PHYSICS

AAKASH INSTITUTE ENGLISH

MOCK TEST 6

Example

1. When a speeding bus stops suddenly, passengers are thrown forward from their seats because

A. Change in momentum

B. Inertia

C. Charge in energy

D. Both (1) and (2)

Answer: B

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2. A 6000 - kg rocket is set for firing . If the exhaust speed is $1000ms^{-1}$, how much gas must be ejected per second to supply the thrust needed , (a) to overcome the weight of the rocket , (b) to give the rocket an initial acceleration of $19.6ms^{-2}$?

A. 58.8 kg , 176.4

B. 60 kg ,176.4 kg

C. 75 kg , 180 kg

D. 90 kg , 120.3 kg

Answer: B

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3. A shell of mass 0.020 kg is fired by a gun of mass 100 kg. If the speed of the shell is $80\frac{m}{s}$, the recoil speed of the gun would be

A. 14 m/s

B. 0.012 m/s

C. 0.016 m/s

D. 100 m/s

Answer: C

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4. which of the following sentence is/are correct

A. momentum has both direction and magnitude

B. momentum is a scalar quantity

C. the rate of change of momentum of an object is in the direction of force

D. both (1) and (3)

Answer: D

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5. The dimensional formula of inertia is

A. $[M^1L^0T^0]$

B. $[M^1L^{-1}T^0]$

C. $[M^0L^0T^0]$

D. $[M^1L^0T^1]$

Answer: C

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6. A person sitting in an open car moving at constant velocity throws a ball vertically up into air. The ball falls

A. Outside the car

B. In the car ahead of the person

C. In the car to the side of the person

D. Exactly in the hand which throw it up

Answer: D

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7. A shell explodes and many pieces fly of in different directions . which of the following options is correct

A. Kinetic energy of shell remains conserved

B. Momentum of shell remains conversed

C. Both momentum and kinetic energy of shell remain conversed

D. Neither momentum nor kinetic energy off shell remain conversed

Answer: B

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8. In which of the following cases , the observer is in intertial frame?

A. A child revolving in a merry-go-round

B. A driver in a car moving with a constant velocity

C. A pilot is an aircraft which is taking off

D. a passenger in a train which is showing down to stop

Answer: B

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9. A bag P (mass M) hangs by a long thread and bullet (mass m) comes horizontally with velocity v and gets caught in the bag. Then for the combined (bag + bullet) system

A. Momentum is (mMv)/(M+m)

B. Kinetic energy is $\frac{1}{2}Mv^2$

C. Momentum is $\frac{mv(M+m)}{M}$

D. Kinetic energy is $\frac{m^2v^2}{2(M+m)}$

Answer: D

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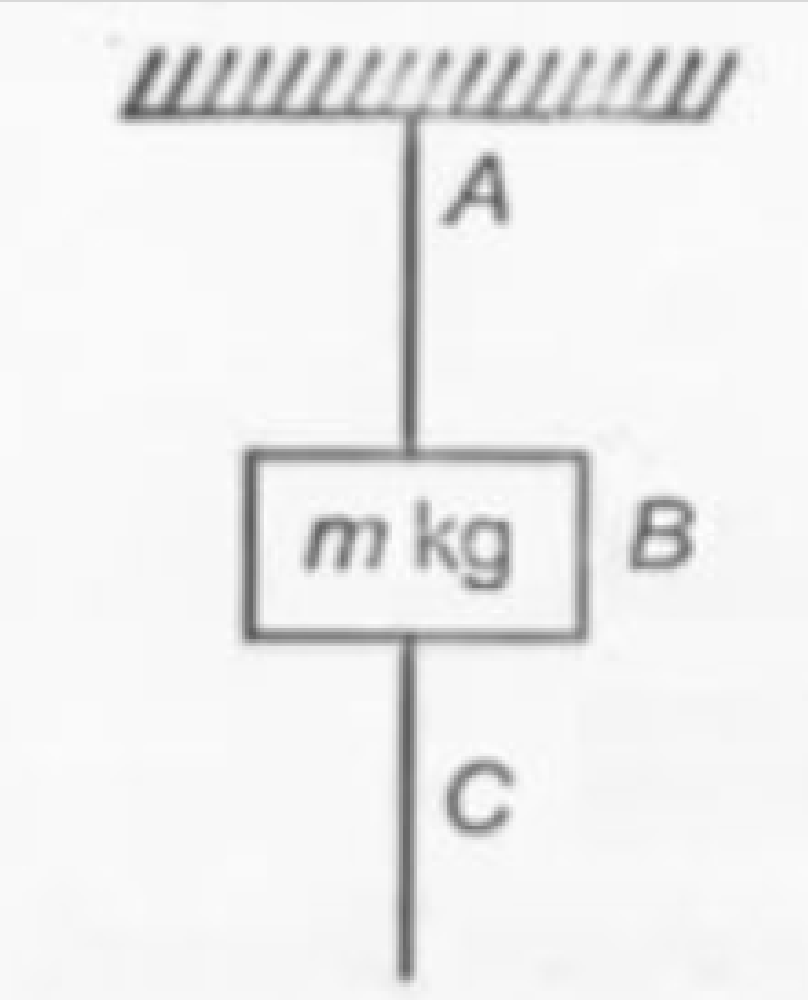
10. A mass of 1 kg is suspended by a string A . Another string C it`s connected to its lower end. If a sudden jark is given to C then



A. The portion AB of the string will break

B. The portion BC of the string will break

C. None of the strings will break

D. The mass will start rotating

Answer: B

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11. A vehicle is moving on a rough road in a straight line with uniform velocity

A. No net force is acting on vehicle

B. A net force must acting on the vehicle

C. An acceleration is being produced in the vehicle

D. An centripetal acceleration is being produced in the vehicle

Answer: A

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12. Rocket engines lift a rocket from the earth surface because hot gas with high velocity

A. Push against the earth

B. Push against the air

C. Provides thrust to the rocket and push it up

D. Heat up the air which lifts the rocket

Answer: C

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13. Which of the following depends on the choice of inertial reference frame ?

A. Momentum

B. Change in momentum

C. Kinetic energy

D. Both (1) & (3)

Answer: D

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14. A shell of mass 5 m, acted upon by no external force and initially at rest , burts into three fragments of masses m, 2 m, 2 m respectively . The first two fragments move in opposite directions with velocites magnitude 2 v and v respectively . The third fragment will

A. Move with a velocity v in direction perpendicular to the other two

B. Move with a velocity 2 v in the direction of velocity of the first fragment

C. Move with a velocity v in the direction of velocity of the second fragment

D. Be at rest

Answer: D

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15. According to Newton`s first law of motion , which of the following statement (s) is/are correct ?

A. If the vector sum of forces acting on a body is zero, then and only then the body remains unaccelerated

B. An inertial frame of reference is one in which Newton`s first law is obeyed

C. Newton`s first law is the law of inertia

D. All of these

Answer: D

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16. Swimming is possible by

A. First law of motion

B. Second law of motion

C. Third law of motion

D. Newton`s law of gravitation

Answer: C

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17. Action and reaction forces act on

A. Same body

B. Different bodies

C. Horizontal surface

D. Nothing can be said

Answer: B

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18. Two forces with equal magnitudes F act on a body and the magnitude of the resultant force is F /3. The angle between the two forces is

A. $\cos^{-1}\left(-\frac{17}{18}\right)$

B. $\cos^{-1}\left(-\frac{1}{3}\right)$

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

D. $\cos^{-1}\left(\frac{8}{9}\right)$

Answer: A

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19. An object is subjected to a force in the north-east direction. To balance this force, a second force should be applied in the direction

A. North east

B. South

C. South west

D. West

Answer: C

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20. A ball of mass 0.2 kg moves with a velocity of $20m / \sec$ and it stops in 0.1 sec , then the force on the ball is

A. 40 N

B. 20 N

C. 4 N

D. 2 N

Answer: A

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21. A force vector applied on a mass is represented as $F = 6i - 8j + 10k$ and acceleration with 1 m/s^2. What will be the mass of the body ?

A. $10\sqrt{2}$ kg

B. $2\sqrt{10}$ kg

C. 10 kg

D. 20 kg

Answer: A

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22. A 5 kg block rests on a horizontal surface. Which of the following option is incorrect? $(g = 10\frac{m}{s})$

A. The normal force on the block equals its weight because of Newton`s second law

B. The normal force on the block is equals to the weight not because of Newton`s third law

C. The normal force on the block equals its weight because of Newton`s third law

D. The normal face on the block is 50 N

Answer: C

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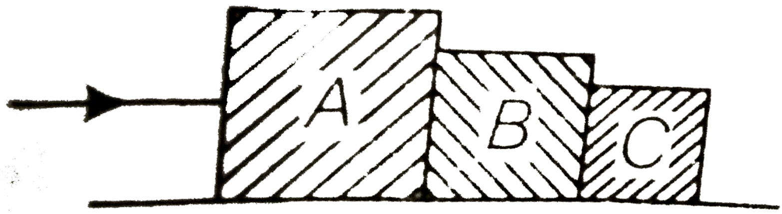
23. Three blocks A,B and C of masses 4 kg, 2kg and 1kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is



A. 12 N

B. 16 N

C. 36 N

D. 4 N

Answer: A

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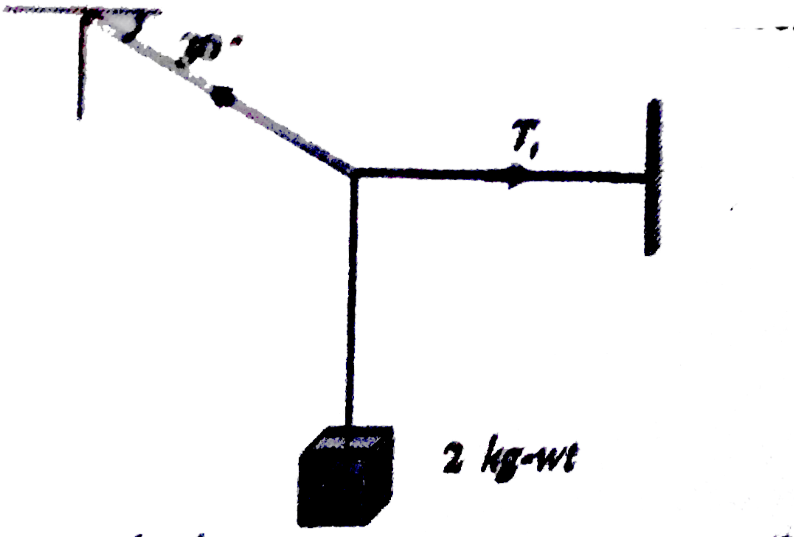
24. A body of weight 2 kg is suspended as shown in the figure. The tension T_1 in the horizontal string (in kg wt) is



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

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

C. $2\sqrt{3}$

D. 2

Answer: C

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25. Newton's third law of motion leads to the law of conservation of

A. Angular momentum

B. Energy

C. Mass

D. Momentum

Answer: D

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26. A block of mass 1 kg is placed on a horizontal surface . The reaction force to the weight of the block is

A. The 10 N normal force from the surface

B. The 10 N reaction force from the block of the surface

C. The weight of the earth

D. A 10 N force on earth

Answer: D

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27. A man of mass 70 kg stands on a weighing scale in a lift which is moving downward with the uniform acceleration of $5\frac{m}{s^2}$. The reading on the weighing scale is

A. 70 kg

B. 35 kg

C. 105 kg

D. 700 kg

Answer: B

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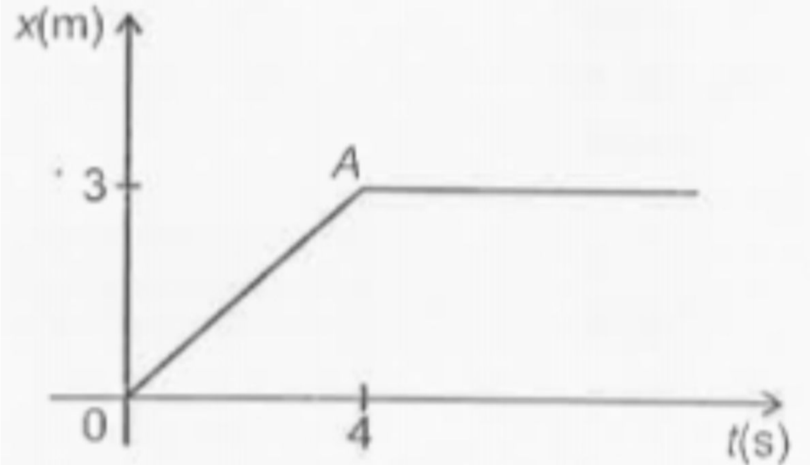
28. The figure shows the position time graph of a particle of mass 40 kg. What is the force acting on the particle of $0 < t < 4$ s



A. 30 N

B. Zero

C. 53.33 N

D. 40 N

Answer: B

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29. A monkey of mass 20 kg climbs on a rope which can stand a maximum tension of 300 N. In which of the following case will the rope break . The monkey

A. Climbs up with an acceleration of $6\frac{m}{s^2}$

B. Climbs down with an acceleration of 4 $\frac{m}{s^2}$

C. Climbs up with a uniform speed of 5$\frac{m}{s^2}$

D. Falls down the rope nearly free under gravity

Answer: A

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30. The correct differential from of Newton`s second law is

A. $F = ma$

B. $F = m\left(\frac{dv}{dt}\right)$

C. $F = \frac{d}{dt}(mv)$

D. $F = m\left(\frac{d^2x}{dt^2}\right)$

Answer: C

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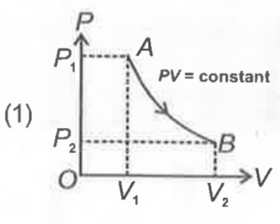
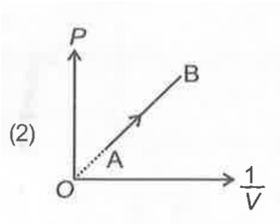
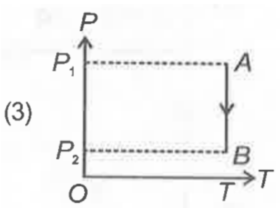
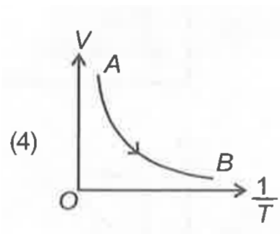
31. Which of the following graph does not belong to isothermal process for an ideal gas?

A. 

B. 

C. 

D. 

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32. Which of the following is incorrect?

A. If two systems A and B are in thermal equilibrium with system C separately, then A and B will be in thermal equilibrium

B. Zeroth law of thermodynamics defines temperature

C. Temperature does not determine the direction of flow of heat when two bodies are placed in thermal contact

D. Internal energy of an ideal gas depends on the state of the system

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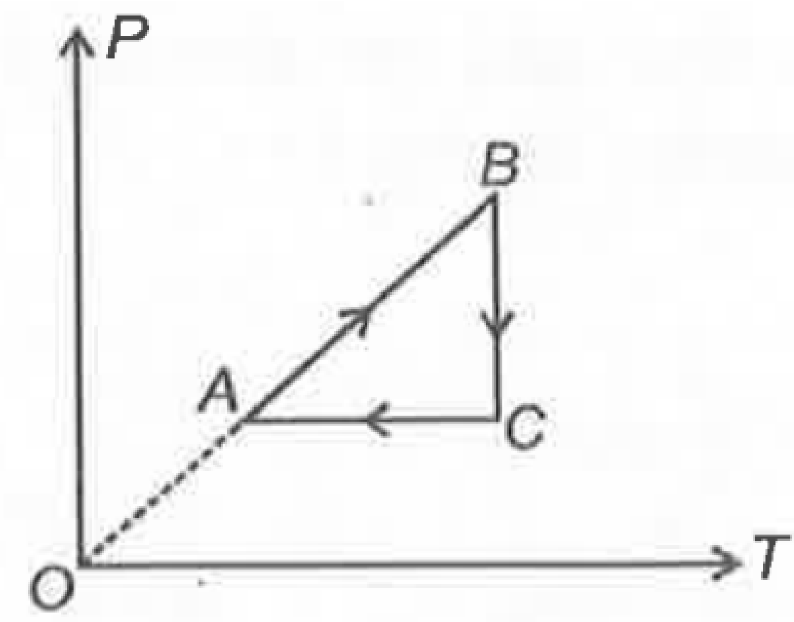
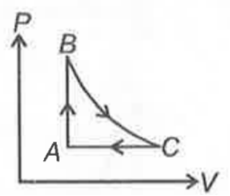
33. The given figure shows the pressure-temperature (P-T) diagram for a fixed mass of an ideal gas undergoing cyclic process ABCA. The corresponding pressure-volume (P-V) graph for the given cyclic process

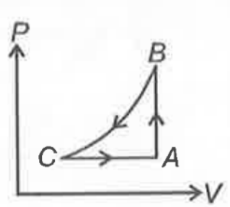


will be

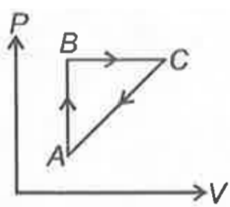
A. (1)

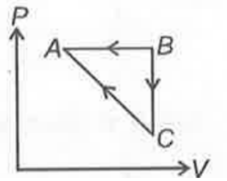


B. (2)



C. (3)



D. (4) 

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34. An ideal gas is found to obey the law $V^2T = cons\tan t$. The initial pressure and temperature are P_0 and T_0. If gas expands such that its pressure becomes $\frac{P_0}{4}$, then the final temperature of the gas will be

A. $\frac{T_0}{4}$

B. $\frac{T_0}{(16)^{\frac{2}{3}}}$

C. $\frac{T_0}{(16)^{\frac{1}{3}}}$

D. $4T_0$

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35. The internal energy of a gas is given by $U = \frac{PV}{2}$. At constant volume, state of gas changes from (P_0, V_0) to $(3P_0, V_0)$ then

A. Heat rejected by gas is P_0V_0

B. Heat absorbed by gas is P_0V_0

C. Work done by gas is $2P_0V_0$

D. Heat absorbed by gas is $\frac{3P_0V_0}{2}$

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36. An ideal gas of adiabatic exponent $\left(\gamma = \frac{7}{5}\right)$ is expanding at constant pressure. The ratio of $dQ : dU : dW$ is (Symbols have their usual meanings)

A. $7 : (5) : (1)$

B. $7 : (2) : (5)$

C. $2 : (1) : (1)$

D. $7 : (5) : (2)$

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37. In the adiabetic expansion of an ideal gas, select the incorrect statement.

A. There is decrease in temperature of the gas

B. There is decrease in initial energy of the gas

C. The work done is positive

D. The work done by gas is equal to heat supplied

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38. Cooling of water under atmospheric pressure is a/an

A. Cyclic process

B. Isobaric process

C. Isothermal process

D. Adiabatic process

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39. A Carnot engine has an efficiency of 20%. When temperature of sink is reduced by $80^{\circ}C$ its efficiency is doubled. The temperature of source is

A. $1492^{\circ}C$

B. $400^{\circ}C$

C. $127^{\circ}C$

D. $80^{\circ}C$

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40. A refrigerator whose coefficient of performance is 6, extract heat from cooling compartment at the rate of 300 J/cycle. How much heat per cycle is rejected in the room?

A. $50J$

B. $250J$

C. $300J$

D. $350J$

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41. An ideal gas is taken through a cyclic thermodynamics process through four steps. The amount of heat given to the system in these steps are $Q_1 = 1000J$, $Q_2 = -800J$, $Q_3 = 450J$, $Q_4 = -200J$ respectively. The efficiency of cycle is nearly

A. 31%

B. 45%

C. 35%

D. 48%

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42. A wall has two layers X and Y each made of different materials. Both layers have same thickness. Thermal conductivity of X is twice that of Y. At steady state the temperature difference of opposite faces of wall is $54^\circ C$. The temperature difference across Y layer is

A. $18^\circ C$

B. $27^\circ C$

C. $0^\circ C$

D. $36^\circ C$

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43. Choose the correct statement among the following.

A. The boiling point of a liquid is independent of superincumbent pressure

B. The melting point of liquid independent of superincumbent pressure

C. At the pressure below that of its triple point no substance can exist as a liquid

D. Both (A) and (B)

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44. A clock with a metallic pendulum 4 second fast each day at a temperature of $20^{\circ}C$. The koi efficient of linear expansion of given metal is $2.77 \times 10^{-5} {}^{\circ}C^{-1}$. The temperature at which clock gives correct reading is nearly

A. $23^{\circ}C$

B. $29^{\circ}C$

C. $17^{\circ}C$

D. $28^{\circ}C$

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45. If $1kg$ ice at $0^{\circ}C$ is mixed with $200g$ steam at $100^{\circ}C$, then which of the following option is correct?

A. Whole ice will melt but whole steam will not convert into water

B. $1200g$ water will be at $100^{\circ}C$

C. Whole ice will not melt so temperature of equilibrium is $0^{\circ}C$

D. Whole ice will melt and holds team will also be converted into water. The equilibrium temperature is $40^{\circ}C$

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46. Two rods of different materials having coefficient of thermal expansion α_1 and α_2 and Young's modulus Y_1 and Y_2 respectively are fixed between two rigid supports separately. The rods are heated such that they undergo same temperature increment. If thermal stress developed in two rods are equal, then $Y_1 : Y_2$ is

A. $\frac{\alpha_1}{\alpha_2}$

B. $\frac{\alpha_2}{\alpha_1}$

C. $1:1$

D. $\frac{\alpha_1 + \alpha_2}{\alpha_1 - \alpha_2}$

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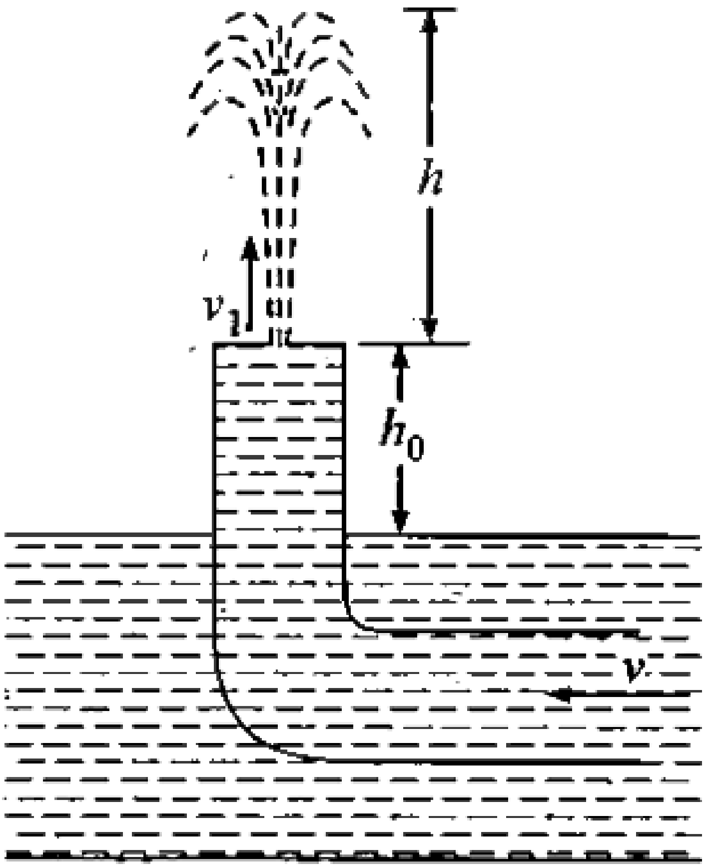
47. A bent tube is lowered into a water stream as shown in figure. The velocity of the stream relative to the tube is equal to $v = 5ms^{-1}$. The closed upper end of the tube located at the height h_0=12 cm has a small orifice.To what height h will the water jet spurt? $\left(g = 10ms^{-1}\right)$



A. 1.5 m

B. 0.25 m

C. 1.13 m

D. 1 m

A. 1.5 m

B. $0.25m$

C. 1.13 m

D. $1m$

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48. A cubical block of iron of side$13.6cm$ is floating in mercury in a vessel .Water is poured in the vessel until it just covers the iron block. What is the height of water column? $(\rho_H g = 13.6g\frac{m}{c}m^3, \ \rho_F e = 7.2g\frac{m}{c}m^3,$ $\rho_H\_2O = 1g\frac{m}{c}m^3)$

A. $6.9cm$

B. $5.8cm$

C. $5.4cm$

D. $7.2cm$

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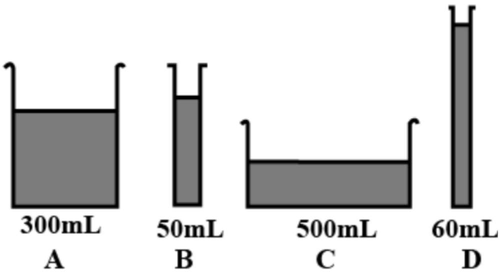
49. The increasing order of normal reaction applied by the base of vessels on the liquid are (Given base area $A_A < A_B < A_C$)



A. $N_A < N_B < N_C$

B. $N_B < N_A < N_C$

C. $N_A < N_C < N_B$

D. $N_A = N_B = N_C$

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50. surface tension of soap solution is $4 \cdot 10^{-2} \frac{N}{m}$. If a soap bubble of radius $5cm$ is blown, then the amount of work done is

A. $8\pi \cdot 10^{-4} J$

B. $4\pi \cdot 10^{-4} J$

C. $2\pi \cdot 10^{-4} J$

D. $8\pi J$

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51. Two immiscible liquid of densities rho and 3ρ are put in a container. The height of each liquid is h. A solid cylinder of length L and density d is put in this container. The cylinder floats completely inside liquids with its axis vertical and length $\frac{L}{3}$ in the denser liquid. The density d is equal to

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

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

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

D. 4ρ

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52. Which one of the following combination is incorrect?

A. Swing of cricket ball- Magnus effect

B. Venturimeter- Bernoulli's theorem

C. Hydraulic lift- Archemedes principle

D. Blood flow and heart attack - Bernoulli's theorem

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53. A rod of uniform cross sectional area $5mm^2$ weighing$5kg$ and length $1m$ is suspended vertically from a fixed support the elongation produced in the rod if [Young's modulus of material, $Y = 2x10^{11}\frac{N}{m^2}$ and $g = 10ms^{-2}$]

A. $0.05mm$

B. $0.025mm$

C. $0.005mm$

D. $0.5mm$

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54. The increase in pressure required to decrease volume by 0.005% of $150litre$ liquid (in kPa) is (Bulk modulus of liquid, $B = 3x10^9\frac{N}{m^2}$)

A. 150

B. 250

C. 50

D. 225

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55. Which one of the following statements is incorrect about the elasticity?

A. There are three types of modulus of elasticity

B. All elastic module have same units

C. Steel is more elastic than rubber

D. On increasing the temperature ,elasticity increases

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56. A satellite is revolving at a height where it completes its3 revolution in one day. If it is shifted to a height where it becomes a geostationery satellite, the ratio of respective distances of orbit from centre of earth is

A. A. $\frac{\left(\frac{1}{3}\right)^2}{3}$

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

C. C. $\frac{\left(\frac{1}{8}\right)^2}{3}$

D. D. $\frac{\left(\frac{2}{3}\right)^1}{3}$

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57. The work done by gravitational force on a point mass $m_0$in moving from the surface of a planet off mass M and radius R to a height $\frac{R}{2}$ is

A. Zero

B. $\frac{2}{3}\left(GM\frac{m_0}{R}\right)$

C. $\left(-2GM\frac{m_0}{3}R\right)$

D. $\left(-GM\frac{m_0}{3}R\right)$

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58. A satellite is revolving round the earth in circular orbit

A. The torque acting on satellite about Centre is earth is always zero

B. The areal velocity of satellite about the earth is inversely proportional to the mass of satellite

C. The magnitude of angular momentum of satellite about the centre of earth remains constant

D. kinetic energy of satellite does not remain constant

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59. Ratio of escape speeds from the surfaces of two uniformly uniformly dense planet of densities ρ and 2ρ respectively having equal radii is

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

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

C. 1

D. 2

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60. A satellite is revolving very close to the earth surface in a circular orbit has potential energy U. Find the change in its mechanical energy if it is made to move away from earth such that its velocity becomes half while going around the earth in a larger circular orbit.

A. Zero

B. $\left(-\frac{U}{4}\right)$

C. $\left(-\frac{U}{8}\right)$

D. $\left(-3\frac{U}{8}\right)$

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61. The change in gravitational force experienced by a particle of mass m, due to a uniform thin circular ring when moving the particle from centre of ring by a distance x $x < \ < R$ (Radius of ring) along the straight line perpendicular to the plane of the ring is proportional to

A. x

B. x^2

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

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

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62. Two spheres A and B of equal radii R, each are uniformly dense with densities 2ρ and rho respectively are placed as shown in figure.The initial acceleration of particle placed at point P due to gravity of both the spheres will be (P is just above the surface of sphere B).

A. $\left(8\frac{\pi}{27}\right)\rho GR$

B. $\left(4\frac{\pi}{3}\right)\rho GR$

C. $\left(\frac{28}{27}\right)\pi\rho GR$

D. $\left(4\frac{\pi}{27}\right)\rho GR$

63. A point mass m, is placed at the surface of a hypothetical planet where acceleration due to gravity is $\frac{g}{2}$, where g acceleration due to gravity at the poles the planet. The latitude of that position is [T is time period of planet rotation about its own axis and R is radius of planet]

A. Zero

B. $\cos^{-1}\sqrt{\frac{gT^2}{8\pi^2 R}}$

C. $\cos^{-1}\left(\frac{gT^2}{8\pi^2 R}\right)$

D. 45°

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64. Which one of the following is incorrect statement about gravitational forces?

A. It is the weakest force in nature

B. Gravitational force between two point masses is independent of medium in which point masses are placed

C. It obeys principle of superposition

D. it is a non-conservative force

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65. A satellite of mass m_0 is revolving around the earth in circular orbit at a height of $3R$ from surface of the earth the areal velocity of satellite is (where R is radius of earth and M_0 is the mass of earth)

A. Zero

B. $\sqrt{GM_\theta R}$

C. $\sqrt{Gm_0 R}$

D. $\sqrt{4GM_\theta R}$

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66. If gravitational potential at a point (x, y, z) in space is given by $V_g = -GM\left[\frac{1}{2x} + \frac{x}{y^2} + \frac{1}{z}\right]$ then x- component of gravitational field intensity at $(1, 1, 1)$ is (all quantities are in SI unit)

A. $\left(G\frac{M}{2}\right)$

B. $\left(-G\frac{M}{2}\right)$

C. GM

D. $(-GM)$

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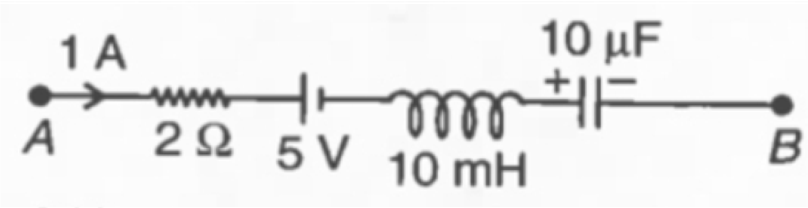
67. If the instantaneous change on the capacitor is 100μC and current through the circuit is decreasing at the rate of $2 \times 10^3 \frac{A}{s}$ then potential difference $V_A - V_B$ is equal to



A. $-3V$

B. $3V$

C. $27V$

D. $7V$

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68. Self inductance is of primary and secondary of an ideal transformer are L and 4L respectively. If current through the primary coil is $i = I_0 \sin \omega t$ then induced EMF across secondary coil due to current variation in the primary coil at $t = \frac{\pi}{3\omega} s$ is

A. A. $2LI_0\omega$

B. B. $\sqrt{3}\frac{L}{2}I_0\omega$

C. C. $LI_0\omega$

D. D. Zero

Watch Video Solution

69. If two resistive wires AB and CD are made to slide on the conducting rails with speeds 5m/s 10 m/s respectively towards right as shown in the figure then value of R for which current through it is 1A is(B=1.5T)

A. $\frac{28}{3}\Omega$

B. $\frac{13}{3}\Omega$

C. 7Ω

D. 2Ω

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70. If $\overrightarrow{B}_1, \overrightarrow{B}_2, \overrightarrow{B}_3$ and $\overrightarrow{B}_4$ are the magnetic field due to current I_1, I_2, I_3 and I_4respectively then in ampere circuital law $\oint \overrightarrow{B}.d\overrightarrow{l} = \mu_0 I$, $\overrightarrow{B}$ is

A. $\overrightarrow{B} = \overrightarrow{B}_1 - \overrightarrow{B}_2$

B. $\overrightarrow{B} = \overrightarrow{B}_2 + \overrightarrow{B}_4$

C. $B = \overrightarrow{B}_1 + \overrightarrow{B}_2 + \overrightarrow{B}_3 + \overrightarrow{B}_4$

D. $\overrightarrow{B} = \overrightarrow{B}_2 - \overrightarrow{B}_3$

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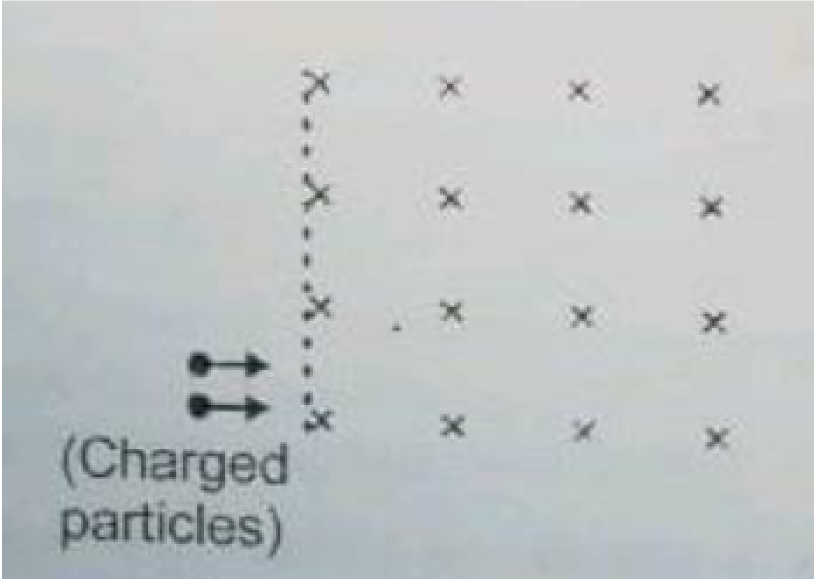
71. A proton and an alpha particle having same kinetic energies are entering in a uniform magnetic field normal to as shown in figure. The ratio of time to return on the same side is



A. $1:1$

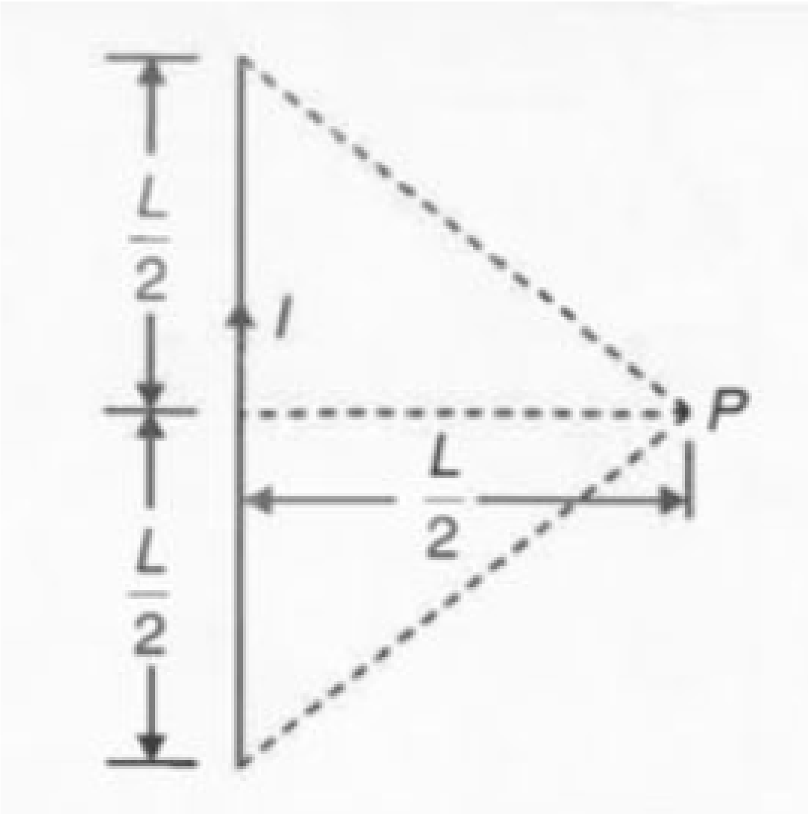
B. $1:2$

C. $1:4$

D. $1:3$

Watch Video Solution

72. B_0 is the magnetic field at point P fir s given straight wire as shown in figure. If this wire is bent into a circular loop,then magnetic field at the center of the loop is



A. $\sqrt{2}\pi B_0$

B. $\frac{\pi B_0}{\sqrt{2}}$

C. $\sqrt{2}\pi^2 B_0$

D. $\frac{\pi^2 B_0}{2}$

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73. If speed of a proton increases in a cyclotron, then the value of specific charge[if relativistic mass is not considered.

A. Remains same

B. Increases

C. Decreases

D. First decreases to a certain value of velocity and then increases

Watch Video Solution

74. The current sensitive and voltage semsitivity of a moving coil galvanometer aare $0.03(rad/A)$ and $\left(3 \times \overset{-5}{10} rad/V\right)$ respecively. The resistance of galvanometer is

A. $1k\Omega$

B. $1m\Omega$

C. $9 \times 10^{-7}\Omega$

D. $\frac{1}{9} \times 10^{7}\Omega$

Watch Video Solution

75. In given figure, current I is flowing through straight wire and divided equally in two loops as shown in the figure. The magnitude of magnetic field intensity at the center (O) is

A. Zero

B. $\frac{\mu_0 I}{8}\left[\frac{1}{r_2} - \frac{1}{r_1}\right.$

C. $\frac{\mu_0 I}{4\pi}\left[\frac{\pi}{2r_2} - \frac{\pi}{2r_1} - \frac{1}{r_1}\right]$

D. $\frac{\mu_0 I}{4\pi}\left[\frac{\pi}{2r_2} - \frac{\pi}{2r_1} + \frac{\pi}{r_1}\right]$

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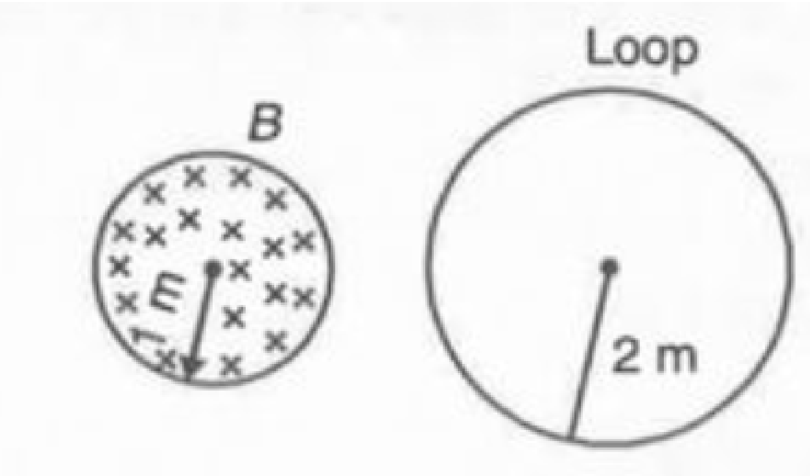
76. A uniform magnetic field is restricted within a region of radius 1m. The magnetic field changes with time(t) as $\overrightarrow{B} = B_0\left(\frac{2t}{3}\right)\hat{k}$. A loop of radius 2m is outside the region of magnetic field as shown in figure. The emf induced in loop is



A. Zero

B. $\frac{2}{3}\pi B_0$

C. $\frac{8}{3}\pi B_0$

D. $\frac{4}{3}\pi B_0$

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77. Which of the following statement is correct about induced electric field?

A. This field is produced by variation of magnetic field with respect to space

B. This field is conservative in nature

C. We cannot define a potential corresponding to this field

D. The lines of induced electric field are not closed curve

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78. There is a conducting rod of length $2L$ that lies along x-axis from $x = -L$ to $x = L$. If rod moves with velocity $\left(v = v_0\hat{i}\right)$ In the magnetic field $\left(\vec{B} = B_0\hat{k}\right)$, then induced emf bbetween ends of rod is

A. Zero

B. $\frac{2}{3}B_0Lv_0$

C. $\frac{1}{3}B_0Lv_0$

D. $2B_0Lv_0$

Watch Video Solution

79. There is a current carrying straight wire of infinite length having current 5A. If a square loop of side 10 cm is kept coplanar with the wire as shown in figure the magnetic flux to the square loop is

A. $\ln(2) \times 10^{-8}$ Wb

B. $5\ln(2) \times 10^{8}$ Wb

C. $2\ln(2) \times 10^{-7}$ Wb

D. $\ln(2) \times 10^{-7}$ Wb

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80. Instantaneous displacement current is 2A in the space between the parallel plates of $4\mu F$capacitor can be established by changing the potential difference at rate of

A. A. 5×10^{5} V/s

B. B. 2×10^{-6} V/s

C. C. 5×10^{-6} V/s

D. D. 10^{5} V/s

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81. The magnetic field in a plane electromagnetic wave is given by $\vec{B} = 2 \times 10^{-7} \left[\sin(0.5 \times 10^3 x + 1.5 \times 10^{11} t)\hat{j}\right]$. The electric field is given by (where B is in T , x is in m and t in s)

A. A. $\vec{E} = \left(60\frac{V}{m}\right)\sin\{0.5 \times 10^3 x + 1.5 \times 10^{11} t\}\hat{k}$

B. B. $\vec{E} = \left(60\frac{V}{m}\right)\cos\{0.5 \times 10^3 x + 1.5 \times 10^{11} t\}\hat{k}$

C. C. $\vec{E} = \left(60\frac{V}{m}\right)\sin\{0.5 \times 10^3 x + 1.5 \times 10^{11} t\}\hat{i}$

D. D. $\vec{E} = \left(60\frac{V}{m}\right)\sin\{0.5 \times 10^3 x + 1.5 \times 10^{11} t\}\hat{j}$

Watch Video Solution

82. An electric bulb of 314 watt is at a distance of 10cm from a point. If the efficiency of bulb is 50% then intensity at that point is

A. A. $1.25 \times 10^3 \frac{W}{m^2}$

B. B. $2.25 \times 10^3 \frac{W}{m^2}$

C. C. $2.50 \times 10^3 \frac{W}{m^2}$

D. D. $5 \times 10^3 \frac{W}{m^2}$

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83. Which of the following statement is correct about electromagnetic waves?

A. Direction of propagation of EM waves can be determined by $\overrightarrow{E} \times \overrightarrow{B}$

B. The velocity of electromagnetic waves in a medium is independent of the amplitude of electric and magnetic field vector.

C. The energy carried by electromagnetic wave is not equally divided between electric field and magnetic field.

D. Both (1) and (2)

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84. Which of the folling physical phenomena does not produce electromagnetic waves?

A. A charge moving with uniform velocity.

B. An accelerating charge

C. High speed electron enters into target of high atomic weight

D. De-excitation of radioactive nucleus

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85. Which of the following statement is incorrect?

A. Displacement current is directly proportional to the rate of change of electric flux between the plates of parallel plate capacitor.

B. In modified Ampere's circuital law $\oint \vec{B} . d\vec{l} = \mu_0(I_c + I_d)$

C. The displacement current is equal to the conduction current during charging of a capacitor

D. According to Ampere-Maxwell's law electric field changing with time does not produce magnetic field

Watch Video Solution

86. An electric bulb bulb rated 100 W, 100 V has to be operated across 141.4 V, 50 Hz A.C. supply. The capacitance of the capacitor which has to be connected in series with bulb so that bulb will glow will full intensity is

A. $\frac{10^{-4}}{\pi}F$

B. $\frac{10^{-2}}{\pi}F$

C. $\frac{1}{\pi}F$

D. $\frac{1}{414}\pi F$

Watch Video Solution

87. An inductor and resistor are connected in series across A.C supply which of the following phasor diagram may be correct?

A.

B.

C.

D.

Watch Video Solution

88. Half power frequencies for a circuit shown in figure are 100 rad/s and 500 ead/s the value of product LC $\left(\in \frac{s^2}{(rad)^2} \right)$

A. 1.1×10^{-5}

B. 2×10^{-5}

C. 6.25×10^{-6}

D. Cannot be determined

Watch Video Solution

89. The reading of the A.C voltmeter in the network shown in figure is (where V is in volt)

A. 400 V

B. 220 V

C. 200V

D. Zero

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90. If $current I = K \cos \omega t + K \sin \omega t$, (where K is a constant and t is time), then RMS value of current for one complete cycle is

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

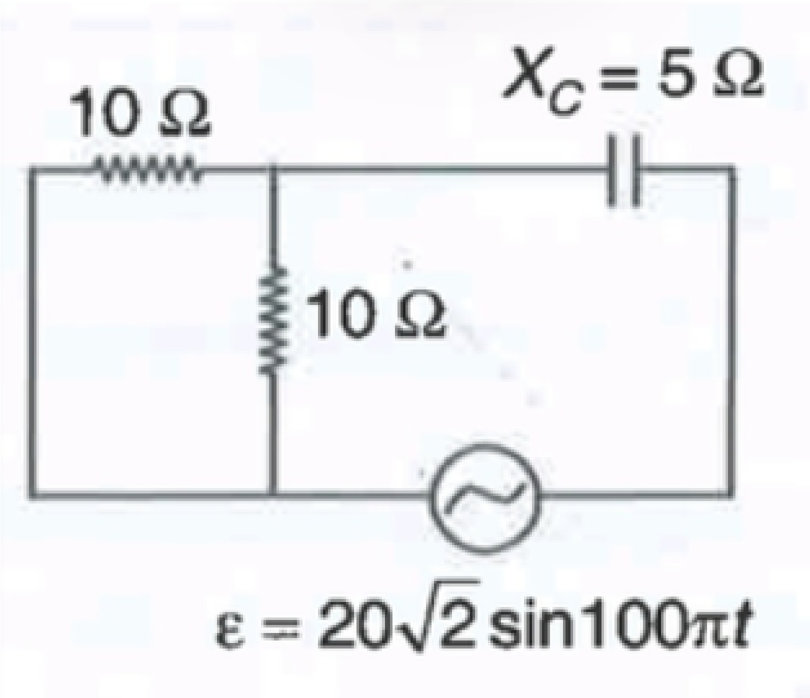
B. $\sqrt{2}K$

C. K/2

D. Zero

Watch Video Solution

91. For the circuit shown in the figure,the rms current through the source is(Where E is in volt and t is in s)



A. 2A

B. 4A

C. $2\sqrt{2}$A

D. $4\sqrt{2}$A

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92. An electrical device draws 0.968 kW form AC mains of 220 V.If current lags voltage in phase by $\phi = \tan^{-1}\left(\frac{2}{3}\right)$.The value of resistance is

A. 50 Omega

B. 34.6 Omega

C. 27.7 Omega

D. 8.4 Omega

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93. In a series LCR, AC circuit, if $V_L = 800$, $V_C = 1600V$ and applied voltage is 1000V, then power factor is

A. 0.6

B. 0.8

C. 1

D. Zero

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94. The impedance of a series R-C, AC circuit is Z_1 for frequency f and Z_2 for 2f. If $\frac{Z_1}{Z_2} = k$, then

A. $k = 1$

B. $0 < k < 2$

C. $1 < k < 2$

D. $k = 2$

Watch Video Solution

95. Which of the following statement is incorrect about AC circuit?

A. For reasonance the the presence of both L and C elements in the circuit is must in LCR series circuit

B. The power factor in LCR series circuit is a measure of how close the circuit is to expanding the maximum power

C. The quality factor is the measure of the sharpness of resonance in series RLC circuit

D. In a step up transformer voltage changes from low to high and the current is increased by the same proportion

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96. A magnetising field intensity of $10Am^{-1}$ is applied on a sample of paramagnetic material of susceptibility 1999. The net magnetic field inside the material is

A. A. $4\pi \times 10^{-6}$ T

B. B. $4\pi \times 1999 \times 10^{-6}$ T

C. C. $8\pi \times 10^{-3}$ T

D. D. $4\pi \times 1998 \times 10^{-6}$ T

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97. The variation of magnetic susceptibility (x) with absolute temperature T for a paramagnetic material is

A.

B.

C.

D.

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98. a paramagnetic sample slows net magnetisation of 18 Am^{-1} when placed in an external magnetic field of 0.9 T at a temperature of 36 K. When the same sample is placed in an external magnetic field of 0.3T at a temperature of 54 K, the magnetisation will be

A. $4Am^{-1}$

B. $81Am^{-1}$

C. $36Am^{-1}$

D. $9Am^{-1}$

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99. A uniformly charged solid sphere a mass M, radius R having charge Q is rotated about its diameter with frequency f_0. The magnetic moment of the sphere is

A. A. $\left(4\frac{\pi}{5}\right)f_0QR^2$

B. B. $\left(2\frac{\pi}{5}\right)f_0QR^2$

C. C. $\left(\frac{\pi}{5}\right)f_0QR^2$

D. D. $\left(\frac{\pi}{2}\right)f_0QR^2$

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100. A short bar magnet of magnetic moment $5\sqrt{3}\times10^{-2}\ JT^{-1}$ is placed with its Axis normal to the earth's horizontal magnetic field. The distance from the centre of a magnet, at its equatorial position, where the resultant field makes an angle 60° with its horizontal field is $(B_H = 0.4\times10^{-4}T)$

A. A. $5(3)^{\frac{1}{3}}$cm

B. B. 5 cm

C. C. $5(6)^{\frac{1}{3}}$ cm

D. D. 10 cm

Watch Video Solution

101. A short bar magnet having magnetic moment $M = 0.80 JT^{1}$ is placed in uniform magnetic field of 0.30 T. If bar magnet is free to rotate in plane of field, then (where U is potential energy and tau is torque)

A. at stable equilibrium, $U = 0.24 J, \tau = 0$

B. at Stable equilibrium $U = 0.24$ J, $\tau \neq 0$

C. at stable equilibrium $U = -0.24$ J, $\tau = 0$

D. at unstable equilibrium U=-0.24 J, tau=0

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102. Which one of the following is not considered as elements of earth's magnetic field?

A. vertical component of Earth's magnetic field

B. horizontal component of Earth's magnetic field

C. angle of dip

D. angle of declination

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103. If a rod PQ of length 1.25m is moving with velocity $10ms^{-1}$ on parallel tracks placed in a uniform magnetic field $B \cdot 10^{-2}$ T as shown in figure. If resistance of ABCDA loop is $10^2\Omega$ current through the loop at that instant is

A. 1mA

B. 1.25 mA

C. Zero

D. 0.5 mA

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104. A conducting rod AB of length l is rotated about point O with an angular velocity velocity omega in a uniform magnetic field (B_0) directed perpendicular into the plane of rotation as shown in the figure. The value of $V_B - V_A$ is

A. $-\left(\frac{1}{6}\right)B_0 l^2 \omega$

B. $\left(\frac{1}{6}\right)B_0 l^2 \omega$

C. $\left(\frac{1}{18}\right)B_0 l^2 \omega$

D. $-\left(\frac{1}{18}\right)B_0 l^2 \omega$

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105. A coil in the shape of an equilateral triangle of side 0.01m is suspended from the vertex such that it is hanging in a vertical plane between pole pieces of a permanent magnet producing a horizontal magnetic field of 4×10^{-2} T. If a current of 1A is passing through it and the magnetic field is parallel the magnetic field is parallel to its plane, then the torque acting on the coil is

A. Zero

B. 1.732×10^{-4} N m

C. 8.76×10^{-7} N m

D. 1.732×10^{-6} N m

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106. A negatively charged particle enters in a semi-infinite uniform magnetic field vecB, directed out the plane of paper as shown in the figure. Through what angle it is is deviated when it leaves the magnetic field?

A. 45°

B. 0°

C. 135°

D. 90°

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107. A He^{2+} at rest experiences an electromagnetic force. Then (where E is electric field and is B magnetic field)

A. E may be present, B must be present

B. E must not be present, B may be present

C. Both E and B must be present

D. E must be present, B may be present

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108. The direction of the magnetic force on a positive charge q moving with velocity v in a uniform magnetic field B for the following cases.

(i) magnetic field is out of the plane of paper and velocity vector is eastward (ii) magnetic field is directed South ward and velocity vector is in south west direction.

A. In case (i) force is southward. In case (ii) force is directed into the plane of paper

B. In case (i) force is Southward. In case (ii) force is eastward.

C. In case (i) force is Southward. In case (ii) force is directed out of the plane of paper.

D. In case (i) force is northward. In case (ii) force is directed out of the plane of paper.

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109. Which one of the following statement is incorrect?

A. a magnet does not exert a force on a stationary electrically charged body

B. magnetic field lines are closed continuous carves and extend from south pole to north pole within the magnet

C. the tangent to the magnetic field line at any point gives the direction of the magnetic field at that point

D. magnetic field lines are widely separated for the magnetic field is strong

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110. An element of length $\overrightarrow{\Delta l} = \Delta z\widehat{K}$ is placed at origin and carries a large current I=15A. The magnetic field on the y axis at a distance of 0.75 m is $(\Delta z = 0.75cm)$

A. 2×10^{-8} T along negative `x-axis

B. $2 \times 10^{-8} T$ along positive x-axis

C. Zero

D. 2×10^{-8}T along negative y-axis`

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C. Zero

D. 2×10^{-8} T along negative y-axis

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C. The tangent to the magnetic field line at any point gives the direction of the magnetic field at that point.

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B. In case (i) Force is southward.In case (ii) force is eastward.

C. In case (i) force is southward.In case (ii) force is directed out of the plane of paper.

D. In case (i) force is northward. In case (ii) force is directed into the plane of paper.

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A. E may be present,B must be present

B. E must not be present,B may be present.

C. Both E and B must be present.

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A. $-\frac{1}{6}B_0 l^2 \omega$

B. $\frac{1}{6}B_0^2 \omega$

C. $\frac{1}{18}B_0 l^2 \omega$

D. $-\frac{1}{18}B_0 l^2 \omega$

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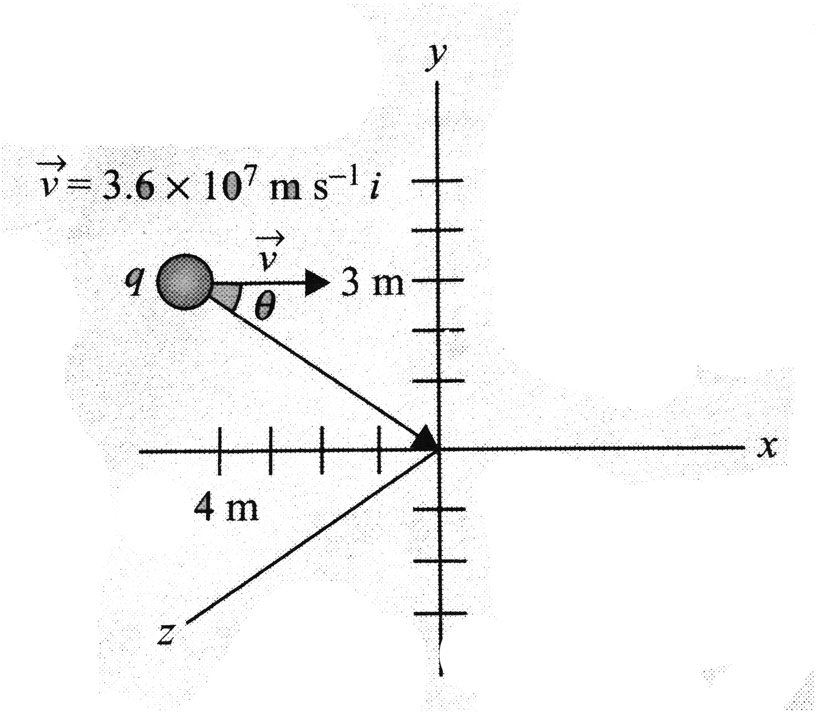
118. A point chanrge of magnitude $q = 4.5nC$ is moving with speed $v = 3.6 \times 10^7 ms^{-1}$ parallel to the x-axis along the line $y = 3m$. Find the magnetic field at the origin produced by this charge when the charge is at the point $x = -4m, y = 3m$, as shown in Fig.



A. 1 mA

B. 1.25 mA

C. Zero

D. 0.5 mA

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A. At stable equilibrium,U=0.24 J, tau=0

B. At stable equilibrium U=$0.24 J$, tau `= 0

C. At stable equilibrium U=-0.24 J, τ=0

D. At stable equilibrium U= -0.24 J,τ= 0

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A. $5(3)^{\frac{1}{3}}$ cm

B. 5 cm

C. $5(6)^{\frac{1}{3}}$ cm

D. 10 cm

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122. A uniformly charged solid sphere a mass M, radius R having charge Q is rotated about its diameter with frequency f_0. The magnetic moment of the sphere is

A. $\frac{4\pi}{5} f_0 Q R^2$

B. $\frac{2\pi}{5} f_0 Q R^2$

C. $\frac{\pi}{5} f_0 Q R^2$

D. $\frac{\pi}{2} f_0 Q R^2$

123. The variation of magnetic susceptibility (x) with absolute temperature T for a paramagnetic material is

A. 

B.

C.

D.

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124. A magnetising field intensity of $10 Am^{-1}$ is applied on a sample of paramagnetic material of susceptibility 1999. The net magnetic field inside the material is

A. $4\pi \times 10^{-6}$ T

B. $4\pi \times 1999 \times 10^{-6}$ T

C. $8\pi \times 10^{-3}$ T

D. $4\pi \times 1998 \times 10^{-6}$ T

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125. Which of the following statement is incorrect about AC circuit?

A. For resonance,the presence of both L and C elements in the circuit is must in LCR series circuit

B. The power factor in a LCR series circuit is a measure of how close the circuit is to expending the maximum power

C. The quality factor is the measure of the sharpness of resonance in series RLC circuit

D. In a step up transformer,voltage changes from low to high and the current is increased by the same proportion

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126. The impedance of a series R-C, AC circuit is Z_1 for frequency f and Z_2 for 2f. If $\frac{Z_1}{Z_2} = k$, then

A. k=1

B. $0 < k < 1$

C. $1 < k < 2$

D. k=2

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127. In a series LCR, AC circuit, if $V_L = 800$, $V_C = 1600V$ and applied voltage is 1000V, then power factor is

A. 0.6

B. 0.8

C. 1

D. Zero

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128. An electrical device draws 0.968 kW form AC mains of 220 V.If current lags voltage in phase by $\phi = \tan^{-1}\left(\frac{2}{3}\right)$.The value of resistance is

A. A. `50 Omega'

B. B. 34.6Ω

C. C. 27.7Ω

D. D. 8.4Ω

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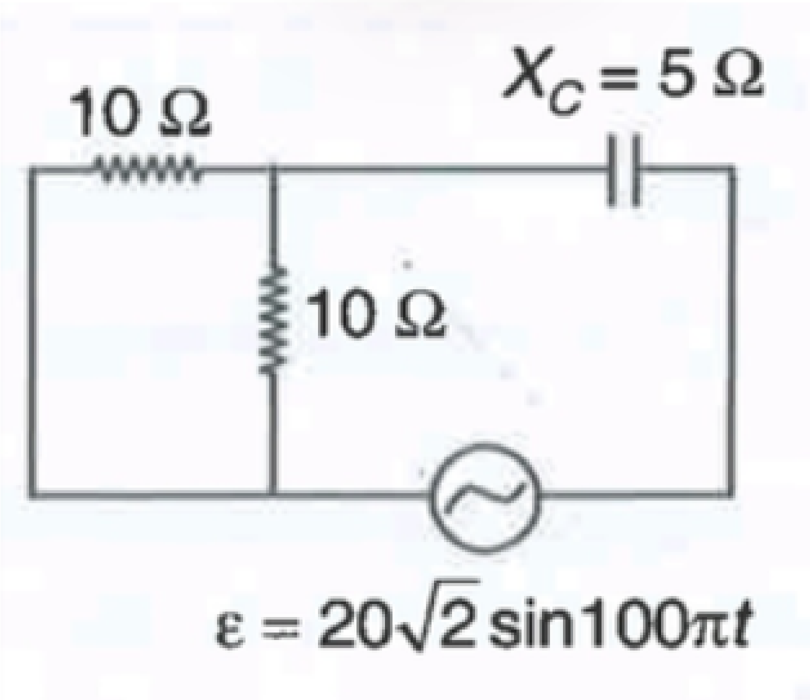
129. For the circuit shown in the figure,the rms current through the source is(Where E is in volt and t is in s)



A. 2 A

B. 4 A

C. $2\sqrt{2}$ A

D. $4\sqrt{2}$ A

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130. If current $I = K \cos \omega t$,(where K is a constant and t is time) then RMS value of current for one complete cycle is

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

B. $\sqrt{2K}$

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

D. Zero

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131. The reading of the A.C voltmeter in the network shown in figure is (where V is in volt)

A. 400 V

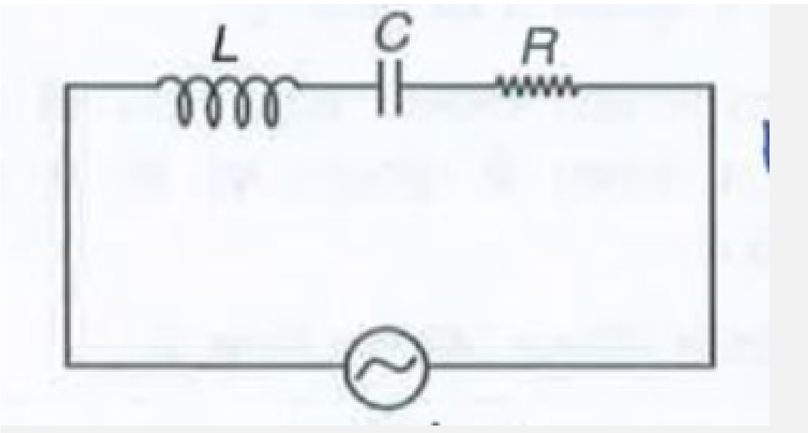
B. 220 V

C. 200 V

D. Zero

Watch Video Solution

132. Half power frequencies foe a circuit shown in the figure are 100 rad/s and 500 rad/s. The value of the product LC is $(\varepsilon = \varepsilon_0 \sin \omega t)$



A. 1.1×10^{-5}

B. 2×10^{-5}

C. 6.25×10^{-6}

D. Cannot be determined

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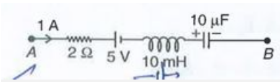
133. An inductor and resistor are connected in series across A.C supply which of the following phasor diagram may be correct?

A. 

B.

C.

D.

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A. $\left(\frac{10^{-4}}{\pi}F\right)$

B. $\frac{\frac{10^{-2}}{\pi}F}{\pi}F$

C. $\frac{1}{\pi}F$

D. $\left(\frac{1}{414\pi}F\right)$

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135. Which of the folling statement is incorrect?

A. Displacement current is directly propotional to the rate of change of electric flux between the plates of parallel plate capicitor.

B. In modified Ampere circuital law, $\left(\oint \vec{B}\,.\,\vec{dl} = \mu_0\left(/_c + /_d\right)\right)$

C. The displacement current is equal to the conduction current during charging of a capacitor.

D. According to Ampere-Maxwell's law, electric field changing with time does not produce magnetic field.

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136. Which of the folling physical phenomena does not produce electromagnetic waves?

A. A charge moving with uniform velocity.

B. An accelerating charge.

C. Hight speed electron enters into target of high atomic weight.

D. De-excitation of radioactive nucleus.

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137. Which of the following statement is correct about electromagnetic waves?

A. Direction of propagation of EM waves can be determined by (vecE times VecB)

B. The velocity of electromagnetic waves in a medium is inedpendent of the amplitude of electric and magnetic field vector

C. The energy carried by electromagnetic wave is not equally divided between electric field and magnetic field

D. Both (1) and (2)

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138. An electric bulb of 314 watt is at a distance of 10cm from a point. If the efficiency of bulb is 50% then intensity at that point is

A. $\left(1.25 \times \overset{3}{10} w / \overset{2}{m}\right)$

B. $\left(2.25 \times \overset{3}{10} w / \overset{2}{m}\right)$

C. $\left(2.50 \times \overset{3}{10} w / \overset{2}{m}\right)$

D. $\left(5 \times \overset{3}{10} w / \overset{2}{m}\right)$

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139. The impulse imparted by an electromagnetic pulse of energy $\left(3 \times \overset{-2}{10} J\right)$ when it falls normally on a perefectly reflecting surface is

A. A. $\left(3 \times \overset{-8}{10} kg - \frac{m}{s}\right)$

B. B. $\left(\overset{-9}{10} Kg - \frac{m}{s}\right)$

C. C. $\left(2 \times \overset{-10}{10} kg - \frac{m}{s}\right)$

D. D. $\left(\overset{-7}{10} kg - \frac{m}{s}\right)$

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140. The magnetic field in a plane electromagnetic wave is given by $\overrightarrow{B} = 2 \times 10^{-7} \left[\sin\left(0.5 \times 10^{3}x + 1.5 \times 10^{11}t\right)\hat{j}\right]$. The electric field is given by (where B is in T , x is in m and t in s)

A. $\left(\overrightarrow{E} = (60V/m)\sin\left\{0.5 \times \overset{3}{10}x + 1.5 \times \overset{11}{10}t\right\}\widehat{K}\right.$

B. $\left(\overrightarrow{E} = (60V/m)\cos\left\{0.5 \times \overset{3}{10}x + 1.5 \times \overset{11}{10}t\right\}\widehat{K}\right.$

C. $\left(\overrightarrow{E} = (60V/m)\sin\left\{0.5 \times \overset{3}{10}x + 1.5 \times \overset{11}{10}t\right\}\hat{i}\right.$

D. $\left(\overrightarrow{E} = (60V/m)\sin\left\{0.5 \times \overset{3}{10}x + 1.5 \times \overset{11}{10}t\right\}\hat{j}\right.$

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141. Instantaneous displacement current is 2A in the space between the parallel plates of $4\mu F$capacitor can be established by changing the potential difference at rate of

A. $\left(5 \times \overset{5}{10}V/s\right)$

B. $\left(2\times\overset{-6}{10}V/s\right)$

C. $\left(5\times\overset{-6}{10}V/s\right)$

D. $\left(\overset{5}{10}V/s\right)$

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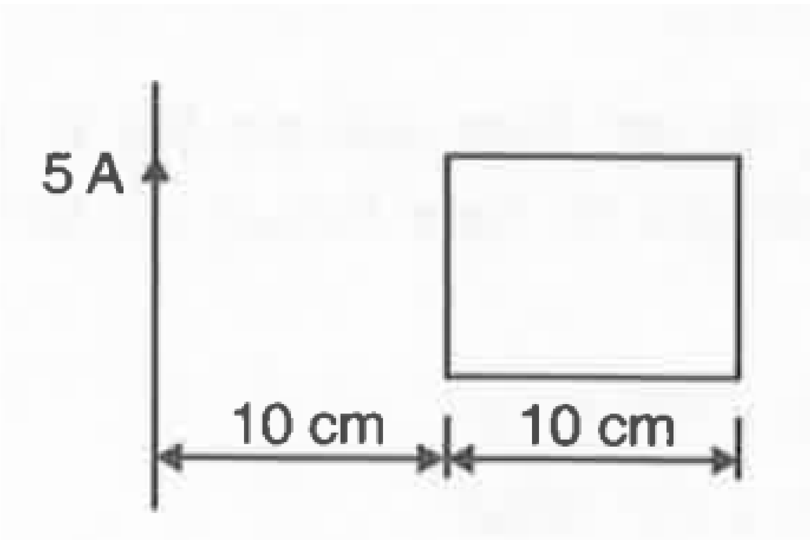
142. There is a current carrying straight wire of infinite length having current 5 A. If a square loop of side 10 cm is kept coplanar with the wire as shown in figure. The magnetic flux through the squre loop is



A. $\left(IN(2) \times \overset{-8}{10} Wb\right)$

B. $\left(2IN(2) \times \overset{-7}{10} Wb\right)$

C. $\left(2IN(2) \times \overset{-7}{10} Wb\right)$

D. $\left(IN(2) \times \overset{-7}{10} Wb\right)$

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143. There is a conducting rod of length $2L$ that lies along x-axis from $x = -L$ to $x = L$. If rod moves with velocity $\left(v = \underset{0}{v}\hat{i}\right)$ In the magnetic field $\left(\overrightarrow{B} = \underset{0}{B}\hat{k}\right)$, then induced emf bbetween ends of rod is

A. Zero

B. $\left(\frac{2}{3}\underset{0}{B}L\underset{0}{v}\right)$

C. $\left(\frac{1}{3}\underset{0}{B}L\underset{0}{v}\right)$

D. $\left(2\underset{0}{B}L\underset{0}{v}\right)$

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144. Which of the following statement is correct about induced electric field?

A. This field is produced by variation of magnetic field with respect to space.

B. This fielld is conservative in nature.

C. we cannot define a potential corresponding to this field.

D. The lines of induced electric field are not closed curve.

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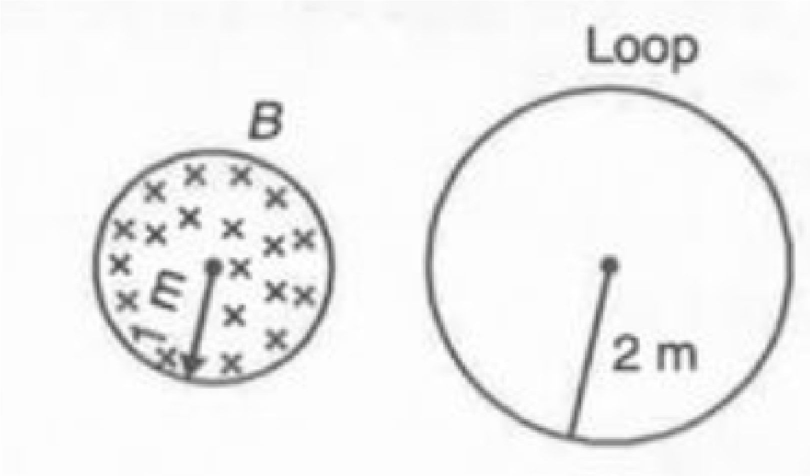
145. A uniform magnetic field is restricted within a region of radius 1m. The magnetic field changes with time(t) as $\overrightarrow{B} = B_0\left(\frac{2t}{3}\right)\hat{k}$. A loop of radius 2m is outside the region of magnetic field as shown in figure. The emf induced in loop is



A. Zero

B. $\left(\frac{2}{3}\pi B_0\right)$

C. $\left(\frac{8}{3}\pi B_0\right)$

D. $\left(\frac{2}{3}\pi B_0\right)$

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146. In given figure, the current (I) is flowing through straight wire annd divided equally in two loops as shown in the figure. The magnitude field intensity at center (O) is

A. Zero

B. $\left(\frac{\mu_0 /}{8}\left[\frac{1}{r_2}-\frac{1}{r_1}\right]\right)$

C. $\left(\frac{\mu_0 /}{4\pi}\left[\frac{\pi}{2r_2}-\frac{\pi}{2r_1}-\frac{1}{r_1}\right]\right)$

D. $\left(\frac{\mu_0 /}{4\pi}\left[\frac{\pi}{2r_2}-\frac{\pi}{2r_1}+\frac{\pi}{r_1}\right]\right)$

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147. The current sensitive and voltage semsitivity of a moving coil galvanometer aare $0.03(rad / A)$ and $\left(3 \times 10^{-5} rad / V\right)$ respecively. The resistance of galvanometer is

A. $(1k\Omega)$

B. $(1m\Omega)$

C. $\left(9 \times 10^{-7}\Omega\right)$

D. $\left(\frac{1}{9} \times \overset{7}{10}\Omega\right.$

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148. If speed of a proton increases in a cyclotron, then the value of specific charge[if relativistic mass is not considered.

A. Remains same

B. Increases

C. Decreases

D. First decreases to a certain value of velocity and then increases

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149. B_0 is the magnetic field at point P for a given straight wire as shown in figure. If this wirre is bent into a circular loop, then magnetic field at the centre of loop is

A. $\sqrt{2}\pi B_0$

B. $\frac{\pi B_0}{\sqrt{2}}$

C. $\sqrt{2}\pi^2 B_0$

D. $\frac{\pi^2 B_0}{\sqrt{2}}$

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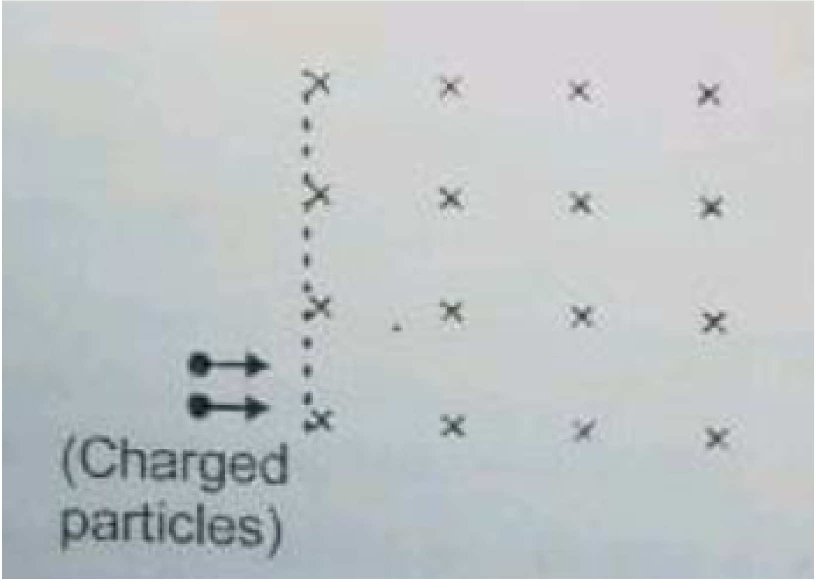
150. A proton and an alpha particle having same kinetic energies are entering in a uniform magnetic field normal to as shown in figure. The ratio of time to return on the same side is



A. $01 : 01$

B. $01 : 02$

C. $01 : 04$

D. $01 : 03$

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151. If two resistive wires AB and CD are made to slide on the conducting rails with speeds 5m/s 10 m/s respectively towards right as shown in the figure then value of R for which current through it is 1A is(B=1.5T)

A. $\left(\frac{28}{3}\Omega\right)$

B. $\left(\frac{13}{3}\Omega\right)$

C. (7Ω)

D. (2Ω)

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152. Self inductance is of primary and secondary of an ideal transformer are L and 4L respectively. If current through the primary coil is $i = I_0 \sin \omega t$ then induced EMF across secondary coil due to current variation in the primary coil at $t = \frac{\pi}{3\omega} s$ is

A. $\left(2L\overset{\omega}{0}\right)$

B. $\left(\frac{\sqrt{3}L}{2}/\overset{\omega}{0}\right)$

C. $\left(L\overset{\omega}{0}\right)$

D. Zero

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153. If the instantaneous charge on the capacitor is $(100m\mu C)$ and current through the circuit is decreasing at the rate $\left(2\times\overset{3}{10}\right)$ A/s then potential diffference $\left(\underset{A}{V}-\underset{B}{V}\right)$ is equal to

A. $(\,-\,)3$ V

B. 3 V

C. 27 V

D. 7 V

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154. Displacement current can be expressed as (symbols have their usual meanings)

A. A. $(\mu_0\varepsilon_0)\left(d\frac{\phi_E}{dt}\right)$

B. B. $\left(\frac{1}{\mu_0\varepsilon_0}\right)\left(d\frac{\phi_E}{dt}\right)$

C. C. $(\varepsilon_0)\left(d\frac{\phi_E}{dt}\right)$

D. D. $(\mu_0)\left(d\frac{\phi_E}{dt}\right)$

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155. An electromagnetic wave travels along X-axis, which of the following pairs of space and time varying field generate the wave

A. A. E_y, B_z

B. B. E_y, B_y

C. C. E_x, B_y

D. D. E_y, B_x

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156. Electric field and magnetic filed are given as $E = E_0 \sin(\omega t - kx)$ and $B = B_0 \sin(\omega t - kx)$ then select the correct option

A. $\left(\frac{E_0}{B_0}\right) = \omega k$

B. $(E_0 B_0) = \omega k$

C. $\left(\frac{E_0}{B_0}\right) = \frac{k}{\omega}$

D. $\left(\frac{E_0}{B_0}\right) = ome\frac{g}{k}$

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157. Electromagnetic waves are produced by

A. Chargeles particles

B. Accelerating charge

C. A static charge

D. A moving Charge

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158. Permanent magnets show

A. Low coercivity and high retentivity

B. High coercivity and high retentivity

C. High coercivity and Low retentivity

D. Low coercivity and low retentivity

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159. Dimension formula 1/sqrt(LC) is

A. A. $[M^0 LT]$

B. B. $[M^0 L^{-1} T^{-1}]$

C. C. $[M^0 L^0 T]$

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

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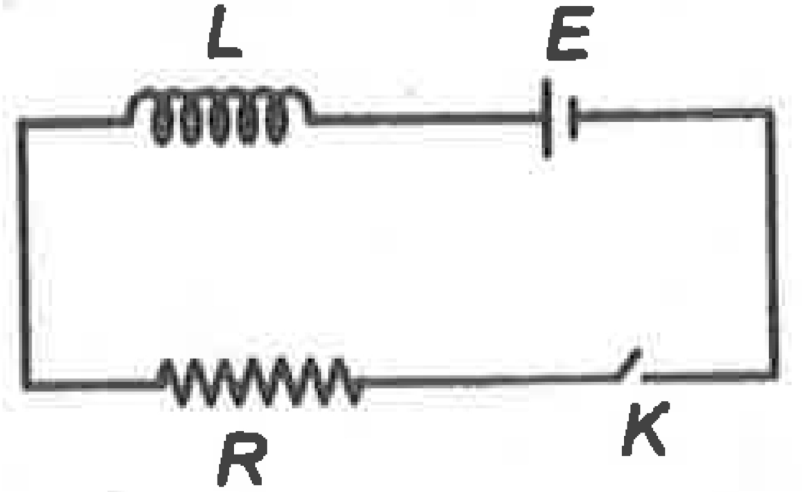
160. In LR circuit, key (K) is closed at $t = 0$. Which of the following quantities is not zero at time equal to time constant at circuit



A. Current

B. Induces a.m.f

C. Power delivered

D. All of these

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161. In a series LCR circuit resonance of frequency is the half of the frequency of source.The nature of the circuit is

A. A. Inductive

B. B. Can not be defined

C. C. Capacitive

D. D. Resistive

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162. Zero reactance is possible in which circuit?

A. A. LR

B. B. LC

C. C. Inductor

D. D. Resistor

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163. An AC current is given by i= 3+4 sinwt ,then its effective value

A. A. $\sqrt{17}A$

B. B. $7A$

C. C. $3A$

D. D. $4A$

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164. Power factor in series LCR circuit at reasonance is

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

B. Zero

C. 1

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

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165. In LC circuit the maximum charge in capacitor is q_0. Then maximum value of rate of change of current is

A. $q_0 L^{-\frac{1}{2}} C^{-\frac{1}{2}}$

B. $q_0 L^{-1} C^{-1}$

C. $q_0 LC$

D. $q_0 L^{-1} C$

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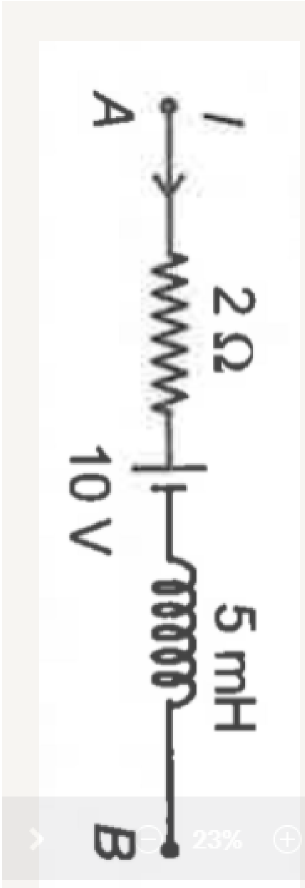
166. In the given circuit, current I is $2A$ and it is decreasing at the rate of



$10^3 AS^{-1}$.Then $V_B - V_A$ is

A. $10V$

B. $9V$

C. $-19V$

D. $19V$

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167. A coil of radius r is placed at the centre of the large coil of radius R where $R\rangle r$ and coils are in same plane.The coefficient of mutual inductance between the coil is

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

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

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

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

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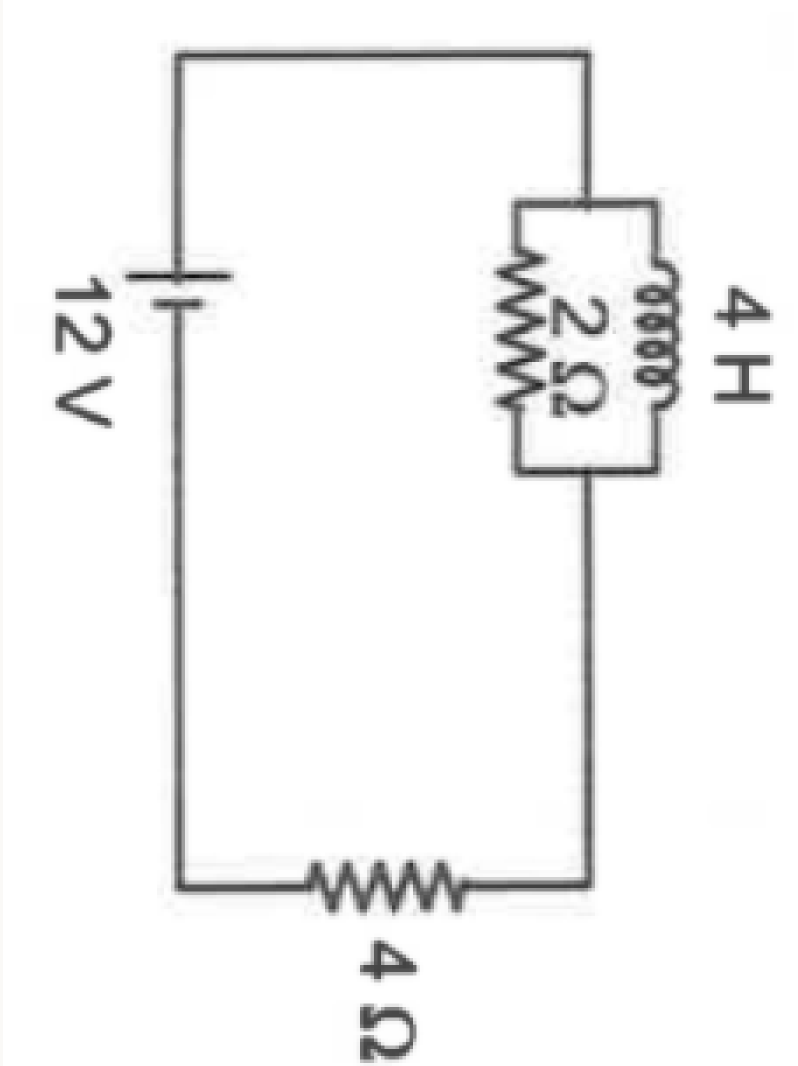
168. Two resistors of 2Ω and 4Ω and ideal inductor of $4H$ are connected to a $12V$ battery as given in the diagram.The steady current through the



battery is

A. $2A$

B. $6A$

C. Zero

D. $3A$

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169. A rectangular coil of area A rotates in a uniform magnetic field B with angular velocity about an axis perpendicular to the field, initially the plane of coil is perpendicular to the field,then the avarage induced e.m.f. after rotating by 90° is

A. A. $\left(BA\frac{\omega}{3}\pi\right)$

B. B. $\left(BA\frac{\omega}{2}\pi\right)$

C. C. $\left(BA\frac{\omega}{\pi}\right)$

D. D. $\left(2BA\frac{\omega}{\pi}\right)$

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170. Which of the following expression represent Bio-savart law

A. A. $\overrightarrow{d}B = \frac{\mu_0 I\left(\overrightarrow{d}l \times \overrightarrow{r}\right)}{4\pi\left(|r|^2\right)}$

B. B. $\overrightarrow{d}B = \frac{\mu_0 I\left(\overrightarrow{d}l \times \hat{r}\right)}{4\pi\left(|r|^3\right)}$

C. C. $\overrightarrow{d}B = \frac{\mu_0 I\left(\overrightarrow{d}l \times \overrightarrow{r}\right)}{4\pi\left(|r|^3\right)}$

D. D. $\overrightarrow{d}B = \frac{\mu_0 I\left(\overrightarrow{d}l. \overrightarrow{r}\right)}{4\pi\left(|r|^2\right)}$

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171. Magnitude of magnetic field at a point P due to a current carrying wire, starting from origin and expanded to y-axis is

A. $3\mu_0 \frac{i}{20\pi}$

B. $\mu_0 \frac{i}{20\pi}$

C. $3\mu_0 \frac{i}{4\pi}$

D. $3\mu_0 \frac{i}{16\pi}$

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172. A conductor of length L and carrying current i is bent to form a coil of two turns.Magnetic field at the centre of the coil will be

A. A. $\mu_\pi \frac{i}{L}$

B. B. $\mu_0\pi \frac{i}{2L}$

C. C. $2\mu_0 \frac{i}{L}$

D. D. $4\mu_0\pi \frac{i}{L}$

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173. Avarage value of current for half wave rectifier having peak value of current I_0 is

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

B. B. $\frac{I_0}{\sqrt{2}}$

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

D. D. $2\frac{I_0}{\pi}$

Answer: C

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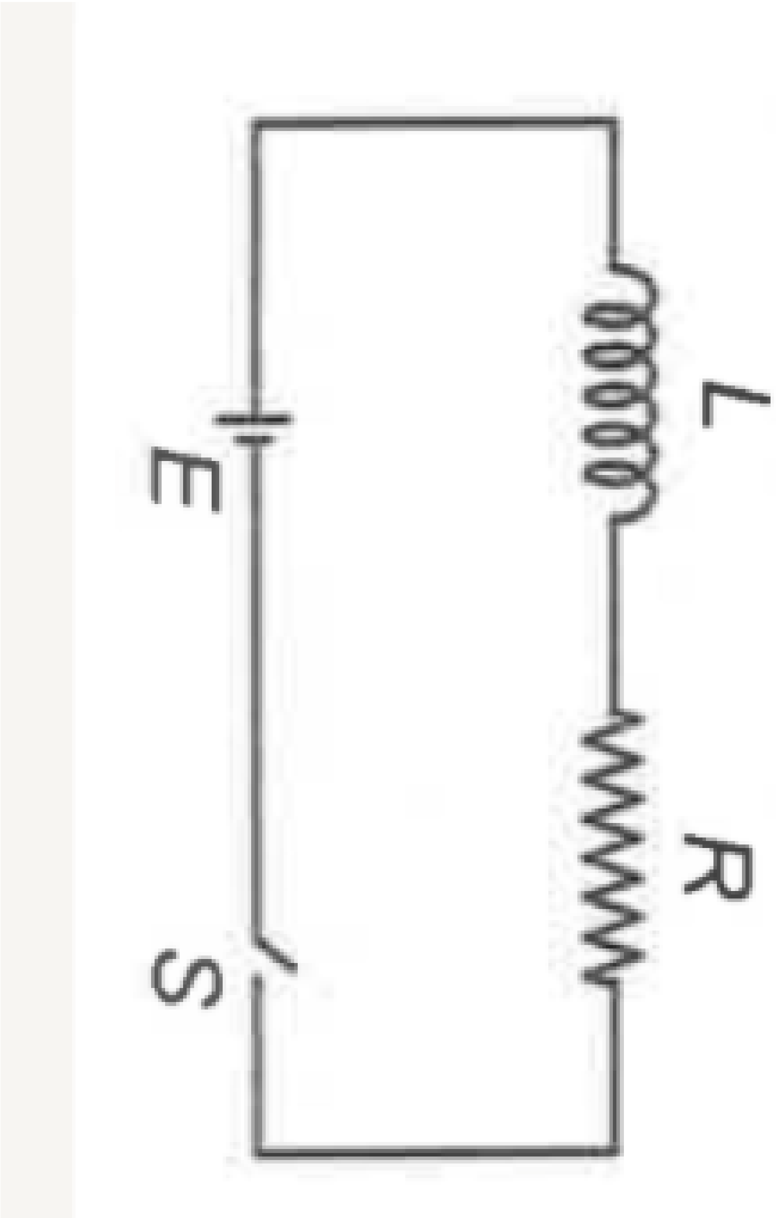
174. Switch is closed at $t=0$ then the current in the circuit at $t=\frac{L}{2}R$ is



A. $\left(\frac{E}{R}\right)\frac{\sqrt{e}-1}{\sqrt{e}}\Big)\Big]$

B. $\left(\frac{E}{R}\right)\left[\frac{e^2-1}{e}\right]^2$

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

D. $\left(\frac{E}{R}\right)e^2$

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175. Energy density in the electric field of electromagnetic wave is U.If amplitude of electric field (E_0) and magnetic field (B_0) is related as $E_0 = cB_0$, then energy density in magnetic field is(c = speed of light)

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

B. $\frac{U}{c}^2$

C. U

D. c^2U

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176. Two charge of same nature are moving parallel to each other,they will

A. Either attract or repel

B. Neither attract nor repel

C. Attract each other

D. Repel each other

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177. Which of the following particle can be accelerated in cyclotron?

A. A. Positron

B. B. Neutrino

C. C. Proton

D. D. Electron

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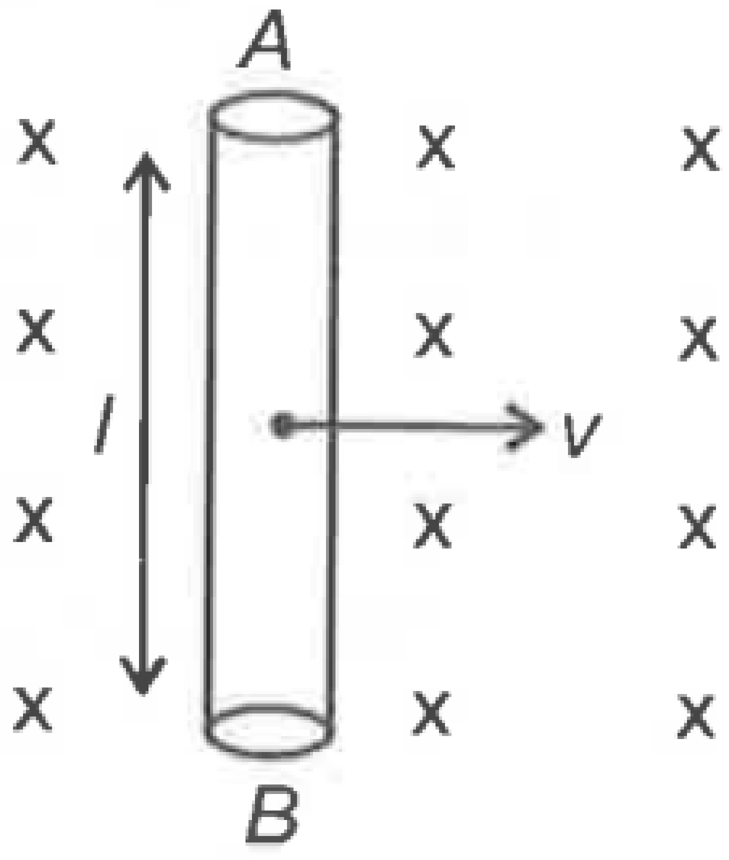
178. The potential difference across the ends of the rod moving with velocity v perpendicular magnetic field is



A. $Bv\frac{l}{4}$

B. Bvl

C. $2Bvl$

D. $Bv\frac{l}{2}$

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179. An insulating rod of length l carries a charge q uniformly distributed on it. the rod is pivoted at one of its end and is rotated at a frequency f about a fixed perpendicular axis. The magnetic moment of the rod is

A. $\frac{q\omega l^2}{3}$

B. $\frac{q\omega l^2}{6}$

C. $\frac{q\omega l^2}{12}$

D. $\frac{q\omega l^2}{24}$

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180. Angles of dip in two vertical planes at right angles to each other are $\cot^{-1}\left(\frac{1}{2}\right)$ and $\cot^{-1}\left(\frac{1}{3}\right)$ respectively.True angle of the dip is

A. $\cot^{-1}\left(\sqrt{\frac{36}{13}}\right)$

B. $\cot^{-1}\left(\sqrt{\frac{5}{6}}\right)$

C. $\cot^{-1}\left(\frac{13}{36}\right)$

D. $\cot^{-1}\left(\sqrt{\frac{13}{36}}\right)$

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181. An alpha particle moving with the velocity $\vec{v} = u\hat{i} + \hat{j}$,in a uniform magnetic field $\vec{B} = B\hat{k}$. Magnetic force on alpha particle is

A. $\left(eu\frac{B}{\sqrt{3}}\right)\left(\hat{i} + \hat{j}\right)$

B. $2euB\left(\hat{i} + \hat{j}\right)$

C. $2euB\left(\hat{i} - \hat{j}\right)$

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

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182. An electron is projected along positive z-axis, magnetic field is present along y-axis then direction of initial acceleration of the particle is

A. Positive z-axis

B. Positive y-axis

C. Negative x-axis

D. Positive x-axis

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183. Magnetic field at the centre of regular hexagon current carrying loop of side length l and current i is

A. A. $\frac{\sqrt{3}\mu_0 i}{\pi l}$

B. B. $\frac{6\mu_0 i}{\pi l}$

C. C. $\frac{2\mu_0 i}{\pi l}$

D. D. $\frac{3\mu_0 i}{\pi l}$

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184. Magnetic induction of the equilateral point od short magnet at distance r from the centre of dipole is $\overrightarrow{B}$. its value at an axial point at same magnet and at same distance is

A. $\left(-\frac{\overrightarrow{B}}{2}\right)$

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

C. $2\overrightarrow{B}$

D. $-2\overrightarrow{B}$

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185. In a geomagnetic pole compass needle

A. A. Move in vertical plane

B. B. Stay in any position

C. C. Stay in North-South direction

D. D. Stay in East-West Direction

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186. Aparant angle of a dip is 30° in a plane at 45° from the magnetic meridian, then the true dip is

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

B. B. $\tan^{-1}\left(\sqrt{6}\right)$

C. C. $\tan^{-1}\left(\frac{1}{\sqrt{6}}\right)$

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

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187. In the electromagnetic wave the electric and magnetic wave are not related as

A. They have no phase difference

B. They have equal energy density

C. They are perpendicular to each other

D. They have phase difference of 90°

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188. The Bohr magneton is

A. $\pi \frac{e}{2} m$

B. $\pi \frac{h}{4} m$

C. $e \frac{h}{2\pi m}$

D. $e \frac{h}{4\pi m}$

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189. Locus of all points having same horizontal magnetic field on the magnetic map of earth is known as

A. Isodynamic line

B. Agonic line

C. Isogonic line

D. Isoclinic line

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190. Magnetic moment of a square loop is M.What will be the magnetic moment of the loop if its shape is changed to circular

A. $4\frac{M}{\pi}$

B. $\pi\frac{M}{4}$

C. $\pi\frac{M}{2}$

D. πM

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191. A bar magnetic dipole moment M is cut into two equal pieces as shown, magnetic moment of each piece is

A. M

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

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

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

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192. Magnetic in a region is given by $\overrightarrow{B} = B_0\hat{i} + B_0\hat{j}$. Torque on a circular loop $x^2 + z^2 = r^2$ carrying current i in anticlockwise direction as seen from a point on positive y-axis is

A. $i\pi r^2 B_0 \hat{k}$

B. $-i\pi r^2 B_0 \hat{k}$

C. $i\pi r^2 \hat{k}$

D. $-i\pi r B_0 \hat{k}$

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193. In parallel L-C circuit current from the source is $1A$ and current from the inductor is $0.6A$. The current from capacitor is

A. $0.8A$

B. $0.4A$

C. $1.6A$

D. 0.5

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194. The ratio of magnetic dipole moment and angular momentum of charged body of charge q and mass m is

A. A. $\frac{q}{2}m$

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

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

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

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195. Magnetic length of a bar magnet is

A. More than geometrical length

B. Less than geometrical length

C. Same as geometrical length

D. Both A and C

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196. Two infinite long wire A and B are separated at a and current are I_1 and I_2 respectively. The distance from wire B where net magnetic field zero is

A. $a\frac{I_1}{I_1 - I_2}$

B. $a\frac{I_2}{I_1 + I_2}$

C. $a\frac{I_1}{I_1 + I_2}$

D. $\frac{3aI_1}{I_1 - I_2}$

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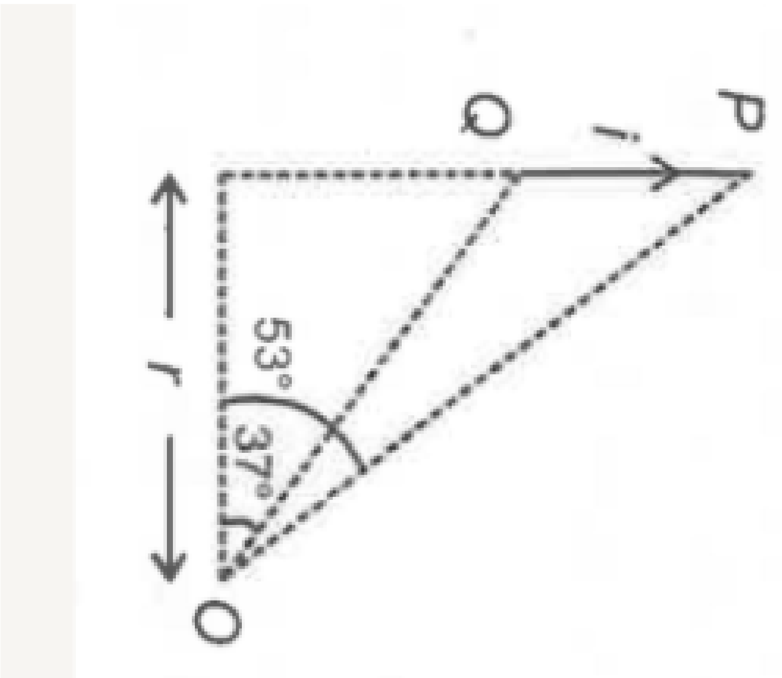
197. Magnetic field at point O due to straight conductor PQ is



A. $\frac{20\mu_0 i}{\pi r} o$

B. $\frac{\mu_0 i}{20\pi r} \odot$

C. $\frac{\mu_0 i}{5\pi r} \otimes$

D. $\frac{\mu_0 i}{20\pi r} \otimes$

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198. The rms speed of N_2 gas molecules is u. If the temperature is doubled and the nitrogen molecules dissociate into nitrogen atoms, the rms speed becomes:

A. v_0

B. $v_0/\sqrt{2}$

C. $\sqrt{2v_0}$

D. $2v_0$

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199. A vessel contains a mixture of 2 moles o hydrogen and 3 moles of oxygen at a constant temperature. The ratio of average translational kinetic energy per H_2 molecule to that per O_2 molecule is

A. $2:3$

B. $3:2$

C. $1:2$

D. $1:1$

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200. The pressure of an ideal gas is written as $p = \frac{2E}{3V}$.Here E refers to

A. Rotational kinetic energy

B. Total kinetic energy

C. Vibrational kinetic energy

D. Translational kinetic energy

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201. The speed of 8 molecules of a gas are as 2, $3,2,4,5,4,6,4$ (m/s). The most probable speed of gas molecule (in m/s) is

A. 2

B. 4

C. 6

D. 5

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202. The translational kinetic energy of one mole oxygen gas at a temperature is $15x10^{-20}J$. Its rotational kinetic energy at same temperature is

A. 10^{-20} J

B. 10^{-15} J

C. 10^{-19} J

D. 5×10^{-19} J

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203. In a mixture of gases, average number of degree of freedpm per molecule is 4. If the speed of sound in the gas is V_0 then the root mean square speed of the molecules of the gas is

A. v_0

B. $2v_0$

C. $v_0/\sqrt{2}$

D. $\sqrt{2}v_0$

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204. If diameter of gas molecule is d then mean free path is inversely proportional to

A. A. d^{-2}

B. B. d^2

C. C. d^{-1}

D. D. d

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205. The velocities of our molecules are $V, 2V, 4V$ and $\sqrt{2}V$, respectively. Their r.m.s. speed is

A. 2.4v

B. 2.2 v

C. 24 v

D. 0.2 v

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206. The ratio of the average speed of oxygen molecules to the average speed of hydrogen molecule at same temperature is

A. $3:1$

B. $4:1$

C. $1:1$

D. $1 : 4$

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207. The change in internal energy of a gas kept in a closed container when 50 cal heat is supplied to it is

A. 10 cal

B. 40 cal

C. 50 cal

D. 100 cal

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208. 1 g of hydrogen at $37^\circ C$ is mixed with 32 g of oxygen at $27^\circ C$. The temperature of mixture is approximatley

A. 20.3 K

B. 303 K

C. $303^{\circ}C$

D. 200 K

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209. Which of the physical quantities is zero in ideal gas molecules?

A. Momentum

B. Density

C. Speed

D. Kinetic energy

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210. The temperature at which r.m.s. velocity of hydrogen molecules is equal that of oxygen at $100 \circ C$ is nearly

A. $230K$

B. 23 K

C. 320 K

D. $23^{\circ}C$

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211. A gas behaves as an ideal gas at

A. High pressure and high temperature

B. Low pressure and low temperature

C. High pressure a low temperature

D. Low pressure and high temperature

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212. Assume $x = 2\cos\left(\pi t + \frac{\pi}{3}\right)$ cm represents the position of a particle performing SHM. The initial position of particle on x-axis is

A. 2 cm

B. 1 cm

C. 4 cm

D. 3 cm

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213. Simple harmonic motion is

A. Linear motion only

B. Angular motion only

C. Linear or angular

D. Neither linear nor angular

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214. Assume $x_1 = A\sin(\omega t)$ and $x_2 = A\cos\left(\omega t + \frac{\pi}{6}\right)$. The phase difference between x_1 and x_2 is

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

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

C. Zero

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

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215. If amplitude of velocity is V_0 then the velocity of simple harmonic oscillator at half of the amplitude is

A. $\sqrt{3}\, v_0$

B. $\sqrt{3}/2\, v_0$

C. $v_0/2$

D. $v_0/\sqrt{2}$

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216. If angular frequency of simple harmonic oscillator is 2 rad/s, then the graph between velocity and displacement is

A. Circle

B. Elliptical

C. Parabolic

D. Straight line

Watch Video Solution

217. If the frequency of the acceleration of a simple harmonic oscillator if f_0 then the frequency of the potwntial energy is

A. f_0

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

C. $2f_0$

D. Zero

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218. The average value of kineic energy in an SHM is (Symbols have usual meanings)

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

B. $m\omega^2 A^2$

C. $\frac{1}{4} m\omega^2 A^2$

D. $\frac{1}{4} m^2\omega^2 A^2$

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219. The magnitude of acceleration of a simple harmnic oscillator when its kinetic energy and potential energy are same, if amplitude of acceleration is a_0 is

A. $\frac{a_0}{\sqrt{}} 2$

B. a_0

C. $\frac{a_0}{2}$

D. $\sqrt{3} \frac{a_0}{2}$

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220. A particle starts from mean position and performs simple harmonic motion with amplitude and time period as A and T respectively. The magnitude of evrage acceleration in half time period is

A. $\frac{4A\pi}{T^2}$

B. $\frac{8A\pi}{T^2}$

C. $\frac{A\pi}{T^2}$

D. $\frac{\sqrt{3}A\pi}{T^2}$

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221. A mass is suspended at the end of a spring and performs SHM with a time period 3 seconds, while the time period f same mass wih other spring is 4 second. If that mass is connected with the combination of the two springs connected in series then time period of oscillator is

A. $7s$

B. $1s$

C. $5s$

D. $25s$

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222. The potential energy of body of mass 2 kg moving along the x-axis is given by $U = 4x^2$, where x is in metre. Then the time period of body (in second) is

A. 3

B. 3π

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

D. π

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223. A simple pendulum has a time period 2 s on the earth surface. If pendulum is taken to height $\frac{R}{2}$ above the earth 's surface, (R is radius of the earth), the time period becomes

A. 3 s

B. $4s$

C. $2s$

D. $1s$

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224. A body is performing SHM At a displacement X_1, its potential energy is 4 J and at a displacement X_2, its potential energy is 9 J. The potential energy at a displacement $(X_1 + X_2)$ is

A. 10 J

B. 5 J

C. 25 J

D. 20 J

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225. The position of S.H.M. is given by x=2[√3sin πt +cos πt]. The amplitude of motion is [x is in metre and symbols have the usual meaning]

A. $2m$

B. $4m$

C. $1m$

D. $\sqrt{3}$ m

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226. Two stretched wires A and B of same material vibrate independently. If the tension, length and radius of wire B is half those of wire A, then ratio of fundamental frequency of vibration of A and B is

A. $1 : \sqrt{2}$

B. $2 : 1$

C. $2\sqrt{2} : 1$

D. $1 : 2\sqrt{2}$

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227. A travelling wave in a stretched string is described by the equation $y = A \sin(kx - \omega t)$. The ratio of a square of maximum particle velocity and square of wave velocity is

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

B. Ak

C. Ak^2

D. A^2k^2

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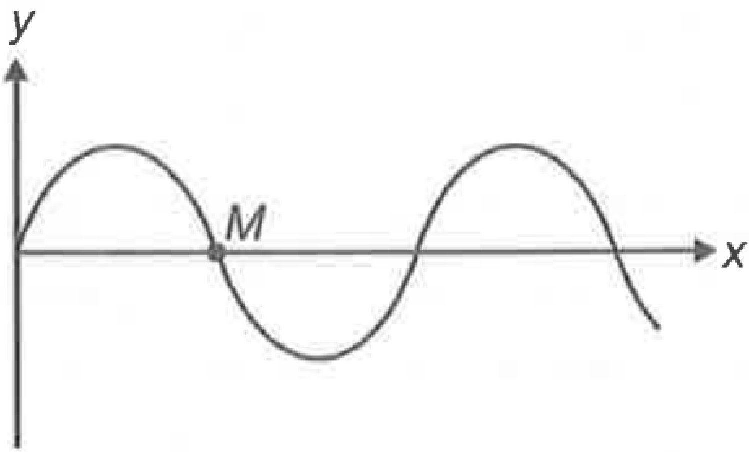
228. A transverse wave is travelling along a string from right to left. The figure represents the shape of the string at the given instant. A point M



has a velocity

A. in upward direction

B. in downward direction

C. Zero

D. along x-axis

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229. Two waves of equal amplitude $1m$ and equal frequency travel in the opposite direction in a medium. The magnitude of amplitude of the resultant wave may not be

A. $2m$

B. $0m$

C. $1m$

D. $3m$

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230. If amplitude of Wave y_1 is two times that of the wave y_2 and frequency of y_1 is 2 times the frequency of y_2, then the ratio of transfer of energy in the wave y_1 and y_2 is

A. $4:1$

B. $1:4$

C. $1:1$

D. $16:1$

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231. In a stationary wave represented by $y = 4\sin(\omega t)\cos(kx)$ cm, the amplitude of the component progressive wave is

A. 4 cm

B. 2 cm

C. 1 cm

D. $\sqrt{2}$ cm

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232. If there are equations of two waves $y = A\sin(\omega t - kx)$ and $z = A\sin(\omega t - kx)$, then on superposition of the two waves, the amplitude of resultant wave is

A. $A\sqrt{2}$

B. $2A$

C. A

D. Zero

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233. The minimum wavelength of sound that is audible to a person is (speed of sound is 340 m/s)

A. 17 cm

B. 17 mm

C. 17 m

D. 27mm

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234. A tuning fork of frequency 510 Hz is vibrated with a sonometer wire and 4 beats per second are heard. The beat frequency increases if the tension in the string is slightly increased. The original frequency of the string is

A. 500 Hz

B. 524 Hz

C. 514 Hz

D. 314 Hz

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235. The fundamental frequency of an open organ pipe is same as that of the first overtone frequency of a closed organ pipe. If the length of open organ pipe is 100 cm then length of closed pipe is

A. 150 cm

B. 100 cm

C. 250 cm

D. 300 cm

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236. At the open end of organ pipe

A. the displacement is zero

B. the displacement is maximum

C. the wave pressure is zero

D. Both (2) & (3)

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237. In a stationary wave

A. All the particles of the medium vibrate in phase

B. the alternate antinodes vibrate in phase

C. All the antinodes vibrate in phase

D. all of these

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238. Two sound sources emitting sound each of wavelength λ are fixed at a given distance apart. A listener moves with a velocity u along the line joining the two sources. The number of beats heard by him per second is

A. $\frac{v_0}{\lambda}$

B. $2v_0\lambda$

C. $2\frac{v_0}{\lambda}$

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

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239. A source of sound produces 6 beats per second with a tuning fork when the source frequency is either 578 hz or 590 hz. The frequency of tuning fork is

A. 584 Hz

B. 572 Hz

C. 596 Hz

D. 500 Hz

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240. An observer moves with a constant acceleration towards a fixed source and start decelerating as soon as it passes the sound source. The variation of frequency f by observer with time t is best shown by

A.

B.

C.

D.

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241. An observer a sitting on a cart executing SHM between A and B listens to a whistle which rotates in a circle with constant speed 5 m/s as shown.The maximum speed of the car is same as that of whistle . If frequency of the whistle is 640 Hz,then maximum possible frequency observed by observer is [Speed of sound in air= 320 m/s]

A. 670 Hz

B. 650 Hz

C. 630 Hz

D. 660 Hz

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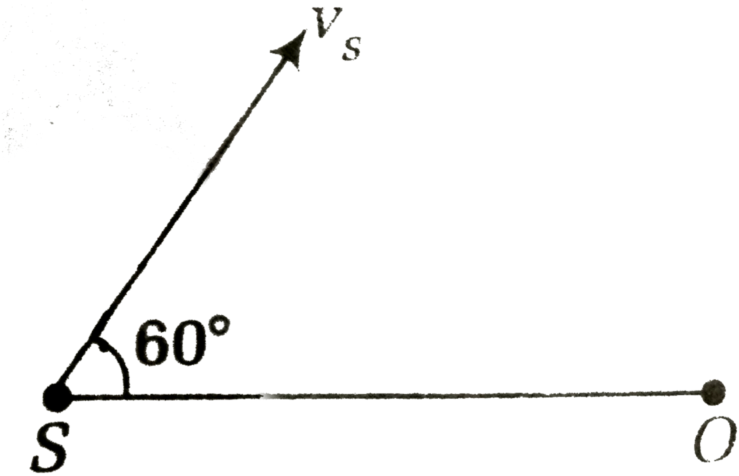
242. A source of sound S emitting waves of frequency 100 Hz. And an observer O are located at some distance from each other. The source is moving with a speed of $19.4 ms^{-1}$ at an angle of 60° with the source observer line as show in the figure. The observer is at rest . The apparent frequency observed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



A. 1052 Hz

B. 1022 Hz

C. 962 Hz

D. 992 Hz

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243. The difference between the apparent frequency of a source of sound as perceived by the observer during its approach and recession is 2% of the natural frequency of the source. If the velocity of sound in air is 300 m/s, the velocity of the source is

A. 1.5 m/s

B. 12 m/s

C. 6 m/s

D. 3 m/s

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244. The fundamental frequency of a sonometer wire is n . If length tension and diameter of wire are triple then the new fundamental frequency is.

A. $n\sqrt{3}$

B. $\frac{n}{3\sqrt{3}}$

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

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

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245. A string is rigidly tied at two ends and its equation of vibration is given by $y = \cos 2\pi t \sin 2\pi x$. Then minimum length of string is

A. 5 m

B. 2π m

C. 1 m

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

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246. Two parts of a sonometer wire divided by movable knife differ in length by 2 cm and produce 1 beat/s when sounded together. Assume fundamental frequencies, if total length of wire is 100 cm, then The frequencies of the two parts of the wire are

A. A. 25 Hz,24 Hz

B. B. 25.5 Hz,24.5 Hz

C. C. 51 Hz,50 Hz

D. D. 50.5 Hz,49.5 Hz

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247. Find the fundamental frequency and nature of organ pipe if it gives 3 consecutive notes of frequencies 255Hz, 425Hz, 595Hz

A. A. 17 Hz,open

B. B. 85 Hz, open

C. C. 17 Hz , closed

D. D. 85 Hz, closed

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248. An organ pipe P_1 closed at one end vibrating in its first harmonic and another pipe P_2 open at both ends vibrating in its third harmonic are in resonance with a given tuning fork. The ratio of the length of P_1 and p_2 is

(a) $8/3$ (b) $3/8$ (c) $1/6$ (d) $1/3$

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

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

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

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

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249. Sound waves are emitted uniformly in all directions from a point source. The dependence of sound level β in decibels on the radial distance r can be expressed as [Given a and b are positive constants]

A. A. $\beta = a - b \log r$

B. B. $\beta = a - \frac{b}{r^2}$

C. C. $\beta = \ - b \log r^2$

D. D. $\beta = a - b(\log r)^2$

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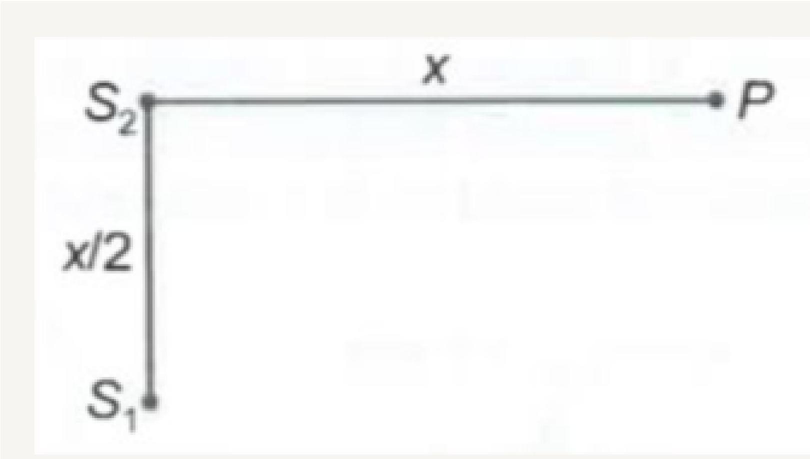
250. The wavelength of sound waves arriving at P from two coherent sources S_1 and S_2 is 4 m as shown. While intensity of each wave is I_0 the resultant intensity at point P is $2I_0$ find minimum value of x



A. $2(\sqrt{5}-2)m$

B. $2(\sqrt{5}-1)m$

C. $\frac{1}{\sqrt{}+1}m$

D. $2(\sqrt{5}+2)m$

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251. The equation of a moving progressive wave is given by $y=\frac{1}{x^2-4xt+4t^2+8}$, where x and y are in metre and t is in second .

Hence speed and direction of propagation of pulse is

A. $4\frac{m}{s}, \ + vex - a\xi s$

B. $4\frac{m}{s}, \ - vex - a\xi s$

C. $2\frac{m}{s}, \ + vex - a\xi s$

D. $2\frac{m}{s}, \ - vex - a\xi s$

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252. A wave pulse is travelling positive x direction with a speed of 4.5 m/s. At time t= 0, the wave pulse is given as $y = \frac{6}{x^2 - 3}$. Here x and y are in metre. Then which function represents the equation of pulse just after 2 second?

A. $y = \frac{6}{(x - 4.5t)^2 + 3}$

B. $y = \frac{6}{(x + 9t)^2 + 3}$

C. $y = \frac{6}{(x - 9)^2 - 3}$

D. $y = \frac{6}{(x+9)^2 - 3}$

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253. Which of the following function does not represent the equation of a standing wave?

A. $y = A\sin kx.\sin\omega t$

B. $y = A\sin(\omega t - kx)$

C. $y = \sin\omega t.\cos kx$

D. $y = A\sin kx.\cos\omega t$

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254. A wave is travelling towards positive x-direction. If the pulse of the wave at any instant is given as shown in figure then which particle will

have negative velocity at any instant?

A. C

B. D

C. A

D. B

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255. A plane progressive wave travelling in +x direction with amplitude $A = 0.2$ m has velocity of 360 m/s. if its wavelength $\lambda = 60m$ then the correct expression of wave is

A. $y = 0.2 \sin\left[2\pi\left(6t - \frac{x}{60}\right]\right.$

B. $y = 0.2 \sin\left[\pi\left(6t - \frac{x}{60}\right]\right.$

C. $y = 0.2 \sin\left[2\pi\left(6t + \frac{x}{60}\right]\right.$

D. $y = 0.2 \sin\left[\pi\left(6t + \frac{x}{60}\right]\right.$

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256. A rod hanging from ceiling has linear density given as $\lambda = m_0(1+x)$ kg/m, where m_0 is constant and x is distance of a point from free end . if the length of the rod is 4m then velocity of wave at x=1m is

A. $\sqrt{12\frac{g}{5}}\frac{m}{s}$

B. $\sqrt{3\frac{g}{4}}\frac{m}{s}$

C. $\sqrt{15\frac{g}{8}}\frac{m}{s}$

D. $\sqrt{4\frac{g}{3}}\frac{m}{s}$

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257. The amplitude of a particle in damped oscillation is given by $A = A_0 e^{-kt} wheresymbolshaveusualmean \in gs$ if $attimet = 4s, thean$

1/8` of initial value t=

A. 16 s

B. 20 s

C. 8 s

D. 12 s

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258. The amplitude of a particle under forced vibration is given as $A = \frac{10}{x^2 - 5x + 6}$. Resonance will takes place at x equal to

A. A. 5/2

B. B. Zero

C. C. 2

D. D. 4

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259. Two SHMs directed along x-axis and y-axis are superimposed on a particle of mass m. If $x = A_1 \sin \omega t$ and `y= A_2 sin(omegat+pi),then path of the particle will be.

A. Ellipse

B. Circle

C. Straight line with slope $-\frac{A_2}{A_1}$

D. Straight line with slope 1

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260. Two simple pendulums have time period 4s and 5s respectively. If they started simultaneously from the mean position in the same direction, then the phase difference between them by the time the larger one completes one oscillation is

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

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

C. $\frac{\pi}{6}$

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

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261. A thin rod of length L is hanging from one end and free to oscillate like s compound pendulum about a horizontal axis, Its time period for small oscillations is

A. $2\pi\sqrt{\frac{L}{g}}$

B. $2\pi\sqrt{2\frac{L}{g}}$

C. $2\pi\sqrt{2\frac{g}{3}L}$

D. $2\pi\sqrt{2\frac{L}{3}g}$

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262. A body of mass m has time period T_1 with one spring and has time period T_2 with another spring. If both the springs are connected in parallel and same mass is used, then new time period T is given as

A. $\frac{1}{T}=\frac{1}{T_1}+\frac{1}{T_2}$

B. $\frac{1}{T^2}=\frac{1}{T_1^2}+\frac{1}{T_2^2}$

C. $T^2=T_1^2+T_2^2$

D. $T=\frac{1}{T_1}+\frac{1}{T_2}$

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263. The time period of a spring mass system of spring constant k and mass m is T. Now, the spring is cut into two equal parts and connected in parallel. If the same mass is attached to new arrangement, then new time period is

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

B. 8T

C. 2T

D. 4T

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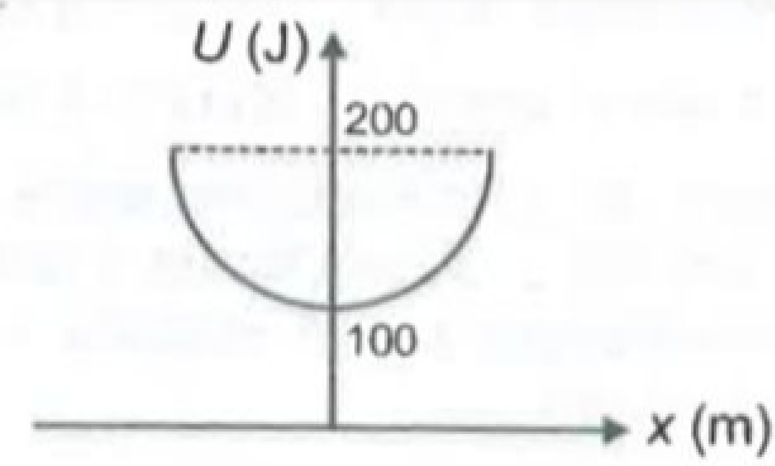
264. The potential energy U versus position x curve of spring mass system executing SHM is shown. If spting constant $K = 2 \times 10^4$ N/m and mass of the object m=2kg, then which of the following is wrong?



A. Maximum velocity=10 m/s

B. Maximum acceleration=$10^3 \frac{m}{s^2}$

C. $K_{\max} = 200J$

D. Amplitude= 10 cm

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265. A particle executes linear. If a and v donate the acceleration and velocity of the particle respectively, then correct graph relating the values a^2 and v^2 is

A.

B.

C.

D.

266. The velocity v of a particle of mass m changes with time t as $d^2\frac{v}{dt} = -kv$, where k is constant. Now, which of the following statements is correct?

A. particle executes SHM with frequency $\frac{\sqrt{k}}{2\pi}$

B. particle executes SHM with time period $2\frac{\pi}{k}$

C. particle does not perform SHM

D. particle executes SHM with time period $T = 2\pi\sqrt{\frac{m}{k}}$

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267. A particle executes linear SHM with amplitude A and mean position is x=0. Determine position of the particle where potential energy of the particle is equal to its kinetic energy.

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

B. A/3

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

D. A/sqrt2

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268. The displacement-time equation of a particle executing SHM is $x - A\sin(\omega t + \phi)$. At tme t=0 position of the particle is x=$\frac{A}{2}$ and it is moving along negative x-direction. Then the angle ϕ can be

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

B. $11\frac{\pi}{6}$

C. $\frac{\pi}{6}$

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

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269. Two SHM are represented by equations $x_1 = 4\sin(\omega t + 37^\circ)$ and $x_2 = 5\cos(\omega t)$. The phase difference between them is

A. 53°

B. 143°

C. 37°

D. 127°

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270. A particle executes linear SHM with time period of 12 second. Minimum time taken by it to travel from positive extreme to half of the amplitude is

A. 3s

B. 2s

C. 1s

D. 4s

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271. The time period of a simple pendulum on the surface of the Earth is T_1 and that on the planet Mars is T_2. If `T_2

A. Less than g

B. Data insufficient

C. Greater than g

D. Equal to g

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272. A simple pendulum is hanging from the roof of a trolley which is moving horizontally with acceleration g. If length of the string is L and mass of the bob is m, then time period of oscillation is

A. $2\pi\sqrt{\frac{L}{g\sqrt{2}}}$

B. $2\pi\sqrt{2\frac{L}{g}}$

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

D. $2\pi\sqrt{\frac{L}{g}}$

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273. In the given pressure - temperature (P-T) diagram, the density of an ideal gas at point A and B are ρ_0 and $3\frac{\rho_0}{2}$ respectively, then the value of X is

A. $3\frac{P_0}{2}$

B. $4P_0$

C. $2P_0$

D. $3P_0$

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274. The temperature at which the velocity of sound in air becomes double its velocity at $0^{\circ} C$ is

A. 1100°C

B. 1400°C

C. 819°C

D. 1092°C

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275. At what temperature RMS velocity of O_2 molecule will be one third of H_2 molecule at -3°C?

A. 1167°C

B. 207°C

C. 90K

D. -3°C

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276. On the basis of kinetic theory of gases, the mean kinetic energy of 1 mole of an ideal gas per degree of freedom is

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

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

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

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

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277. Average kinetic energy of H_2 molecules at 300 K is E. At the same temperature, average kinetic energy of O_2 molecules is

A. E/4

B. E

C. 16E

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

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278. Figure shows volume - temperature (V-T) graph for same mass of an ideal gas at two different pressures P_1 and P_2. Hence

A. $P_1 = P_2$

B. $P_1 = \frac{1}{P_2}$

C. $P_1 < P_2$

D. $P_1 > P_2$

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279. If n moles of an ideal gas undergoes a thermodynamic process $P = P_0\left[1 + \left(\frac{2V_0}{V}\right)^2\right]^{-1}$, then change in temperature of the gas when volume is changed from $V = V_0$ to $V = 2V_0$ is [Assume P_0 and V_0 are constants]

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

B. $\frac{9P_0V_0}{7nR}$

C. $\frac{4P_0V_0}{5nR}$

D. $\frac{3P_0V_0}{4nR}$

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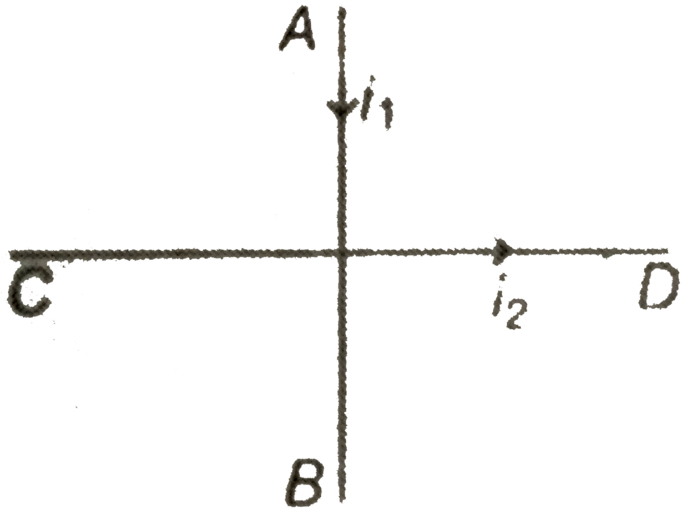
280. Two long wires AB and CD carry currents l_1 and l_2 in the direction as shown in the figure, then choose correct statement at the instant shown



A. Force on wire AB is towards left

B. Torque on wire AB is clockwise

C. Force on wire AB is towards right

D. Torque on wire AB is anticlockwise

A. Force on wire AB is towards left

B. Torque on wire AB is clockwise

C. Force on wire AB is towards right

D. Torque on wire AB is anticlockwise

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281. A long straight hollow metallic tube carrying a current I has three sections of different area of cross section as shown in figure. Three points A, B and C are on a line parallel to the axis of the tube. If magnetic field at this point are B_1, B_2, B_3 respectively, then

A. $B_3 > B_1 > B_2$

B. $B_3 < B_1 < B_2$

C. $B_1 = B_2 = B_3$

D. $B_1 = B_3 > B_2$

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282. Positive and negative ions are productid at the origin. If they are subjected simultaneously to an electric field along the +y $-direction$ and $maGNeticfieldalong + z$-direction, then

A. Positive ions deflect towards +x direction and negative ions towards -x direction

B. Positive ions deflect towards -x direction and negative ions towards +x direction

C. All ions deflect towards +x direction

D. All ions deflect towards -x direction

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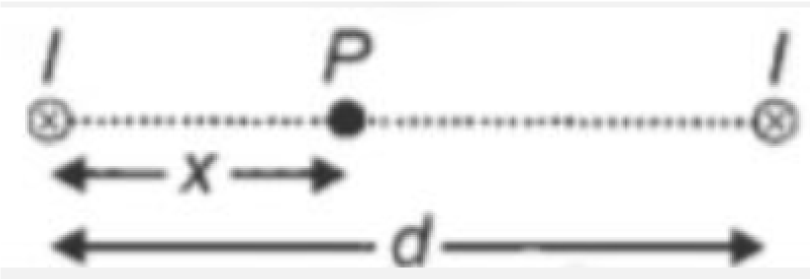
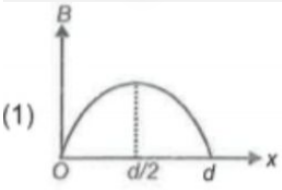
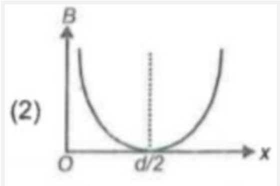
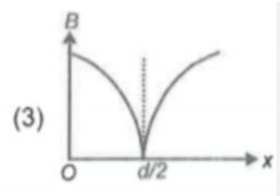
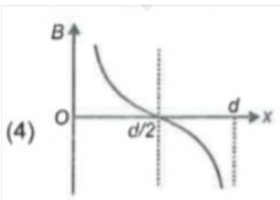
283. Two thin long wires are parallel to each other at a separation d apart and they carry equal currents I each along the same direction as shown in figure. The magnetic field (B) at a point P varieswith x according to graph.



A. 

B. 

C. 

D. 

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284. A non-conducting rod AB of length l has total charge Q . The rod is rotated about an axis passing through a point (l/3)` distance from one end and perpendicular to plane of rod with constant angular speed omega, the magnetic moment of rod is

A. $\frac{Ql^2\omega}{12}$

B. $\frac{Ql^2\omega}{18}$

C. $\frac{Ql^2\omega}{6}$

D. $\frac{Ql^2\omega}{9}$

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285. A wire of length 1rn along x-axis carries a current $2A$, is placed inside the field of $\overrightarrow{B} = \left(3.0\hat{j} + 4.0\hat{k}\right)$ tesla, then force exerted on the wire is

A. $6\hat{k} + 8\hat{j}$

B. $6\hat{k} - 8\hat{j}$

C. $8\hat{k} - 6\hat{j}$

D. $8\hat{k} - 6\hat{j}$

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286. A square loop of length L is made of wire of uniform cross-section carrying current I as shown in figure then magnetic field at centre of square is

A. Zero

B. $\frac{2\sqrt{2}\mu_0 l}{\pi L}$

C. $\frac{9\mu_0 l}{2\pi L}$

D. $\frac{\sqrt{2}\mu_0 l}{\pi L}$

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287. A charge Q moves in Y-direction in the plane of a very long wire carrying a current I as shown in figure . Instantaneous force on the

charge is

A. Along OX

B. Along OY

C. Opposite to OX

D. Opposite to OY

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288. The incorrect relation as per Ampere circuital law is

A. $\oint \overrightarrow{B} . \overrightarrow{dL} = \mu_0 \sum l$

B. $\oint \overrightarrow{H} . \overrightarrow{dL} = \sum l$

C. $\oint \overrightarrow{H} . \overrightarrow{dL} = \mu_0 \sum l$

D. Both (1) & (2)

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289. Which of the following curves corresponds to maximum growth ?

A.

B.

C.

D.

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290. When a long rod of iron magnetised by means of an electric current, then its length increase. This phenomenon is

A. Magnetostriction

B. Retentivity

C. Coercivity

D. Hysteresis loss

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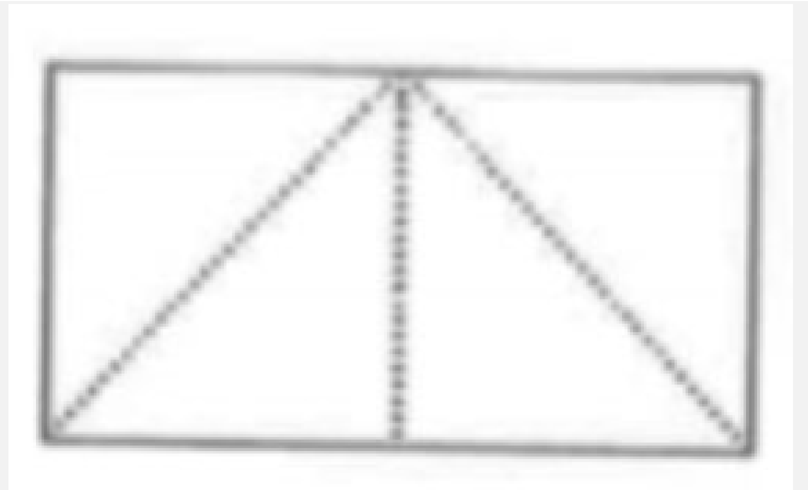
291. A bar magnet of magnetic moment M is cut into four identical parts as shown in figure, then magnetic moment of each part is



A. $\left(\frac{M}{2}\right)$

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

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

D. $\left(\frac{M}{4}\right)$

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292. The angle of dip at a certain place where the horizontal and vertical components of the earth's magnetic field are equal is

A. 90°

B. 45°

C. 0°

D. 30°

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293. Gauss's law in magnelism ensures that

A. Magnetic field lines from closed loops

B. Magnetic monopole does not exist

C. Magnetic field is conservative

D. Both (1) & (2)

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294. Two identical short bar magnets of magnetic moment M each are placed at distance r apart in end-on position, then magnetic force between both is

A. $\left(\frac{\mu_0}{4\pi}\right).\left(\frac{M^2}{r^2}\right)$

B. $\left(\frac{\mu_0}{4\pi}\right).\left(4\frac{M^2}{r^4}\right)$

C. $\left(\frac{\mu_0}{4\pi}\right).\left(6\frac{M^2}{r^4}\right)$

D. $\left(\frac{\mu_0}{4\pi}\right).\left(6\frac{M^2}{r^2}\right)$

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295. Two magnets of magnetic moments M and $M\sqrt{3}$ are joined to form a cross(+) . The combination is suspended freely in a uniform magnetic field . At equilibrium position, the magnet of magnetic moment M makes an angle theta with the field, then theta is

A. 60°

B. 30°

C. 90°

D. 45°

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296. A ship is sailing due west according to mariner's compass . If the declination of the place is 20° east , then true direction of ship is

A. 20°` west of north

B. 70°` west of north

C. 20°` north of east

D. 70°` north of east

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297. If θ_1 and θ_2 be the apparent angles of dip observed in two verticle planes at right angles to each other, then the true angle of dip θ is given by

A. $\tan\theta = \dfrac{\tan\theta_1 \tan\theta_2}{\sqrt{\tan^2\theta_1 + \tan^2\theta_2}}$

B. $\tan\theta = \dfrac{\tan^2\theta_1 \tan^2\theta_2}{\tan^2\theta_1 + \tan^2\theta_2}$

C. $\tan\theta = \dfrac{\tan\theta_1 \tan\theta_2}{\sqrt{\tan\theta_1 + \tan\theta_2}}$

D. $\tan\theta = \dfrac{\sqrt{\tan\theta_1 \tan\theta_2}}{\tan\theta_1 + \tan\theta_2}$

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298. The intensity of magnetisation of a magnetic material is I . Now material is the cut such that volume of the material is halved, then new intensity of magnetization is

A. I\`

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

C. $2l$

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

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299. Which of the following is correct for a diamagnetic material ?

A. $\mu_r > 1, \chi_m < 1$

B. $\mu_r < 1, \chi_m < 1$

C. $\mu_r < 1, \chi_m > 1$

D. $\mu_r < 1, \chi_m < 0$

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300. A galvanometer has range 0 – V volt and it has resistance R. When the series resistor of resistance 2R is connected, the range becomes 0 · V . Then

A. $V' = 2V$

B. $V' = 3V$

C. $V' = 1.75V$

D. $V = 1.5V$

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301. Flux ϕ (in weber) in a closed circuit of resistance5 omega varies with time (in second) according to equation $\phi = 3t^2 - 5t + 2$. The magnitude of average induced current between0 to $2s$ is

A. $1.4A$

B. $0.7A$

C. $0.35A$

D. $0.20A$

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302. Temperature of an ideal gas is increased such that the most probable velocity of molecules increase by factor 4 .the rms velocity increase by the factor ?

A. 2

B. 4

C. 6

D. 8

303. A metallic ring hangs vertically from a thread with its axis pointing $E - W$. A coil is fixed near to the ring and co-axial with it. When current in the coil is switch on,then the ring

A. Moves towards south

B. Moves towards East

C. Moves towards North

D. Moves towards West

304. A square loop of sides L is placed at centre of a circular loop of radius r (r << L) such that they are coplanar, then mutual inductance between both loop is

A. $\frac{\mu_0 L}{4r}$

B. $\mu_0 \frac{L}{2r}$

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

D. $\mu_0 \frac{L^2}{2r}$

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305. Two coils of self inductance L_1 and L_2 are placed near each other so that the total flux in one coil is partially linked with the other. Their mutual inductance (M) will be given by

A. $M = L_1 L_2$

B. $M = \sqrt{(}L_1 L_2)$

C. $M > \sqrt{L_1 L_2}$

D. $M < \sqrt{L_1 L_2}$

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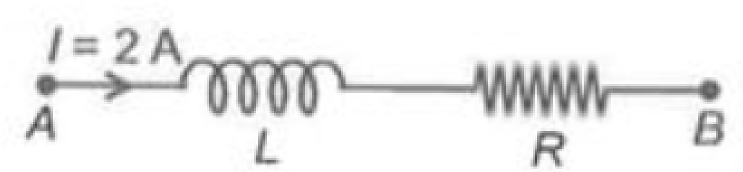
306. In an AC subcircuit as shown in figure, the resistance $R = 1omega$. At a certain instant $V_A - V_B = 2V$ and current is increasing at the rate of $\frac{dl}{dt} = 10 \frac{A}{s}$. The inductance of the coils is



A. 0H

B. $0.02H$

C. $0.01H$

D. $0.1H$

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307. When DC motor run at full speed , then induced emf will be

A. Maximum

B. Minimum

C. Zero

D. Any of these

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308. The current through inductor of $2H$ is given by $I = 2t \cos 2t$. The voltage across the inductor is

A. $-8 \sin 2t - 4t \cos 2t$

B. $8t \sin 2t - 4t \cos 2t$

C. $8t \sin 2t - 4 \cos 2t$

D. $8t \sin 2t + 4 \cos 2t$

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309. The ratio of the mean value over half cycle to the r.m.s vslue of an AC for given graph is

A. 1

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

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

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

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310. In a cirtain circuit current changes with time according to $i = \sqrt{t}$. Average value of current between$t = 1$ to $t = 2s$ is about to

A. $0.9A$

B. $1.0A$

C. $1.2A$

D. $1.8A$

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311. In a certain circuit $E = 200\cos(100\pi t)$ and $i = 10\sin\left(100\pi t + \frac{\pi}{4}\right)$.

Their phasor representation is

A.

B.

C.

D.

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312. An air core coil and an electric bulb are connected in series with an AC source. If an iron rod is put in the coil, then the intensity of light of the bulb will

A. Increase

B. Decrease

C. Fluctuate

D. Remain unchanged

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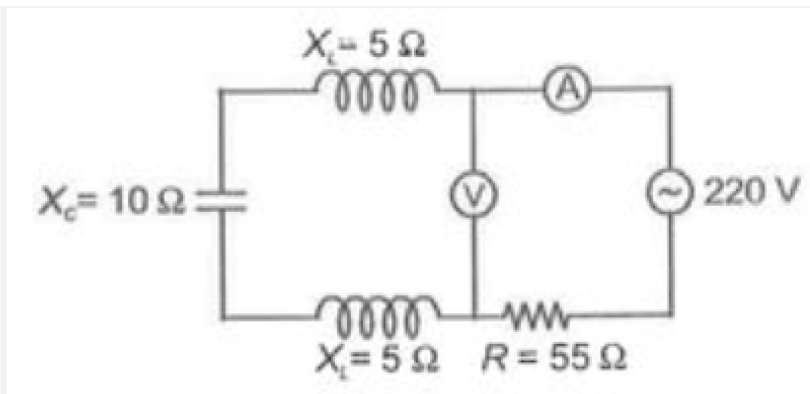
313. The reading of ammeter and voltmeter in the given circuit is



A. $4A, 0V$

B. $4\sqrt{2}A, 0V$

C. $0A, 0V$

D. $4A, 4V$

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314. The current is given by $i = i_0 + i_0$ sin omega t then its r.m.s value will be

A. $3\frac{i_0}{2}$

B. $i_0\sqrt{\left(\frac{3}{2}\right)}$

C. $\frac{i_0}{2}$

D. $\frac{i_0}{3}$

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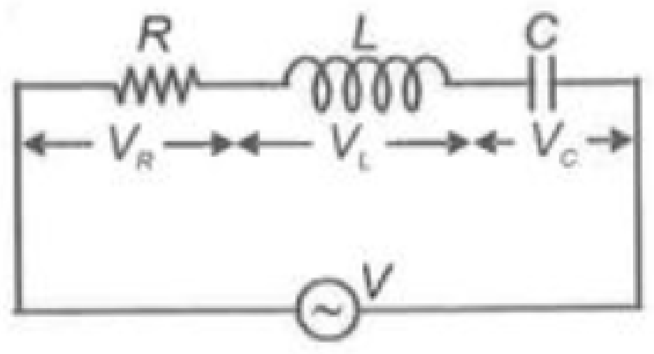
315. At resonance in series R-L-C circuit



A. $V_R + V_L + V_C = 0$

B. $V_R + V_L = 0$

C. $V_R + V_C = 0$

D. $V_L + V_C = 0$

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316. In series $L - R$ circuit, $X_L = R$. Now a capacitor with $X_C = R$ is added in series. New power factor

A. Same as initial

B. $\frac{1}{\sqrt{2}}$ times the initial

C. $\frac{1}{2}$ times the initial

D. $\sqrt{2}$ times the initial

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317. The alternating voltage induced in a secondary coil of a transformer is mainly due to

A. Iron core of transformer

B. A varying electric field

C. Vibrations of the primary coil

D. A varying magnetic fiels

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318. The electric field of an electromagnetic wave in free spaces is given by $\overline{E} = 5\cos(10^5 t + kx) jatk \frac{V}{m}$, where t in second and x in metre then

A. The wave number k is $\frac{1}{3} \cdot 10^{-3} m^{-1}$

B. The wavelength lambda is $6\pi \cdot 10^3 m$

C. The wave amplitude is $5\frac{V}{m}$

D. All of these

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319. A plane E.M wave in free space is travelling along the $+x$direction. The electric field component of the wave at a perpendicular point of sapace and time is $\overline{E} = 10^3 \hat{j}$ V/m. Its magnetic field component bar B at this point be

A. $0.33 \cdot 10^{-5} \hat{k}$

B. $0.3310^{-5}\left(-\hat{k}\right)$

C. $0.33 \cdot 0^{+}5\hat{k}$

D. $0.33 \cdot 10^{+}5\left(-\hat{k}\right)$

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320. Displacement current continues in a circuit,

A. When electric field is changing in the circuit

B. When magnetic field is changing in the circuit

C. When electric field is constant in the circuit

D. When magnetic field is constant in the circuit

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321. Intensity of plane electromagnetic waves in the direction of propagation of wave

A. Varies inversely with distance

B. Varies inversely with square of distance

C. Remains constant

D. Is directly proportional to the distance

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322. The momentum carried by E-M waves in vaccum is P, then energy associated with the wave is equal to (C) is speed of light)

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

B. $\frac{P}{c}$

C. $\frac{P^2}{2}c$

D. Pc

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323. The equation of a wave travelling on a string given by, $y = \gamma e^{-\left(\left(\frac{x}{\alpha} + \frac{t}{\beta}\right)^2\right)}$ what will be speed of of wave?

A. $\beta\gamma$

B. $\frac{\beta}{\alpha}$

C. $\frac{\gamma}{\beta}$

D. $\frac{\alpha}{\beta}$

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324. Consider a wave with frequency 300 Hz and speed $350ms^{-1}$. How far apart are two points 60°` out of phase?

A. $\left(\frac{1}{7}\right)m$

B. $\left(\frac{36}{7}\right)m$

C. $\left(\frac{7}{36}\right)m$

D. $7m$

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325. Select incorrect statement

A. The equation, $\frac{\partial^2 y}{\partial x^2} = \left(\frac{1}{v^2}\right)\left(\frac{\partial^2 y}{\partial t^2}\right)$ represents a wave.

B. Relation between pressure amplitude and displacement amplitude is $P_0 = BAk$

C. The equation, $y = 2a\cos(kx)\cos(\omega t)$ does not represent a travelling wave

D. The equation, $y = A\sin(2x^2 - 3t^2)$ does not represent a travelling wave

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326. Fifth overtone of a closed pipe is found to be in in unison with the third overtone of an open organ pipe. Find ratio of length of open organ pipe to that of closed organ pipe .

A. $\left(\frac{5}{11}\right)$

B. $\left(\frac{7}{11}\right)$

C. $\left(\frac{4}{11}\right)$

D. $\left(\frac{8}{11}\right)$

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327. Which of the following options is representing average energy per unit volume of a travelling wave? (Where rho is density, omega is angular frequency, A is amplitude)

A. $\left(\frac{1}{2}\right)\rho^2\omega^2A^2$

B. $\left(\frac{1}{2}\right)\rho^2\omega^2A$

C. $\left(\frac{1}{2}\right)\rho^3\omega^2A$

D. $\left(\frac{1}{2}\right)\rho\omega^2A^2$

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328. A cylindrical tube, is open at both the ends, it has fundamental frequency 200 Hz` in air. Now half of length contains water. The fundamental frequency will now be

A. $600Hz$

B. $500Hz$

C. $200Hz$

D. $100Hz$

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329. A tuning fork of frequency 512 Hz is vibrated with sonometer wire and 6 beats per seconds are heard. The beat frequency reduces if the tension in the string is slightly increased. The original frequency of vibration of the string is

A. $506Hz$

B. $512Hz$

C. $518Hz$

D. $524Hz$

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330. In a standing wave the phase difference between two points on either side of a a node will be

A. π

B. 2π

C. $\left(\frac{\pi}{2}\right)$

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

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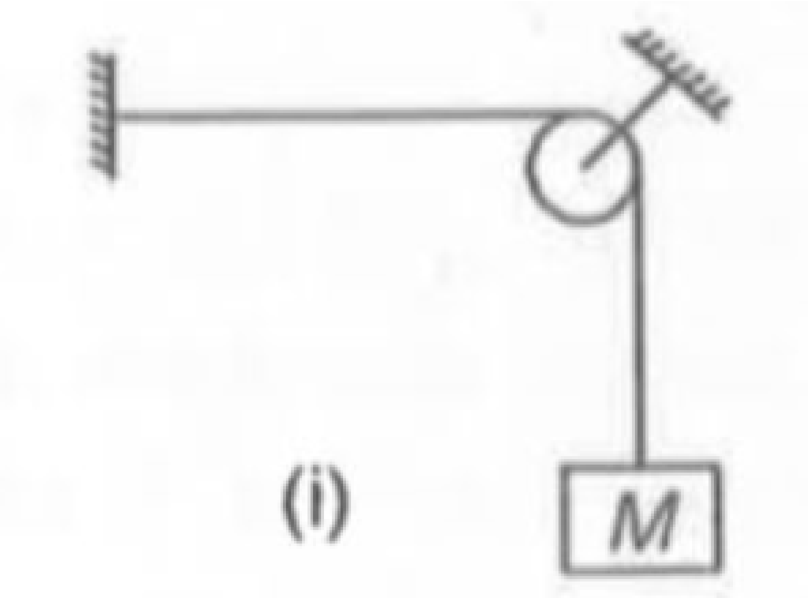
331. When block hangs in air, the horizontal string vibrates in its tenth harmonic in unison with a particular tuning fork. When block is placed in elevator acceleration in downward direction, the same string vibrates in its eleventh harmonic with same tuning fork. What will be acceleration of



elevator ?

A. $\left(\frac{11}{10}\right)g$

B. $\left(\frac{10}{11}\right)g$

C. $\left(\frac{21}{121}\right)g$

D. $\left(\frac{g}{11}\right)$

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332. The two waves of same frequency moving in the same direction give rise to

A. Beats

B. Interference

C. Stationary wave

D. All of these

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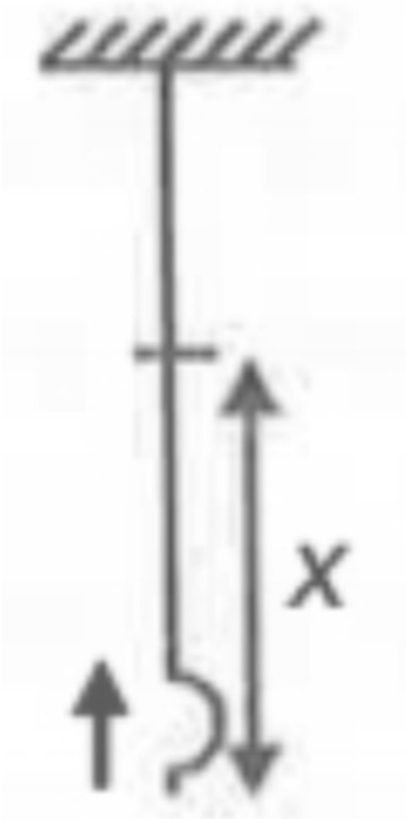
333. Consider a vertical uniform string having mass per unit length lambda. A pulse is generated at the bottom. Acceleration of the pulse



depends on x as

A. x^2

B. $\sqrt{x}$

C. x

D. Independent of x

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334. The equation of travelling wave is $y = a\sin(bt + cx)$ then the ratio of wave velocity to maximum particle velocity is

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

B. $\left(\frac{a}{b}\right)$

C. $\left(\frac{b}{c}\right)$

D. $\left(\frac{a}{c}\right)$

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335. A gun is fired in a valley between two parallel mountains. The echo from one mountain is heard after 2 second and from the other 2 second after the first echo. What will be width of valley? Speed of sound in air is $360ms^{-1}$.

A. $500m$

B. $680m$

C. $1080m$

D. $1200m$

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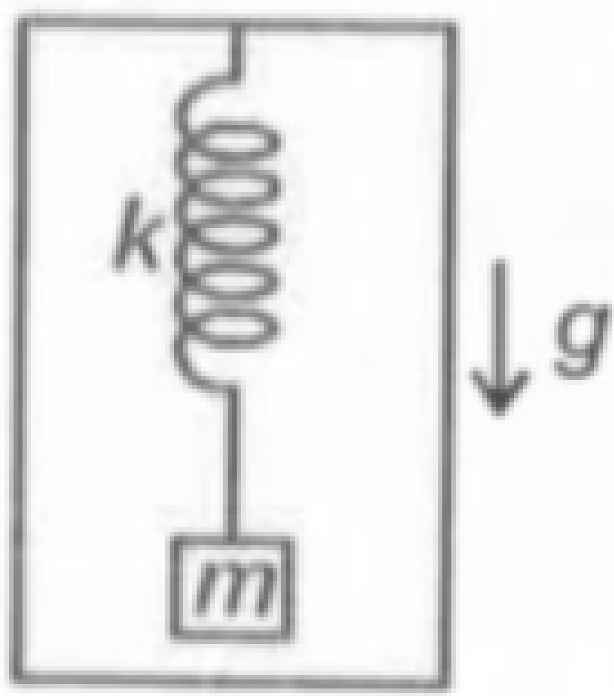
336. A block is hanging in a lift as shown in figure. If lift is falling freely then time period of block is



A. Infinite

B. Zero

C. $2\pi\sqrt{\frac{m}{k}}$

D. Can't be predicted

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337. Two sine waves travel in the same direction in a medium. The amplitude of each wave is A and the phase difference between the two waves is 120°. The resultant amplitude will be

A. A

B. $2A$

C. $4A$

D. $\sqrt{2}A$

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338. Which of the following statement is correct ?

A. A wave transports only momentum

B. A wave transports only energy

C. A wave transports both energy and momentum

D. A wave transports neither energy nor momentum

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339. For a particle which is undergoing simple harmonic motion, the square of velocity v^2 is plotted against the square of displacement x^2. The curve will be

A. An ellipse

B. A straight line

C. A circle

D. A parabola

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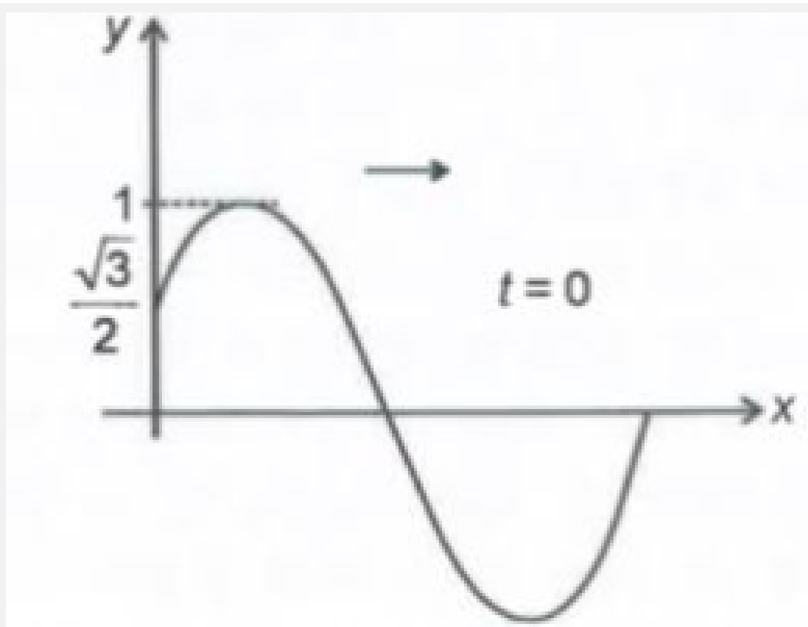
340. Figure shows a snapshot for a travelling wave. The equation of wave at $t = 0$ will be



A. $y = \cos \pi \left(X - 2t + \frac{1}{6} \right)$

B. $y = \sin \pi \left(X - 2t + \frac{1}{3} \right)$

C. $y = \sin \pi \left(X - 2t - \frac{1}{6} \right)$

D. $y = \cos \pi \left(X - 2t - \frac{1}{3} \right)$

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341. Two sources S_1 and S_2 of sound having frequencies 338Hz and 342Hz are separated by a large distance. The speed of sound is 340 ms^(-1). With what velocity should an observer move from source $S_2 \to S_1$ so that he hears no beats?

A. $1ms^{-1}$

B. $2ms^{-1}$

C. $3ms^{-1}$

D. $4ms^{-1}$

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342. A boy blowing a whistle of frequency f_0 is walking directly away from a wall at $1ms^{-1}$ towards his stationary friend. If his friend hears 4 beats per second and speed of sound is $340ms^{-1}$, find approximate value of f_0.

A. $600Hz$

B. $500Hz$

C. $560Hz$

D. $680Hz$

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343. The sound level of a dog's bark is $50dB$. The intensity of a rock concert is$10,000$ times that of dog's bark. What is the sound level of the rock concert?

A. $50dB$

B. $100dB$

C. $90dB$

D. $60dB$

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344. A string fixed at both ends, is vibrating in a particular mode of vibration. Vibration is such that a point on string is at maximum displacement and it is at a distance of one fourth of length of string from one end. The frequency of vibration in thus mode is $200Hz$. What will be the frequency of vibration when it vibrates in next mode such that the same point is at maximum displacement?

A. $200Hz$

B. $400Hz$

C. $500Hz$

D. $600Hz$

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345. A string is fixed between two rigid support. Mass per unit length of the string is lambda. Now the tension in the wire is decreased by 19%. The percentage decrease in frequency will be

A. 21%

B. 10%

C. 19%

D. 11%

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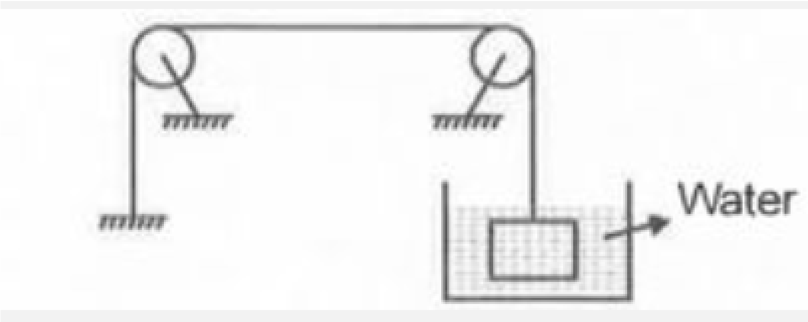
346. If the wire is gently tapped in vertical direction halfway between the pulleys, what is the lowest frequency at which it will vibrate transversely? The mass per unit length of the eire is 0.02 kg/m and it has a length of0.2 m between pulleys. Volume of block is $\frac{1}{200}m^3$and its mass is $10kg$.



A. $250Hz$

B. $125Hz$

C. $62.5Hz$

D. $500Hz$

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347. The equation for a certain wave on a string is, $y = 7 \cdot 10^{-2} \sin(5\pi x)\cos(8t)$. What is the length of the shortest string that could be used? (Where y and x are in meter and t is in second)

A. $0.4m$

B. $0.3m$

C. $0.2m$

D. $0.1m$

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348. Which of the following statement is incorrect?

A. All the waves require medium for their propagation

B. Only mechanical waves require an elastic medium for the propagation

C. Electromagnetic waves donot require material medium for their propagation

D. Speed of sound increases with temparature

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349. Select the correct option regarding simple harmonic motion.

A. Equilibrium at mean position must be stable

B. Its motion must be periodic

C. Its potential energy will not be conserved

D. All of these

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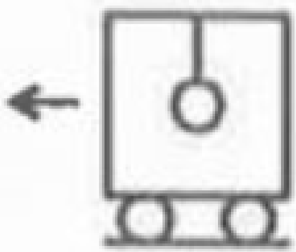
350. The simple pendulum shown here has time period T, when the cart is at rest. If cart moves with constant velocity $8ms^{-1}$ towards left, then the new time period will be



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

B. $2\sqrt{2T}$

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

D. T

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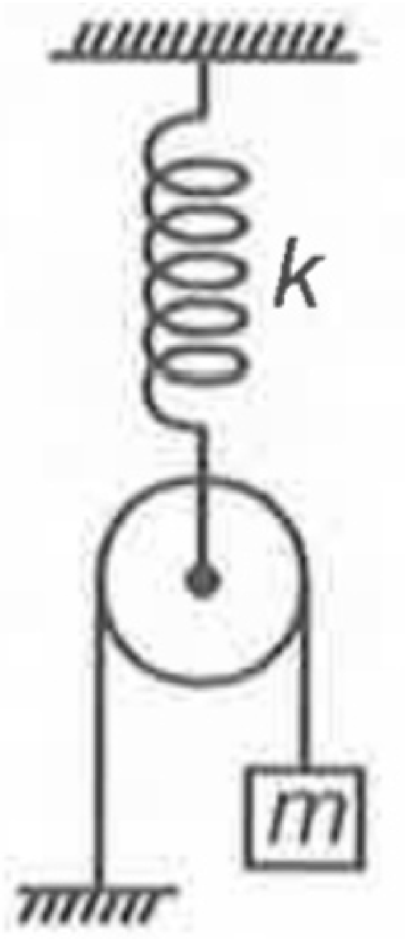
351. The time period of block of mass m is (Assume pulleys and string are massless)



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

B. $T=2\frac{\pi}{3}\sqrt{\frac{m}{2}k}$

C. $T=2\pi\sqrt{4\frac{m}{k}}$

D. $T = \frac{\pi}{3}\sqrt{4\frac{m}{k}}$

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352. The equation of motion of a particle starting at $t = 0$ is given by $x = 5\sin\left(20t + \frac{\pi}{3}\right)$, where x is in centimeter and t is in second. When does the particle come to rest for the second time?

A. $\frac{\pi}{10}s$

B. $7\frac{\pi}{100}s$

C. $7\frac{\pi}{120}s$

D. $5\frac{\pi}{7}s$

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353. Consider a simple pendulum undergoing oscillation in vertical plane following simple harmonic motion. The maximum tension in the string is double the minimum tension. What will be angular amplitude?

A. $\cos^{-1}\left(\frac{1}{3}\right)$

B. $\cos^{-1}\left(\frac{1}{4}\right)$

C. $\cos^{-1}\left(\frac{3}{4}\right)$

D. $\cos^{-1}\left(\frac{2}{3}\right)$

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354. A small block oscillates back and forth on a smooth concave surface of radius $1m$. Find the time period of small oscillations.(Take $g = \pi^2 ms^{-2}$)

A. $8s$

B. $4s$

C. $2s$

D. $1s$

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355. A particle is performing simple harmonic motion on a straight line with time period 12 second. The minimum time taken by particle to cover distance equal to amplitude will be

A. $1s$

B. $2s$

C. $3s$

D. $4s$

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356. Consider a damped oscillation due to air resistance. It is given that air resistance is directly proportional to velocity but in opposite direction. It us found that amplitude reduces to half in 20 oscillations. Whaat eill be amplitude when it completes 80 oscillations? (Initially amplitude is 15 cm)

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

B. $\frac{15}{16}$ cm

C. $\frac{1}{16}$ cm

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

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357. A particle is performing a motion on the x-axis with its position given by $x = A + B \sin \omega t$. The amplitude of particle is

A. A. $A + B$

B. B. A

C. C. $A - B$

D. D. B

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358. Four cylinders contain equal number of moles of argon, hydrogen, nitrogen and ozone at different temperatures. Their temparatures are $2K$, $3K$,$5K$ and $2K$ respectively. The energy is minimum in

A. Argon

B. Hydrogen

C. Nitrogen

D. Ozone

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359. An experiment is being performed by a student in laboratory on ideal gas. He found the value of $C_P - C_V$ equal to 1.00 R in state A and is 1.08 R in state B.. Let P_A, P_B denote the pressures and T_A, T_B denote the temperature of state A and B respectively. Which of the following will be correct?

A. $P_A < P_B$and $T_A > T_B$

B. $P_A > P_B$ and $T_A < T_B$

C. $P_A = P_B$ and $TA < TB$

D. $P_A = P_B$ and $TA = T_B$

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360. In a monatomic ideal gas the pressure and the volume relation follows the equation given by $P^6V^5 = cons\tan t$. The gas contains n number of moles. Find the amount of heat required to increase the temperature of gas by5 kelvin.

A. $15nR$

B. $7.5nR$

C. $75nR$

D. $37.5nR$

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361. The internal energy of an ideal gas is sum of total kinetic energy of molecules. Consider an ideal gas in which the relation among U, P and V is $U = 2 + 3PV$ The gas is

A. Monatomic

B. Diatomic

C. Polyatomic

D. Both(1) & (2)

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362. Two moles of oxygen gas undergo a process given by $P = \frac{2}{1 + \left(\frac{V}{3}\right)^2}$, where P is pressure and V is volume. What will be rms speed of gas molecules when volume of gas becomes $3m^3$?

A. $\frac{3}{8} ms^{-1}$

B. $\frac{15}{4}\sqrt{10} ms^{-1}$

C. $\frac{15}{4} ms^{-1}$

D. $\frac{4}{3}\sqrt{10} ms^{-1}$

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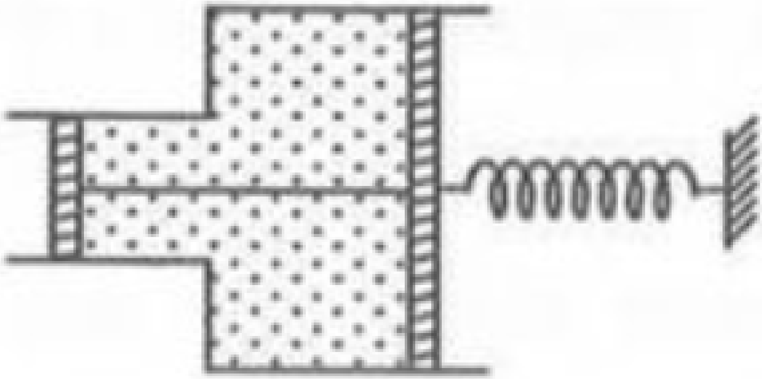
363. A horizontal cylinder has two sections of unequal cross-section, in which two pistons can move freely. The pistons are joined by a string. Some gas is trapped between the pistons . Spring is massless and in natural length. If this gas is heated, the spring will



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A. Compress

B. Elongate

C. Remain at natural length

D. Either (1) or (2) depending on initial pressure

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364. An ideal gas has pressure P, volume V and temperature T. Select the correct option.

A. The translational kinetic energy for monatomic gas is $\frac{3}{2}PV$ but for diatomic gas it is $\frac{5}{2}PV$.

B. The translational kinetic energy for both monatomic and diatomic gas will be same.

C. Average velocity of each molecule of any type of gas will be proportional to sqrt T, where T is absolute temperature.

D. Average energy for one molecule per degree of freedom for monatomic gas is $\frac{1}{2}kT$but that for diatomic it is$2 \cdot \frac{1}{2}kT$.

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365. The mean free path of molecules of an ideal gas of diameter d is proportional to

A. d

B. d^{-1}

C. d^0

D. d^{-2}

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