. $10A$

Answer:

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211. A ring of radius R moves with a velocity v in a uniform static magnetic field B as shown in diagram. The emf between P and Q is

A. Zero

B. $[vBR(1-\cos\theta)]$

C. $\left[2vBR\sin\left(\frac{\theta}{2}\right)\right]$

D. $[vBR\sin\theta]$

Answer:

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212. In propagation of electromagnetic wave which of the following statement is correct?

A. Rate of flow of energy crossing a unit perpendicular area is described by the poynting vector $\bar{s}$

B. Paynting vector , $\left(\overline{S} = \overline{E}\cdot\overline{B}\right)$

C. Electromagnetic wave cannot exert pressure on surface due to absence of momentum

D. Pressure exerted by electromagnetic wave on perfectly absorbing surface $\left(P = 2\left[\frac{s}{c}\right]\right)$ where s is the poynting vector

Answer:

Watch Video Solution

213. For the study of crystal structure, which part of electromagnetic spectrum is used?

A. Ultraviolet rays

B. Infra-red waves

C. Infra-red waves

D. X-rays

Answer:

Watch Video Solution

214. In an electric circuit, there is a capacitor of reactance 100 Ω connected across the source of 300 volt. The displacement current will be

A. $3A$

B. $1.5A$

C. $2.2A$

D. $3\sqrt{2}A$

Answer:

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215. A plane electromagnetic wave of Intensity $6\frac{W}{m^2}$ strikes a small mirror of area $20cm^2$, hel perpendicular to the incident wave. The radiation force on the mirror will be (Assume that mirror is perfectly reflecting)

A. $8 \cdot 10^{-11} N$

B. $4 \cdot 10^{-11} N$

C. $10^{-11} N$

D. $2 \cdot 10^{-12} N$

Answer:

Watch Video Solution

216. The Maxwell's equations are written as: (1)-$\left[\oint(\overline{E}.\bar{d}s) = \left(q_e nclose \frac{d}{\varepsilon_0}\right)\right]$, (2)-$\left[\oint(\overline{B}.\bar{d}s) = 0\right]$,(3)-$\left[\oint(\overline{E}.\bar{d}l) = \frac{d}{dt}\left\{\oint(\overline{B}.\bar{d}s)\right\}\right]$ Which of the Maxwell's equations contains non-conservative electric field?

A. A. (i) only

B. B. (ii) & (ii)

C. C. (i)& (iii)

D. D. (iii) only

Answer:

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217. The magnetic field at a point x on the axis of a small bar magnet is equal to the field at a point y on the equator of the same magnet. The ratio of the distances of x and y from the centre of the magnet is

A. 2^{-3}

B. 2^3

C. $\frac{2^1}{3}$

D. $\frac{2^{-1}}{3}$

Answer:

Watch Video Solution

218. Considering the earth as a short magnet with its centre coinciding with the centre of earth, show that the angle of dip$\phi$is related to magnetic latitude λ by the relation $\tan\phi = 2\tan\lambda$.

A. 2

B. 0.5

C. 1

D. 0.25

Answer:

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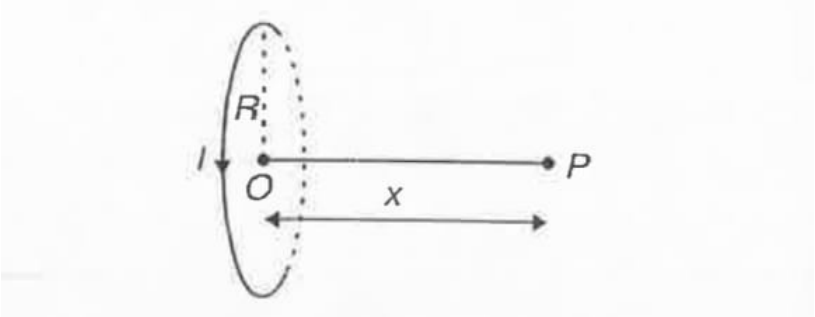
219. A coil having N turns carry current I as shown in the figure. the magnetic field intensity at a point P is



A. $\left(\frac{1}{\mu_0}\right)$ times the magnetic field intensity in the material

B. μ_r times the magnetic field intensity in the material

C. Same as that of the material

D. Cannot be determined due to fringing of the field

Answer:

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220. The resistance of three parts of a circular loop is shown in the figure.

The magnetic field at the centre 0 is

A. Zero

B. $\left[\frac{2\mu_0 i}{5r}\right]$

C. $\left[\frac{\mu_0 i}{6r}\right]$

D. $\left[\frac{\mu_0 i}{3r}\right]$

Answer:

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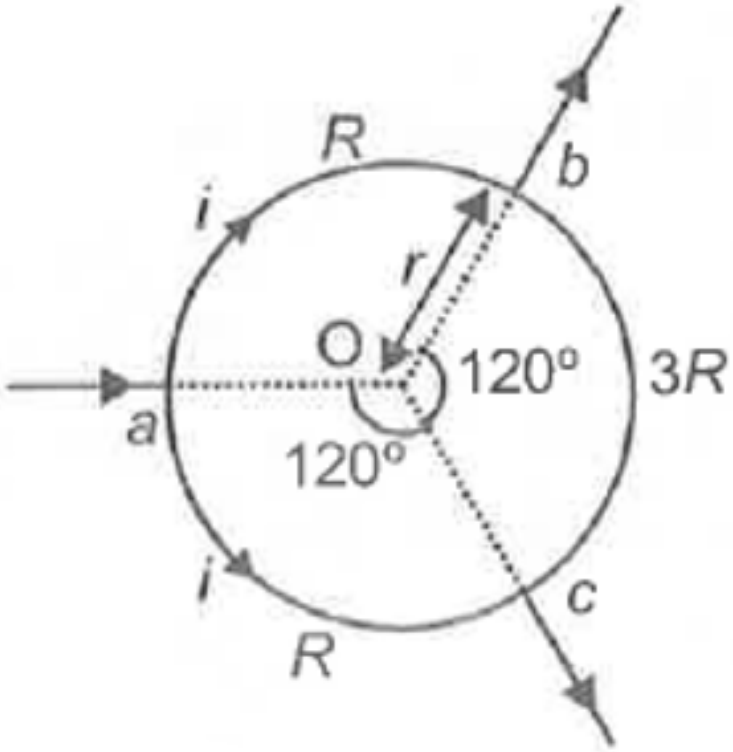
221. Which of the following staternents is correct?



A. When magnetic flux linked with conducting loop is zero then emf induced is always zero

B. When emf induced in conducting loop is zero, then magnetic flux linked with loop must be zero

C. Transformer works on mutual induction

D. All of these

Answer:

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222. A ball is thrown onto a floor at an angle. If its velocity vector is $4\hat{i} - 3\hat{j}\left(\frac{m}{s}\right)$ and restitution coefficient is $\frac{2}{3}$ 2 3 then, the velocity by which itr ebounds is

A. $-4\hat{i} + 2\hat{j}$

B. $-4\hat{i} + 3\hat{j}$

C. $4\hat{i} + 2\hat{j}$

D. $4\hat{i} - 2\hat{j}$

Answer:

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223. A circular disc made of iron is rotated about its axis. If due to the change of surrounding temperature its angular speed increased by 1%, then find the percentage change in its kinetic energy

A. 1% increase

B. 1% decrease

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

D. $\frac{1}{2}$% decrease

Answer:

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224. A thin circular ring of mass M and radius r is rotating about its axis with an angular speed ω. Two particles having mass m each are now attached at diametrically opposite points. The angular speed of the ring will become

A. $\frac{\omega M}{m+M}$

B. $\frac{\omega(M+2m)}{M}$

C. $\frac{\omega M}{m+N}$

D. $\frac{\omega M}{M+2m}$

Answer:

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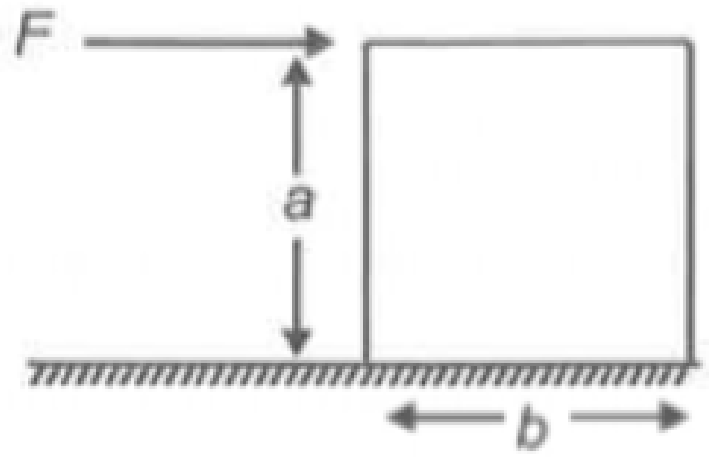
225. force F is applied at the topmost point of block of mass M. The force required to topple the block before sliding is (μ = coefficient of friction)



A. a.$F > \left(\frac{Mgb}{2a}\right)$

B. b.$F < \mu Mg$

C. c.$F > \left(\frac{Mga}{2b}\right)$

D. d.Both (1) & (2)

Answer:

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226. The moment of inertia of a flat annular ring having mass M, inner radius a and outer radius b about the diametric axis through the centre is

A. A. $\frac{M}{4}\left(b^2 + a^2\right)$

B. B. $\frac{M}{2}\left(b^2 + a^2\right)$

C. C. $\frac{M}{4}(b - a)$

D. D. $\frac{M}{4}\left(b^2 - a^2\right)$

Answer:

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227. A ring of mass m and radius R is acted upon by a force Fas shown in figure. There is sufficient friction between the ring and the ground. The force of friction necessary for pure rolling is

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

B. Zero

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

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

Answer:

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228. A particle is moving on a straight line x + y = 2. Its angular momentum about origin is L = 3t + 2 (kg $m^2 s^{-1}$). Find the force acting on the particle at t = 2 s. (x and y are in metre)

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

B. B. $\sqrt{2}N$

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

D. D. 3 N

Answer:

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229. A solid sphere is released from rest from the top of a curved surface as shown in figure. Half portion of surface is rough and another half is smooth. If sphere is released from rough side, then the maximum height attained by it on smooth side is (Rough surface has sufficient friction to roll the body)

A. $\frac{3h}{7}$

B. h

C. $\frac{2h}{7}$

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

Answer:

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230. If v_2, v_2, and v_3 are the velocities of points P,C and Q respectively lying on body doing pure rolling motion, then correct order of velocities will be

A. $v_3 = v_2 > v_1$

B. $v_1 > v_2 > v_3$

C. $v_3 > v_2 > v_1$

D. $v_3 > v_2 = v_1$

Answer:

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231. Two cylinders P and Q of same mass and same radius start rolling down a fixed inclined plane from the same height at the same time. Cylinder P has most of its mass concentrated near its surface, while Q has most of its mass concentrated near the axis. Choose the correct statement regarding the motion of P and Q

A. A. P reaches the ground with larger angular speed

B. B. Q reaches the ground with larger angular speed

C. C. Both P and Q reach the ground at the same time

D. D. Both P and Q reach the ground with same translational kinetic energy

Answer:

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232. Four particles each of mass M are lying symmetrically on the rim of a disc of mass 6 M and radius R. Moment of inertia of this system about an axis passing through one of the particles and prependicular to plane of disc is

A. A. $\frac{15MR^2}{2}$

B. B. $17MR^2$

C. C. $\frac{19MR^2}{2}$

D. D. $\frac{29MR^2}{2}$

Answer:

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233. A metre stick is balanced on a knife edge at its centre. When two coins, each of mass 5 g are put one on top of the other at the 12.0 cm

mark, the stick is found to be balanced at 45.0 cm. What is the mass of the metre stick?

A. 33 g

B. 13 g

C. 70 g

D. 66 g

Answer:

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234. Three particles A, B and C are moving as shown in figure. Calculate the angular momentum of the third particle C so that the angular momentum of system about point O becomes zero

A. $40\hat{k}kgms^{-1}$

B. $-40\hat{k}kgms^{-1}$

C. $80\hat{k}kgms^{-1}$

D. $-80\hat{k}kgms^{-1}$

Answer:

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235. The angular position of a particle revolving about an axis is given by $\Theta(t) = t^2 - 3t + 4$ radian. Find the acceleration of the point at time t = 2 s. Given radius of circular path is 1 m

A. A. $5\frac{m}{s^2}$

B. B. $\sqrt{5}\frac{m}{s^2}$

C. C. $2\frac{m}{s^2}$

D. D. $1\frac{m}{s^2}$

Answer:

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236. A rod is hinged at point P, vertically standing upward, Due to slight jerk rod starts to come down. The angular velocity of rod just after turning through angle e is (hinge is smooth)

A. $\sqrt{\frac{6g}{L}}\sin\left(\frac{\theta}{2}\right)$

B. $\sqrt{\frac{6g}{L}}\cos\left(\frac{\theta}{2}\right)$

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

D. $\sqrt{\frac{3g(1+\cos\theta)}{L}}$

Answer:

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237. Father (80 kg) and son (30 kg) are sitting at one of the ends of a 4 m long boat (40 kg) standing still on water. They start to shift slowly. Father stopped at centre of boat but son stopped at other end. Neglecting friction with water, how far does the boat move on the water during the process?

A. A. 1.25 m

B. B. 1.2 m

C. C. 1.87 m

D. D. 1.5 m

Answer:

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238. A block of mass M is placed on the top of a bigger block of mass 10 M as shown in figure . All the surfaces are frictionless. The system is released from rest. Find the distance moved by the bigger block at the instant the smaller block reaches the ground.

 .

A. Vertically shifted downward without shift in horizontal direction

B. Shifted diagonally from initial position

C. Right of the initial position parallel to base

D. Left of the initial position parallel to base

Answer:

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239. If large number of particles are distributed on XY plane and their centre of mass is at origin of coordinates, then

A. A. Sum of moments of all the particles w.r.t the origin is zero

B. B. Sum of moments of masses of all particles about x-axis is zero

C. C. Sum of moments of masses of all particles about y-axis is zero

D. D. All of these

Answer:

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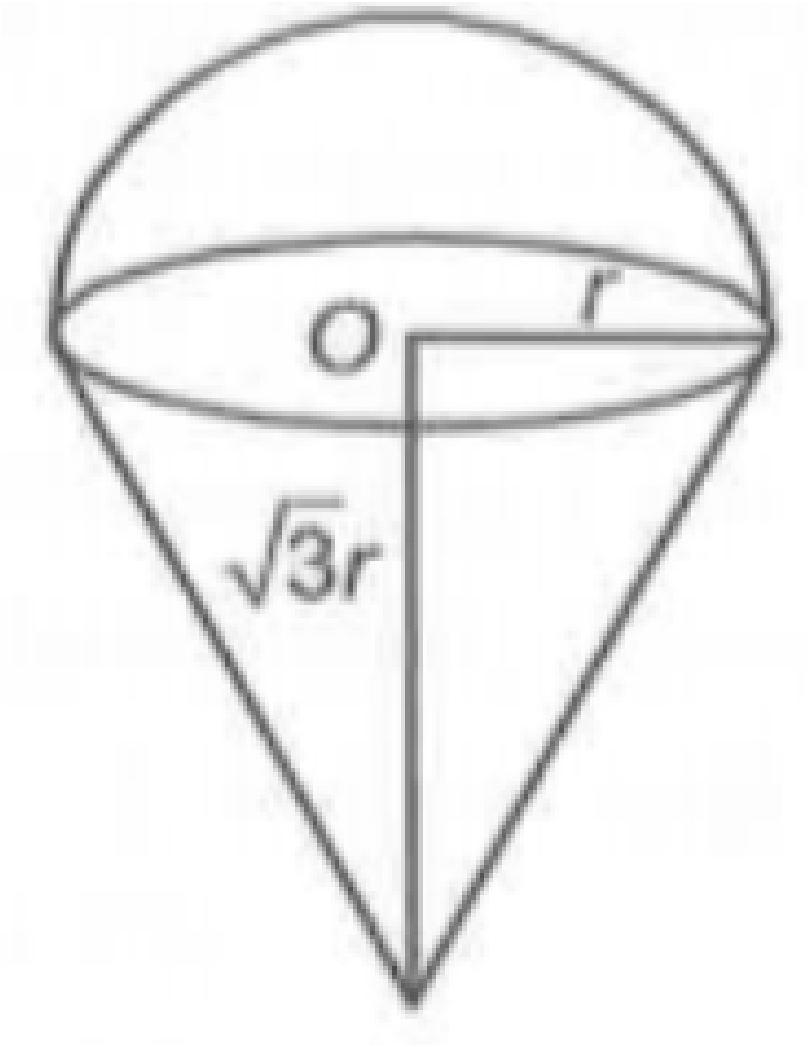
240. A uniform solid hemisphere of radius r is joined to a uniform solid right circular cone of base radius r and height $\sqrt{3}r$. If both have same density, then find the position of centre of mass from centre of



hemisphere

A. $\frac{r}{4}$ distance from O

B. At O

C. $\frac{r}{2}$ distance from O

D. $\frac{r}{3}$ distance from O

Answer:

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241. A small block B of mass m_2 is placed on another block A of mass m_1 A constant horizontal force F is applied to the block A. All the surfaces are assumed to be frictionless. Find the acceleration of center of mass of the system

A. $\frac{m_2^2 F}{m_1 + m_2}$

B. $\frac{F}{m_1 + m_2}$

C. $\frac{F}{m_1}$

D. $\frac{m_1^2 F}{m_1 + m_2}$

Answer:

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242. A 5 kg body is fired vertically up with a speed of 200 m/s. Just before it hits the ground, its speed is 150 m/s. Over the entire trip, the work done by gravity is

A. 42000 J

B. Zero

C. 45000 J

D. $-43750J$

Answer:

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243. A body of mass 2 kg is acted upon by two forces 2 N and 5 N in the direction of $\hat{i}+\hat{j}$ and $\hat{j}-\hat{k}$ respectively. If the body is displaced from (3,-2, 1) to (-1, 2, 3) (Positions are in m), then work done is

A. 15 J

B. 20 J

C. 10 J

D. $5\sqrt{2}$ J

Answer:

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244. An elastic string of unstretched length L and force constant k is stretched by a small length x. It is further stretched by another small length y. The work done in second stretching is

A. $\frac{1}{2}k(x+y)^2$

B. $\frac{1}{2}ky(2x+y)$

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

D. $\frac{1}{2}k\left(x^2+y^2\right)$

Answer:

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245. A chain of mass m and length L is held at rest on smooth horizontal surface such that a part I of the chain is hanging vertically from the table. If the chain is let go, what is its speed as its end just leaves the horizontal surface?

A. A. $\sqrt{g\left(\frac{L}{2}-\frac{I^2}{2L}\right)}$

B. B. $\sqrt{2g\left(L-\frac{I^2}{L}\right)}$

C. C. $\sqrt{g\left(L-\frac{I^2}{L}\right)}$

D. D. $\sqrt{\frac{gI^2}{L}}$

Answer:

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246. A conservative force acts on a 4 kg particle in x direction. The potential energy U(x) is given by $U(X) = 40 + (x-6)^2$, where x is in metre. If it is given that at x = 8 m, KE is 30 J then find the maximum KE of the particle.

A. A. 24 J

B. B. 34 J

C. C. 10 J

D. D. 17 J

Answer:

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247. Engine of a car supplies constant power to the car which accelerates from rest. Car moves along a straight road. If velocity and displacement of car at any time t be v and s respectively then

A. A. $V \propto \frac{t^3}{2}$

B. B. $S \propto \frac{t^2}{3}$

C. C. $S \propto \frac{t^3}{2}$

D. D. Both (1) & (2)

Answer:

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248. A pump is required to lift 1000 kg of water per minute from a well 20 m deep and ejects at a speed of 20 m/s. The power of engine is

A. A. 2 kW

B. B. 1.1 kW

C. C. 6.6 kW

D. D. 6 kW

Answer:

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249. A particle of mass 0.1 kg is subjected to a force F which varies with distance x as shown. If it starts its journey from rest at x = 0, then its speed at X = 12 m is

A. 40 m/s

B. $2\sqrt{5}\frac{m}{s}$

C. $10\sqrt{2}\frac{m}{s}$

D. $20\sqrt{3}\frac{m}{s}$

Answer:

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250. A particle of mass m is projected with speed $\sqrt{R\frac{g}{4}}$ from top of a smooth hemisphere as shown in figure. If the particle starts slipping from the highest point, then the horizontal distance between the point where it leaves contact with sphere and the point at which the body was placed is

A. $\frac{R\sqrt{3}}{8}$

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

C. $\frac{R\sqrt{7}}{4}$

D. $\frac{R\sqrt{7}}{16}$

Answer:

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251. The electric field in a region is given by $\vec{E} = \left(\frac{A}{x^3}\right)\hat{i}$. Write a suitable SI unit for A. Write an expression for the potential in the region

assuming the potential at infinity to be zero.

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

B. $\frac{A}{2x^2}$

C. $\frac{A}{2x^3}$

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

Answer:

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252. A point mass 1 kg collides elastically with a stationary point mass of 5 kg. After their collision, the 1 kg mass reverses its direction and moves with a speed of 2 m/s. For the system of these two masses the KE of the centre of mass is

A. A. 1 J

B. B. 1.5 J

C. C. 0.75 J

D. D. 0.5 J

Answer:

Watch Video Solution

253. A ball of mass m is thrown upward with a velocity v. If air exerts an average resisting force F, the velocity with which the ball returns to the thrower is

A. $v\sqrt{\frac{mg-R}{mg+R}}$

B. $v\sqrt{\frac{mg+R}{mg}}$

C. $v\sqrt{\frac{mg}{mg+R}}$

D. $v\sqrt{\frac{R}{mg+R}}$

Answer:

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254. A heavy particle hanging from a string of length I is projected horizontally with speed $\sqrt{gl}$. Find the speed of the particle at the point where the tension in the string equals weight of the particle.

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

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

C. C. $\sqrt{(3gI)}$

D. D. $\sqrt{2gI}$

Answer:

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255. Consider an inclined plane whose upper half is rough while lower half is smooth. Friction coefficient of the rough surface is μ = 0.8. A heavy rope of mass M is placed on the inclined plane such that it remains in equilibrium. What minimum fraction of rope is required on rough surface for equilibrium?

A. $\frac{1}{15}$

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

C. $\frac{15}{16}$

D. $\frac{1}{16}$

Answer:

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256. A bob of mass m is connected by string of length L to point P. The system is released from rest with the pendulum bob in a horizontal position. Which of the following graph is correctly showing the variation of T (tension) with Θ?

A. 

B. 

C. 

D. 

Answer:

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257. A 3 kg mass attached to a spring scale rests on frictionless surface as shown in figure. The spring scale attached to the front end of a box car, reads 15 N when the car is in motion. If the spring reads zero when the car is at rest, determine acceleration of the car while it is in motion

A. $5ms^{-2}$

B. $10ms^{-2}$

C. $1ms^{-2}$

D. $3ms^{-2}$

Answer:

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258. A block of mass Mis pulled vertically upward through a rope of mass m by applying force F on one end of the rope. What force does the rope exert on the block?

A. $\frac{mF}{M+m}$

B. $\frac{MF}{M+m}$

C. $\frac{m}{M}F$

D. $\frac{M}{m}F$

Answer:

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259. A vehicle is moving at a speed of 30 m/s on a circular road of radius 450 m. Its speed is increasing at a rate of $2\frac{m}{s^2}$. The acceleration of particle at this instant is

A. A. $2\frac{m}{s^2}$

B. B. Zero

C. C. $2.8\frac{m}{s^2}$

D. D. $4\frac{m}{s^2}$

Answer:

Watch Video Solution

260. A block of mass m is placed on a smooth wedge of incination θ. The whole system s acelerated horizontally so tht the block does not slip on the wedge. The force exerted by the wedge on the block has a magnitude

A. $mg\cos\theta$

B. $mg\sin\theta$

C. mg

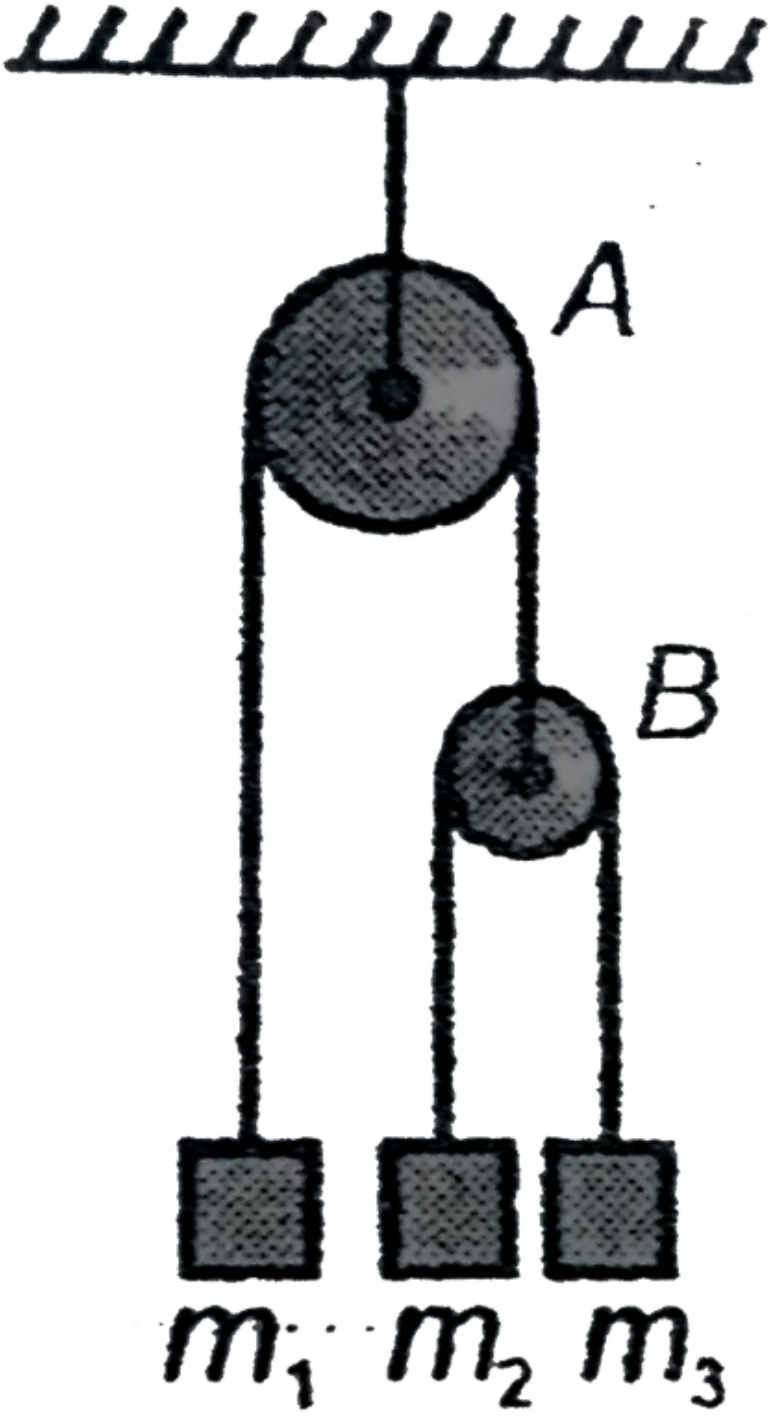
D. $\frac{mg}{\cos\theta}$

Answer:

Watch Video Solution

261. In the arrangement , shown below pulleys are massless and frictionless and threads are inextensible , block of mass m_1 will remain at

rest if


A
B
m_1
m_2
m_3

A. $\frac{4}{m_1} = \frac{1}{m_2} + \frac{1}{m_3}$

B. $\frac{1}{m_1} = \frac{1}{m_2} + \frac{1}{m_3}$

C. $\frac{1}{m_3} = \frac{2}{m_2} + \frac{3}{m_1}$

D. $m_1 = m_2 = m_3$

Answer:

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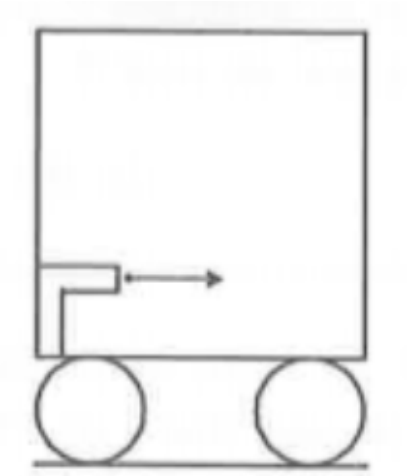
262. A cannon is fixed to the floor of a carriage, which is free to move without friction along a straight track. The combined mass of cannon and carriage is M. The instant cannon fires a cannon ball of mass m with

speed u, the velocity of centre of mass of cannon + carriage + ball is



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

B. Zero

C. $\frac{\mu}{m+M}$

D. $\frac{Mu}{m+M}$

Answer:

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263. Two blocks of masses 2 kg and 4 kg are connected by a massles string which is just taut. Now two forces 3 N and 14 N are applied on blocks. The tension in the string is

A. 6 N

B. Zero

C. 24.3 N

D. 20 N

Answer:

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264. Select the correct statement(s) regarding Newton's laws of motion.

A. Newton's first law defines inertial frame of reference

B. Newton's laws are applicable only in inertial frame of reference

C. According to Newton's second law, in absence of any force a particle in motion should continue moving with uniform velocity.

D. Both (1) & (2)

Answer:

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265. Two objects, a ring and a spherical shell of same mass and radius are released from the top of two Identical inclined plane. If they are rolling without slipping, then ratio of speed of center of mass of the two objects when they will reach the bottom of the inclined plane is

A. $\sqrt{5}:\sqrt{3}$

B. $\sqrt{5}:\sqrt{6}$

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

D. $\sqrt{5}:1$

Answer: B

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266. A wheel initially at rest, is rotated with a uniform angular acceleration. The wheel rotates through an angle θ_1 in the first one second and through an additional angle θ_2 in the next one second. The ratio θ_1 / θ_2 is:

A. 8

B. 4

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

D. $\frac{1}{8}$

Answer: B

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267. A uniform rod PQ of mass m and length t rotates with an angular velocity a while its center moves with linear velocity $v = \frac{2\omega \cdot f}{3}$ on a smooth horizontal surface If the end Q of the rod is suddenly gets stuck at the moment as shown in the figure then angular velocity of the rod will be

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

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

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

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

Answer:

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268. If a moving particle have linear momentum $\overline{P}$ and position vector $\bar{r}$ then choose the correct relation between $\bar{r}, \bar{p}$ and angular momentum $\overline{L}$ of particle about the origin.

A. $\bar{r}.\overline{L}=0$

B. $\left|\bar{r}.\overline{L}\right|=0$

C. $\overline{L}.\overline{P}\neq 0$

D. $\left|\overline{L}.\overline{P}\right|=0$

Answer: A

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269. A cubical block of mass M and side a is placed on a rough horizontal plane as shown in the figure A force F is acting on the block at height $3\frac{a}{4}$ from the bottom. The minimum value of coefficient of friction (μ) such that block lopples without sliding will be

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

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

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

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

Answer: D

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270. A disc of mass m and radius R is rolling without slipping as shown in the figure. The magnitude of net velocity of the point P is $\left(OP = \frac{R}{2}\right)$

A. $R\omega_0$

B. $\frac{\sqrt{5} \cdot R(\omega_0)}{2}$

C. $\frac{\sqrt{7} \cdot R(\omega_0)}{2}$

D. $\frac{\sqrt{3} \cdot R(\omega_0)}{2}$

Answer: D

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271. A spherical shell of mass m and radius R is rolling up without slipping on a rough inclined plane as shown in the figure. The direction of static

friction acting on the shell is

A. Downwards along the inclined plane

B. Upward along the inclined plane

C. May be upwards or downward along the inclined plane

D. Static friction will not act

Answer: A

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272. Two identical rings are moving with equal kinetic energy One ring rolls without slipping and other ring is in pure translational motion. The ratio of their respective speeds of centre of mass is

A. $1:\sqrt{2}$

B. $\sqrt{2}:\sqrt{3}$

C. $1:\sqrt{3}$

D. $1:1$

Answer: C

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273. A uniform disc of mass m and radius R is thrown on horizontal lawn in such a way that it initially slides with speed V_0 without rolling. The distance travelled by the disc till it starts pure rolling is (Coefficient friction between the contact is 0.5)

A. $v^2 _ \frac{0}{9}g$

B. $5v^2 _ \frac{0}{9}g$

C. $v^2 _ \frac{0}{3}g$

D. $3v^2 _ \frac{0}{8}g$

Answer: B

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274. A solid sphere of mass M and radius R is in pure rolling as shown in figure. The angular momentum of the sphere about the origin is (linear velocity of centre of mass is v_0, in positive x-direction)

A. $3MR\frac{V_0}{5}(-K)$

B. $3MR\frac{V_0}{5}(+K)$

C. $7MR\frac{V_0}{5}(-K)$

D. $7MR\frac{V_0}{5}(+K)$

Answer: C

Watch Video Solution

275. Two blocks A and B having masses 5 kg and 10 kg respectively connected through a massless string which is passing over a pulley (disc) of mass 2 kg and radius 25 cm as shown in figure If system is. released from rest. then angular acceleration of the pulley is (String does not slip

over the pulley horizontal surface is smooth and $g = 10ms^{-2}$ $(\forall K_T ST_{02} \_ N \exists T_P HY_E 02_{011} \_ Q01)$

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276. Three forces of magnitude F, F and $\sqrt{2F}$ are acting on the periphery of a disc of mass m and radius R as shown in the figure. The net torque about the centre of the disc is

A. $FR\widehat{K}$

B. $-FR\widehat{K}$

C. $3FR\widehat{K}$

D. $-3FR\widehat{K}$

Answer: B

Watch Video Solution

277. A plank of mass 2m and length L is al rest on a frictionless horizontal floor At one end of it, a child of mass m is standing as shown in figure If child walks and reaches the other and then the distance travelled by child wrt ground will be

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

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

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

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

Answer: C

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278. A system of uniform rod of mass m and length 2R and a uniform disc of m and radius R are as shown in the figure. The moment of inertia of the system about the axis OO' (perpendicular to plane of disc) will be

A. $\frac{79mR^2}{12}$

B. $\frac{41mR^2}{6}$

C. $\frac{7mR^2}{6}$

D. $\frac{25mR^2}{12}$

Answer: B

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279. A uniform rod of mass m and length / is hinged at upper end. Rod is free to rotate in vertical plane. A bail of mass m moving horizontally with velocity vo collides at lower end of rod perpendicular to it and sticks to it. The minimum velocity of the ball such that combined system just completes the vertical circle will be

A. $2\left[\sqrt{2gl}\right.$

B. $\sqrt{2gl}$

C. $2\left[\sqrt{gl}\right]$

D. $\sqrt{gl}$

Answer: A

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280. A particle of mass 2 kg released from point A(2, 0, 0) m as shown in the figure. The rate of change of angular momentum of the particle about the origin at time t = 2 s will be (Origin is taken somewhere above the ground in space at sufficient height and $g = -10\hat{j}\frac{m}{s^2}$)

(AAK_TST_02_NEET_PHY_E02_016_Q01)`

A. A. $\left(+40\hat{k}\right)N-m$

B. B. $\left(-40\hat{k}\right)N-m$

C. C. $\left(+40\hat{j}\right)N-m$

D. D. $\left(-40\hat{j}\right)N-m$

Answer: B

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281. The distance of center of mass from the center of a uniform disc of radius R. if a circular plate is removed from the disc as shown in figure will be (C is centre of complete disc)

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

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

C. $3\frac{R}{8}$

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

Answer: B

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282. The radius of gyration of a uniform square plate of mass M and sida about its diagonal is

A. $\frac{a}{\sqrt{6}}$

B. $\frac{a}{\sqrt{12}}$

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

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

Answer: B

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283. Choose the correct statement about the center mass of a body,

A. Center of mass always lies outside the body

B. Center of mass always lies inside the body

C. Position of center of mass relative to the body depends on the choice of origin

D. Center of mass may either lie inside or outside the body

Answer: D

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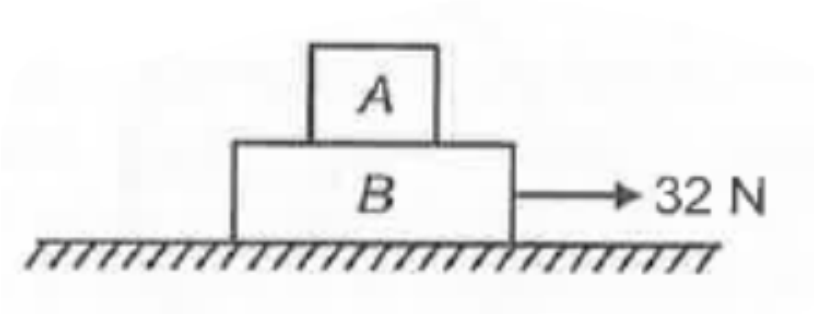
284. Block A of mass 3 kg is placed on another block B of mass 5 kg placed on the smooth surface. If coefficient of friction between two blocks is $\frac{1}{2}$ and 32 N force is applied on block B as shown in the figure, then the work done by the frictional force on block A in first two second will be (initial velocity of the system is zero and $g = 10\frac{m}{s^2}$)



A. $+96J$

B. 50 J

C. $-96J$

D. $-50J$

Answer: D

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285. The potential energy of a particle varies with position X according to the relation $U(x) = \left[\left(\frac{X^3}{3}\right) - \left(3\frac{X^2}{2}\right) + 2X\right]$ then

A. The point x = 1 is point of stable equilibrium

B. The point x = 2 is point of stable equilibrium

C. Both x = 1 and x = 2 are points of unstable equilibrium

D. The point x = 1 is point of neutral equilibrium

Answer: A

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286. A man pulls out a block of mass m from the depth d with help of a light string. If acceleration of the block is $\frac{g}{2}$ then the work done by the string on the block will be

A. $-3mg\frac{d}{2}$

B. $+3mg\frac{d}{2}$

C. $-mg\frac{d}{2}$

D. $+mg\frac{d}{2}$

Answer: B

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287. A block of mass m is attached with a spring in vertical plane as shown in the figure. If initially spring is in its natural length and the block is released from rest, then maximum extension in the spring will be

A. $2m\frac{g}{k}$

B. $4m\frac{g}{k}$

C. $m\frac{g}{k}$

D. $m\frac{g}{2}k$

Answer: A

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288. A small block of mass m is placed at the bottom of fixed circular smooth surface of radius R as shown in the figure If a velocity v. 14 gR is given to the block then maximum height from the bottom of circular surface, where block will leave the contact

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

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

C. R

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

Answer: A

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289. A wooden block of mass 2m is hung with the help of a light string of length / in the vertical plane. A bullet of mass m/4 moving horizontally

with velocity $V_0\{V_0 = \sqrt{5gl}\}$ penetrates the block and comes out with velocity $\frac{v_0}{2}$ The maximum height reached by the block is (Assume string remains vertical till bullet passes through the block)

A. $\frac{v_0^2}{256g}$

B. $\frac{v_0^2}{128g}$

C. $\frac{v_0^2}{512g}$

D. $\frac{v_0^2}{32g}$

Answer: C

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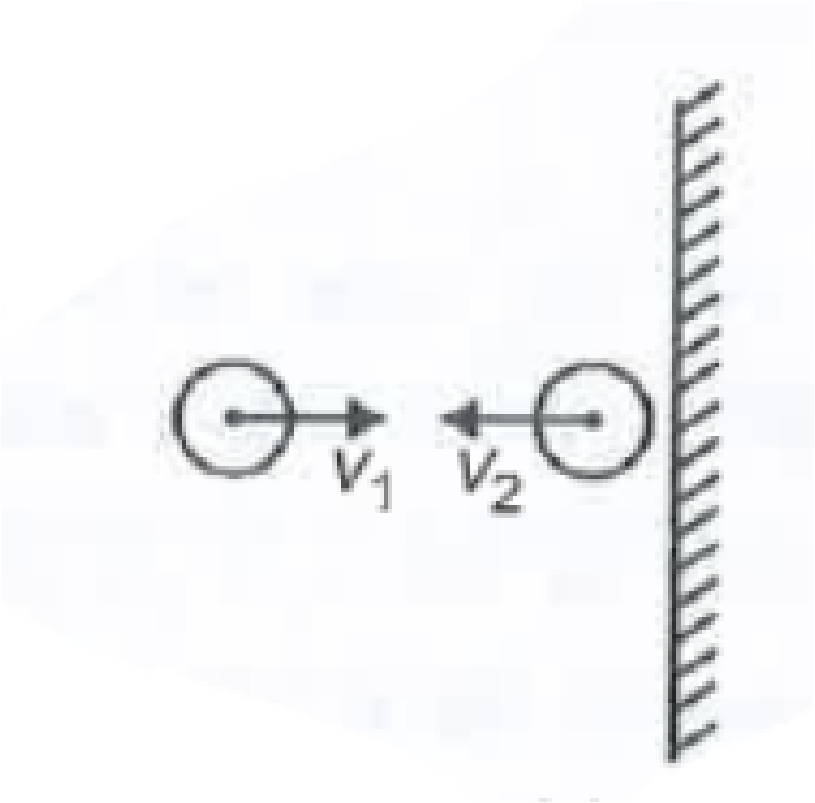
290. A ball collides perpendicularly with a vertical wall with speed v, and rebounds with speed v, as shown in the figure. If$v_1 > v_2$then coefficient

of restitution(e) is



A. 1

B. Zero

C. $0' < e < 1$

D. $e < 1$

Answer:

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291. A constant force Facts on a body The power delivered by F will depend on position x as (velocity of body is zero at x = 0)

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

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

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

D. $X^{\frac{1}{2}}$

Answer: D

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292. The potential energy of a particle of mass 2 kg moving in a plane is given by $U = (-6x - 8y)J$. The position coordinates x and y are measured in meter. If the particle is initially at rest at position (6, 4)m, then

A. Its acceleration is of magnitude 5 m/s2

B. It crosses the y-axis at (x = 0, y = 6 m)

C. Its speed when it crosses the y-axis is 10 m/s

D. Both (1) & (3)

Answer: A

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293. Choose the correct statement out of the following.

A. Work done by the static friction on a body will always be positive

B. Work done by the kinetic friction on a body will always be negative

C. Work done by the static friction on a bady will always be zero

D. Work done by the static friction on a body may either be positive, negative or zero

Answer: B

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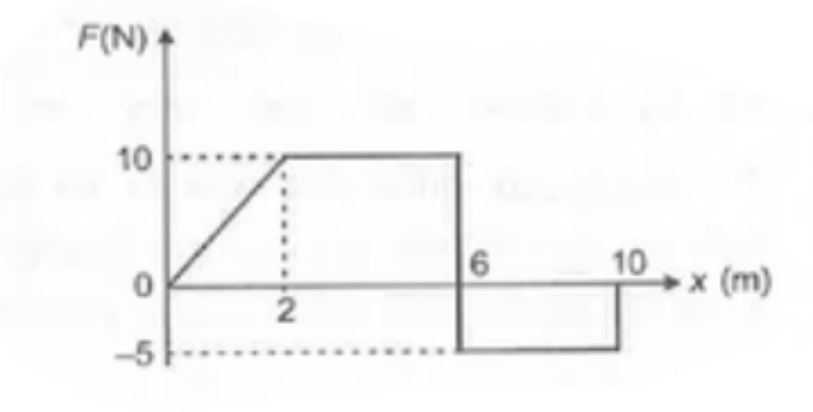
294. The force versus position (F-x) graph of a particle of mass 2 kg is shown in the figure. If at x = 0 velocity of particle is 2 m/s then velocity of the particle at x = 8 m will be



A. $2\sqrt{11}\frac{m}{s}$

B. $\sqrt{22}\frac{m}{s}$

C. $2\sqrt{22}\frac{m}{s}$

D. $4\sqrt{11}\frac{m}{s}$

Answer: D

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295. A force ` bar F = (3hat i-4 hat j +b hat k)N is acting on the particle which is moving from point A (0-1, 1) m to the point B(2, 2 3) m If net work done by the force on the particle is zero then value of b is

A. -3

B. -2

C. 2

D. 3

Answer: B

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296. A block of mass m is placed over rough inclined plane having inclination 30° . The co- efficient of friction between the block and the

inclined plane is 0.75 . The contact force on the block is

A. 200 j

B. 300 j

C. 100 j

D. 50 j

Answer: B

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297. A force $F = \left(x\hat{i} + 2y\hat{j}\right)$N is applied on an object of mass 10 kg, Force displaces the object from position A(1, 0) m to position B(3, 3) m then the work done by the force is (x and y are meter)

A. 8 J

B. 5 J

C. 13 J

D. 16 J

Answer: C

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298. A block of mass 5 kg is placed on a plank of mass 10 kg which is placed on the smooth horizontal surface as shown in figure. If a 100 N force is applied on the plank then the acceleration of the plank wrt ground is (Coefficient of friction between block and plank $\mu_s = \mu_k = 0.4$ and $g = 10\frac{m}{s^2}$)

A. $8 = \frac{m}{s^2}$

B. $2 = \frac{m}{s^2}$

C. $6 = \frac{m}{s^2}$

D. Zero

Answer: A

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299. In given arrangement as shown in figure, the system is in equilibrium. Choose the correct option $\left(g = 10\frac{m}{s^2}\right)$

A. $T_1 = 100\sqrt{5}N$

B. $\theta = \tan^{-1}(2)$

C. $T_1 = 100\sqrt{3}N$

D. Both (1) and (2)

Answer: D

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300. A block of mass 10 kg is placed on the rough horizontal surface. A pulling force F is acting on the block which makes an angle θ above the horizontal. If coefficient of friction between block and surface is $\frac{4}{3}$ then minimum value of force required to just move the block is $\left(g = 10\frac{m}{s^2}\right)$

A. 80 N

B. 160 N

C. 60 N

D. 120 N

Answer: A

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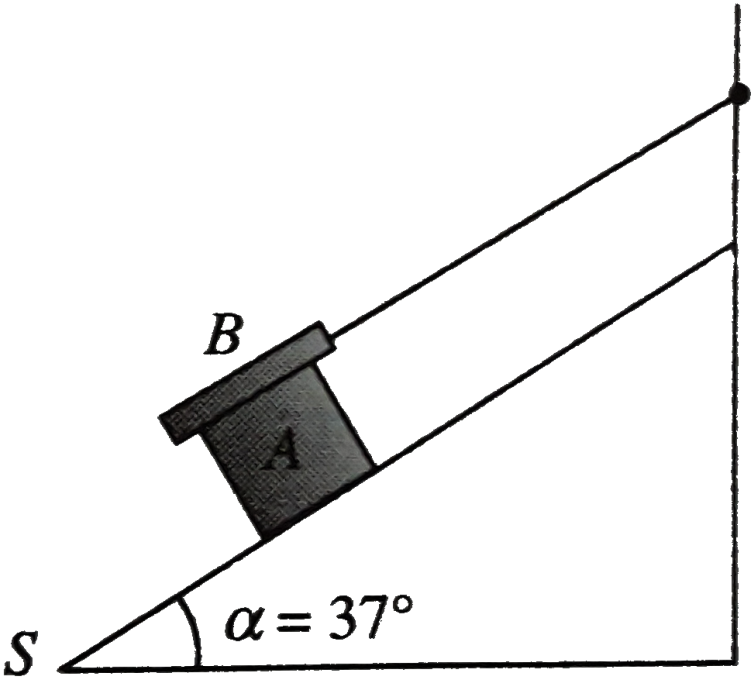
301. A block A of weight W slide down an inclined plane S of slope37° at a contact velocity,while the plane B also of weight W rests on top of A The plank B is atteched by a cord to the top of plane .The coefficient of kinetic frictionμ is the same between the surface A and B and between S and A

Determine the value of $1/\mu$



A. 13

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

C. 12

D. 1

Answer: C

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302. A rope of length 5 m has uniform mass per unit length. $\lambda = 2k\frac{g}{m}$ The rope is pulled by a constant force of 10N on the smooth horizontal surface as shown in figure The tension in the rope at x = 2 m from polit A is

A. 2 N

B. 8 N

C. 6 N

D. 5 N

Answer: D

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303. Two Blocks P and Q of masses 5 kg: and 10 kg espevelv re placed on a rough horizontal surface ta to central force ct 25 N is applied on the block Pas shown in figure The frictiona force exerted oy the surface or the block Q will be $\left(g = 10\frac{m}{\hat{}}2\right)$

A. 10 N

B. 5 N

C. 50 N

D. 40 N

Answer: B

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304. Choose the correct statement(s) about the frictional force between two solid surfaces in contact

A. Static friction is a variable force

B. $\bar{f}_{\lim} = \mu_s \overline{N}$

C. Knetic friction is self adjusting

D. Both (1 and (2

Answer: D

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305. Two blocks of masses 10 kg and 9 kg are connected with light string which is passing over an ideal pulley as shown in figure. If system is released from rest then the acceleration of 9 kg block at the given instant is about (Assume all the surfaces are smooth and $g = 10\frac{m}{s^2}$)

A. $1.8\frac{m}{s^2}$

B. $4.73\frac{m}{s^2}$

C. $3.5\frac{m}{s^2}$

D. $3\frac{m}{s^2}$

Answer: B

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306. Two blocks A and B of masses 10 kg and 5 kg respectively are placed inside a cart which is moving horizontally with an acceleration of$2\frac{m}{s^2}$ as

shown in the figure. If all the surfaces are smooth then the ratio of normal reaction between the block A and vertical surface of the cart and normal reaction between the blocks A and B is

A. $3:1$

B. $2:3$

C. $2:1$

D. $1:2$

Answer: A

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307. A block of mass 20 kg is hung with the help of ideal string, pulleys and spring (Spring constant k = 1000 N/m) as shown in figure. If block is in equilibrium position then extension in the spring will be $\left(g = 10ms^{-2}\right)$

A. 10 cm

B. 2.5 cm

C. 5 cm

D. 20 cm

Answer: D

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308. Three blocks A, B and C of masses 5 kg, 5 kg and 10 kg respectively are connected with two light strings, one of them is passing over an ideal pulley The system is released from rest on smooth inclined plane of inclination 30" as shown in figure. The value of tension $\frac{T_1}{T_2}$ is

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

B. 2

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

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

Answer: B

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