



PHYSICS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2017

Physics

1. What is the minimum energy required to launch a satellite of mass m from the surface of a planet

of mass M and radius R in a circular orbit at an altitude of $2R$?

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

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

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

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

Answer: A



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2. A mercury drop of radius 1 cm is sprayed into 10^6 drops of equal size. The energy expended in joule is (surface tension of mercury is $(460 \times 10^{-3} N/m)$)

A. 0.057

B. 5.7

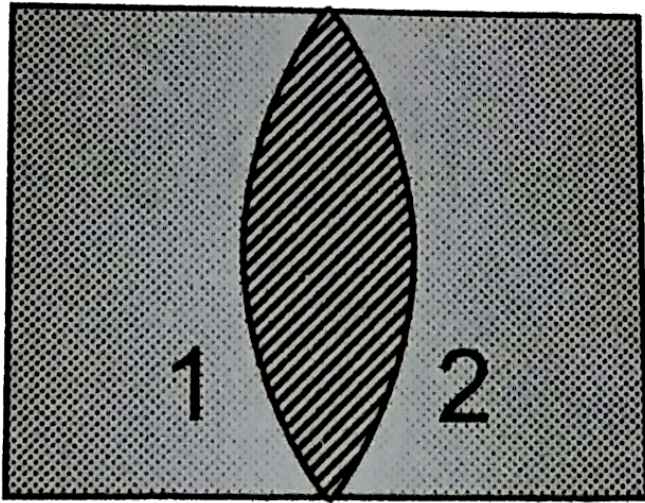
C. 5.7×10^{-4}

D. 5.7×10^{-6}

Answer: A



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3.

Two plano-concave lenses (1 and 2) of glass of refractive index 1.5 have radii of curvature 25 cm and 20 cm. They are placed in contact with their curved surface towards each other and the space between them is filled with liquid of refractive index $\frac{4}{3}$ the the combination is

A. convex lens of focal length 70 cm

B. concave lens of focal length 70 cm

C. concave lens of focal length 66.6 cm

D. convex lens of focal length 66.6 cm

Answer: C



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4. A charged particle moves through a magnetic field perpendicular to its direction. Then

- A. kinetic energy changes but the momentum is constant
- B. the momentum changes but the kinetic energy is constant
- C. both momentum and kinetic energy of the particle are not constant
- D. both momentum and kinetic energy of the particle are constant

Answer: B



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5. After two hours, one-sixteenth of the starting amount of a certain radioactive isotope remained undecayed. The half-life of the isotope is

A. 15 minutes

B. 30 minutes

C. 45 minutes

D. 4 hour

Answer: B



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6. A coil of inductance 300mh and resistance 2Ω is connected to a source of voltage 2V . The current reaches half of its steady state value is

A. 0.1s

B. 0.05s

C. 0.3s

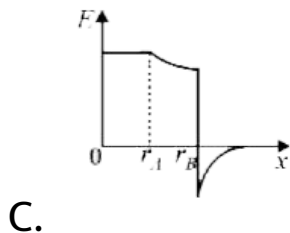
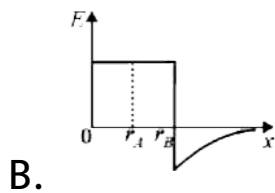
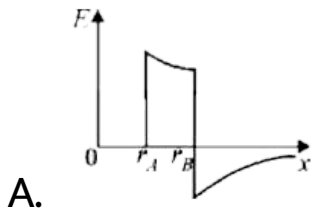
D. 0.15s

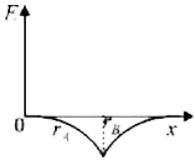
Answer: A



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7. Two concentric conducting thin spherical shells A and B having radii r_A and r_B ($r_B > r_A$) are charged to Q_A and $-Q_B$ ($|Q_B| > |Q_A|$). The electric field strength along a line passing through the centre varies with the distance x as :





D.

Answer: A



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8. A capillary tube of radius R is immersed in water and water rises in it a height H . Mass of water in capillary tube is M . If the radius of the tube is doubled, mass of water that will rise in capillary tube will be

A. M

B. $2M$

C. $M/2$

D. $4M$

Answer: B



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9. A sonometer wire resonates with a given tuning fork forming a standing wave with five antinodes between the two bridges when a mass of 9kg is suspended from the wire. When this mass is replaced by a mass ' M ' kg, the wire

resonates with the same tuning fork forming three antinodes for the same positions of the bridges. Find the value of M .

A. 25 kg

B. 5 kg

C. 12.5 kg

D. $\frac{1}{25}$ kg

Answer: A



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10. When a metal surface is illuminated by light wavelengths 400nm and 250nm , the maximum velocities of the photoelectrons ejected are v and $2v$ respectively . The work function of the metal is
($h =$ Planck's constant, $c =$ velocity of light in air)

A. $2hc \times 10^6 J$

B. $1.5hc \times 10^6 J$

C. $hc \times 10^6 J$

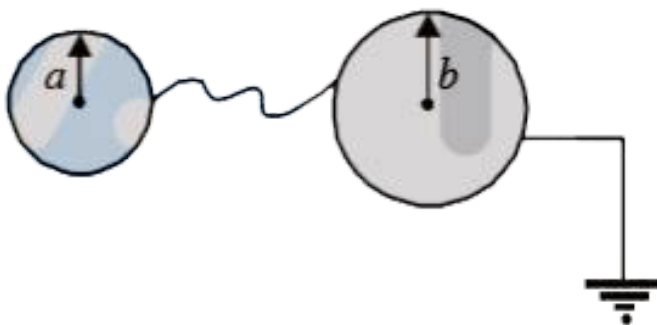
D. $0.5 \times 10^6 J$

Answer: A



11. Two conducting shells of radius a and b are connected by conducting wire as shown in figure.

The capacity of system is :



A. $4\pi\epsilon_0 \frac{ab}{b - a}$

B. $4\pi\epsilon_0(a + b)$

C. zero

D. infinite

Answer: D



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12. When ${}_{92}\text{U}^{235}$ undergoes fission, 0.1 % of its original mass is changed into energy. How much energy is released if 1kg of ${}_{92}\text{U}^{235}$ undergoes fission ?

A. $9 \times 10^{10} \text{ J}$

B. $9 \times 10^{11} \text{ J}$

C. $9 \times 10^{12} J$

D. $9 \times 10^{13} J$

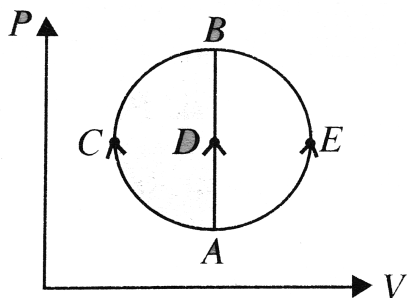
Answer: D



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13. One mole of an ideal gas is taken from state A to state B by three different processes (a) ACB , (b) ADB and (c) AEB as shown in the $P - V$

diagram. The heat absorbed by the gas is



- A. greater in process (ii) than in (i)
- B. the least in process (ii)
- C. the same in (i) and (iii)
- D. less in (iii) than in (ii)

Answer: B



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14. In the formula $X = 3YZ^2$, X and Z have dimensions of capacitance and magnetic induction respectively. The dimensions of Y in MKSQ system are,

A. $[M^{-3}L^{-2}T^{-4}A^{-4}]$

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

C. $[M^{-3}L^{-2}A^4T^9]$

D. $[M^{-3}L^2A^4T^4]$

Answer: C



15. Two very long, straight, parallel wires carry steady currents I_1 & $-I_1$ respectively. The distance between the wires is d . At a certain instant of time, a point charge q is at a point equidistant from the wires, in the plane of the wires. Its instantaneous velocity v is perpendicular to this plane. The magnitude of the force due to the magnetic field acting on the charge at this instant is

A. $\frac{\mu_0 I q v}{2\pi d}$

B. $\frac{\mu_0 I q v}{\pi d}$

C. $\frac{2\mu_0 I q v}{\pi d}$

D. 0

Answer: D



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16. Two projectiles A and B thrown with speeds in the ratio $1 : \sqrt{2}$ acquired the same heights. If A is thrown at an angle of 45° with the horizontal, the angle of projection of B will be

A. 0°

B. 60°

C. 30°

D. 45°

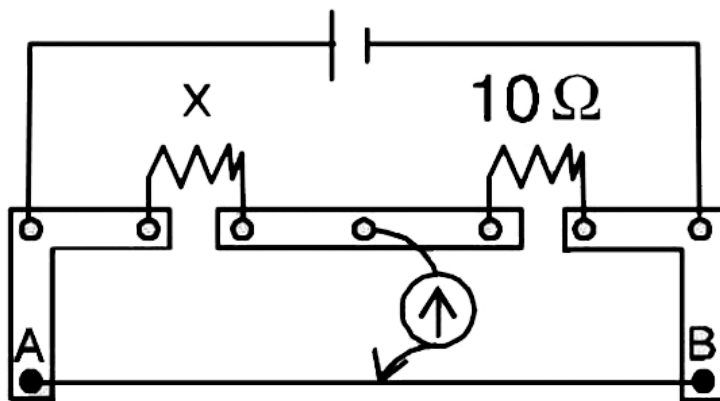
Answer: C



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17. A meter bridge is set up as shown, to determine an unknown resistance X using a standard 10 ohm resistor. The galvanometer

shows null point when tapping -key is at 52 cm mark. The end-corrections are 1 cm and 2 cm respectively for the ends A and B. The determine value of X is



- A. 10.2 ohm
- B. 10.6 ohm
- C. 10.8 ohm

D. 11.1 ohm

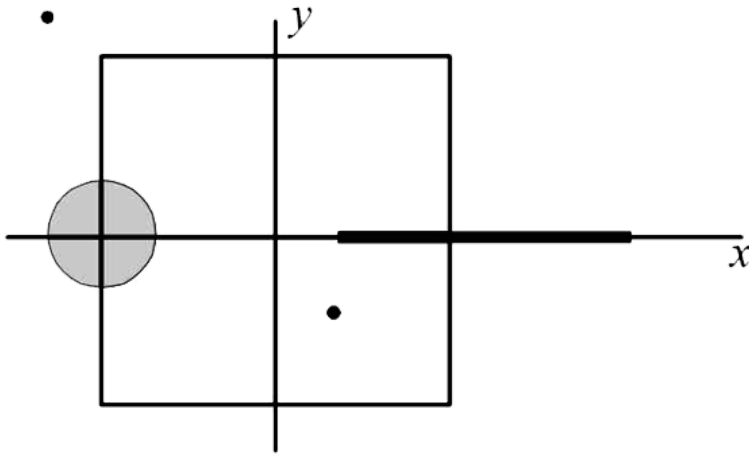
Answer: B



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18. A disc of radius $a/4$ having a uniformly distributed charge $6C$ is placed in the x-y plane with its centre at $(-a/2, 0, 0)$. A rod of length a carrying a uniformly distributed charge $8C$ is placed on the x-axis from $x = a/4$ to $x = 5a/4$. Two point charges $-7C$ and $3C$ are placed at $(a/4, -a/4, 0)$ and $(-3a/4, 3a/4, 0)$,

respectively. Consider a cubical surface formed by six surfaces $x = \pm a/2$, $y = \pm a/2$, $z = \pm a/2$. The electric flux through this cubical surface is



- A. $\frac{-2C}{\epsilon_0}$
- B. $\frac{2C}{\epsilon_0}$
- C. $\frac{10C}{\epsilon_0}$

D. $\frac{12C}{\epsilon_0}$

Answer: A



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19. A particle of mass m moving in the x direction with speed $2v$ is hit by another particle of mass $2m$ moving in the y direction with speed v . If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to :

A. 56 %

B. 62 %

C. 44 %

D. 50 %

Answer: A



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20. A particle of mass m moving in the x direction with speed $2v$ is hit by another particle of mass $2m$ moving in the y direction with speed v . If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to :

- A. development of air current when the plate is placed
- B. induction of electrical charge on the plate
- C. shielding of magnetic lines of force as aluminium is a paramagnetic material.
- D. electromagnetic induction in the aluminium plate giving rise to electromagnetic damping.

Answer: D



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21. Steel wire of length 'L' at $40^\circ C$ is suspended from the ceiling and then a mass 'm' is hung from its free end. The wire is cooled down from $40^\circ C \rightarrow 30^\circ C$ to regain its original length 'L'. The coefficient of linear thermal expansion of the steel is $10^{-5} / ^\circ C$, Young's modulus of steel is $10^{11} N/m^2$ and radius of the wire is 1mm. Assume that $L \gg$ diameter of the wire. Then the value of 'm' in kg is nearly

A. 1

B. 2

C. 3

D. 5

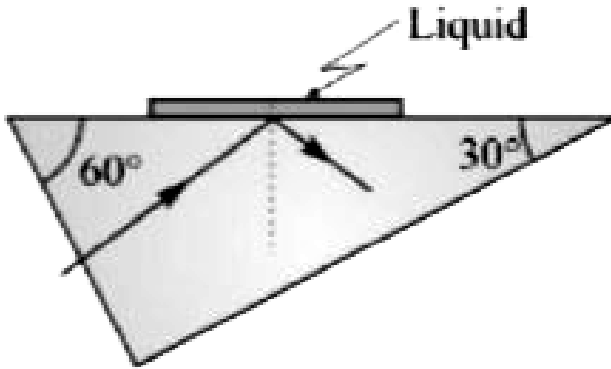
Answer: C



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22. On a hypotenuse of a right prism ($30^\circ - 60^\circ - 90^\circ$) of refractive index 1.50, a drop of liquid is placed as shown in figure. Light is allowed to fall normal on the short face of the prism. In order that the ray of light may get totally reflected, the maximum value of refractive

index is :



A. 1.30

B. 1.47

C. 1.20

D. 1.25

Answer: A



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23. A tuning fork of frequency 392 Hz , resonates with 50 cm length of a string under tension (T). If length of the string is decreased by 2%, keeping the tension constant, the number of beats heard when the string and the tuning fork made to vibrate simultaneously is

A. 4

B. 6

C. 8

D. 12

Answer: C



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24. Hydrogen (H), deuterium (D), singly ionized helium (He^+) and doubly ionized lithium (Li) all have one electron around the nucleus. Consider $n = 2$ to $n = 1$ transition. The wavelength of emitted radiations are $\lambda_1, \lambda_2, \lambda_3$ and λ_4 respectively. then approximately

A. $\lambda_1 = \lambda_2 = 4\lambda_3 = 9\lambda_4$

B. $4\lambda_1 = \lambda_2 = 2\lambda_3 = \lambda_4$

$$C. \lambda_1 = 2\lambda_2 = 2\sqrt{2}\lambda_3 = 3\sqrt{2}\lambda_4$$

$$D. \lambda_1 = \lambda_2 = 2\lambda_3 = 3s\sqrt{2}\lambda_4$$

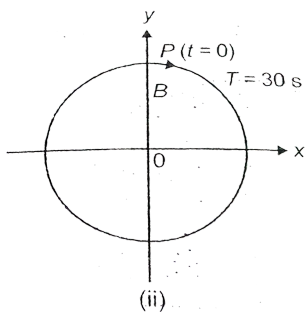
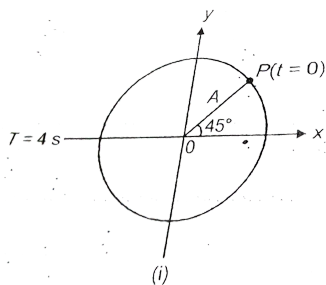
Answer: A



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25. The following figure depicts two circular motions. The radius of the circle, the period of revolution in the initial position and the sense of revolution are indicated on the figure. Obtain the simple harmonic motion of the x-projection of the radius vector of the rotating particle P in each

case.



A. $x(t) = a \cos\left(\frac{2\pi t}{4} + \frac{\pi}{4}\right)$

B. $x(t) = a \cos\left(\frac{\pi t}{4} + \frac{\pi}{4}\right)$

C. $x(t) = a \sin\left(\frac{2\pi t}{4} + \frac{\pi}{4}\right)$

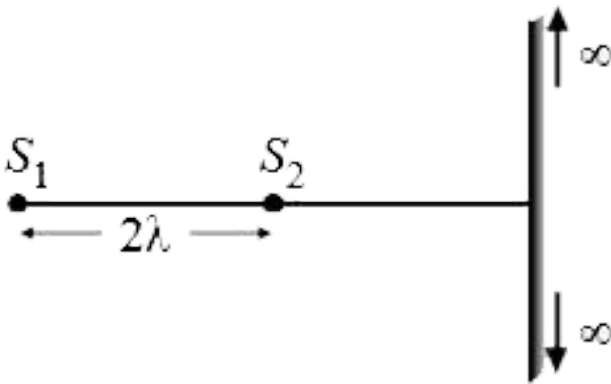
D. $x(t) = a \cos\left(\frac{\pi t}{3} + \frac{\pi}{2}\right)$

Answer: A



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26. There are two sources kept at distances 2λ . A large screen is perpendicular to line joining the sources. Number of maximas on the screen in this case is ($\lambda =$ wavelength of light)



A. 1

B. 3

C. 5

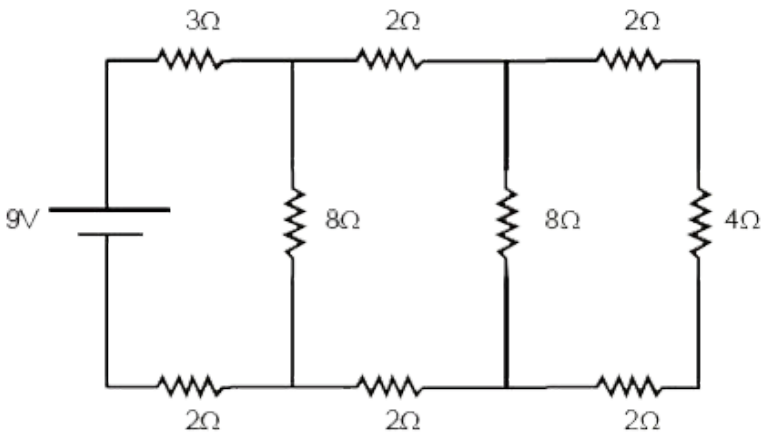
D.7

Answer: B



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27. In the circuit shown in figure the current through



A. the 3ω resistor is 0.50 A

B. the 3ω resistor is 0.25 A

C. the 4ω resistor is 0.50 A

D. the 4ω resistor is 0.25 A

Answer:



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28. A telescope has an objective lens of 10 cm diameter and is situated at a distance of one kilometre from two objects. The minimum

distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is 5000\AA , of the order of

A. 5 cm

B. 0.5cm

C. 5 cm

D. 5 mm

Answer: D



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29. During vapourisation

I. change of state from liquid to vapour state occurs.

II. temperature remains constant.

III. both liquid and vapour states coexist in equilibrium.

IV. specific heat of substance increases. Correct statements are

A. I, II and IV

B. II, III and IV

C. I, III and IV

D. I , II and III

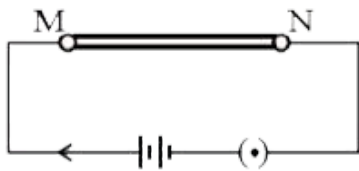
Answer: D



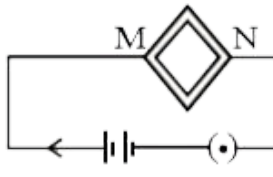
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30. A wire is connected to a battery between the point M and N as shown in the figure (1). The same wire is bent in the form of a square and then connected to the battery between the points M and N as shown in the figure (2). Which

of the following quantities increases ?



(1)



(2)

- A. Heat produced in the wire and resistance offered by the wire.
- B. Resistance offered by the wire and current through the wire.
- C. Heat produced in the wire, resistance offered by the wire and current through the wire.

D. Heat produced in the wire and current through the wire

Answer: D



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31. A body moves in a circular orbit of radius R under the action of a central force. Potential due to the central force is given by $V(r) = kr$ (k is a positive constant). Period of revolution of the body is proportional to-

A. $R^{1/2}$

B. $R^{-1/2}$

C. $R^{-3/2}$

D. $R^{-5/2}$

Answer: A



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32. Two identical heavy spheres of equal mass are placed on a smooth cup of radius $3r$ where r is radius of each sphere. Then the ratio of reaction

force between cup and any sphere to reaction

force between two sphere is

A. 1

B. 2

C. 3

D. 4

Answer: B



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33. A long, hollow conducting cylinder is kept coaxially inside another long, hollow conducting cylinder of larger radius. Both the cylinders are initially electrically neutral.

A. A potential difference appears between the two cylinders when a charge density is given to the inner cylinder.

B. A potential difference appears between two cylinders when a charge density is given to the outer cylinder

C. No potential difference appears between the two cylinders when a uniform line charge is kept along the axis of the cylinders.

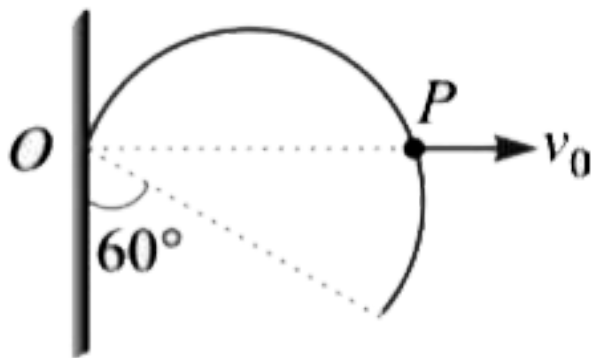
D. No potential difference appears between the two cylinders when same charge density is given to both the cylinders

Answer: A



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34. A thin but rigid semicircular wire frame of radius r is hinged at O and can rotate in its own vertical plane. A smooth peg P starts from O and moves horizontally with constant speed v_0 , lifting the frame upward as shown in figure



Find the angular velocity ω of the frame when its diameter makes an angle of 60° with the vertical :

A. v_0 / r

B. $v_2 / 2r$

C. $2v_2 / r$

D. $v_0 r$

Answer: A



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35. Given that $A + B = R$ and $A = B = R$. What should be the angle between A and B ?

A. 0

B. $\pi / 3$

C. $2\pi / 3$

D. π

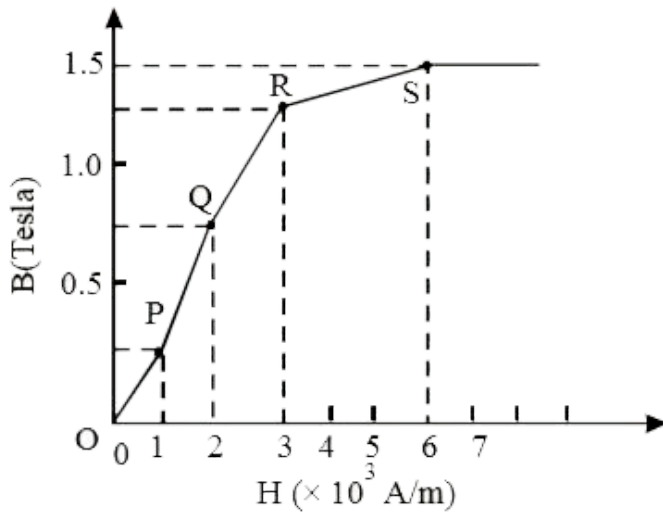
Answer: C



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36. The basic magnetization curve for a ferromagnetic material is shown in figure. Then, the value of relative permeability is highest for

the point



A. P

B. Q

C. R

D. S

Answer: B



37. Five gas molecules chosen at random are found to have speeds of 500,600,700,800 and 900 m/s Then,

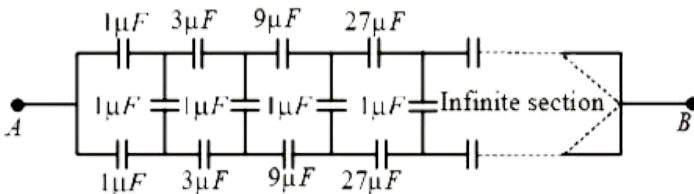
- A. The root mean square speed and the average speed are the same.
- B. The root mean square speed is 14 m/s higher than the average speed.
- C. The root mean square speed is 14 m/s lower than the average speed.

D. The root mean square speed is $\sqrt{14}$ m/s
higher than the average speed.

Answer: B

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38. What is equivalent capacitance of circuit between points A and B?



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

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

C. Infinite

D. $(1 + \sqrt{3})\mu F$

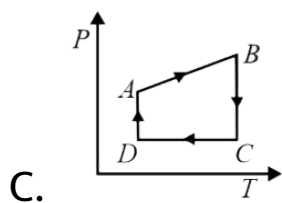
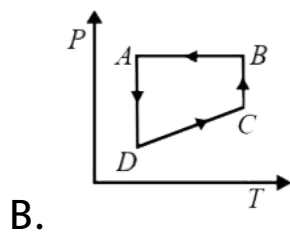
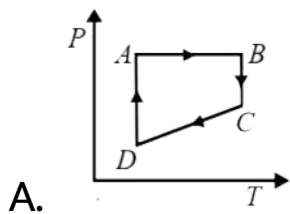
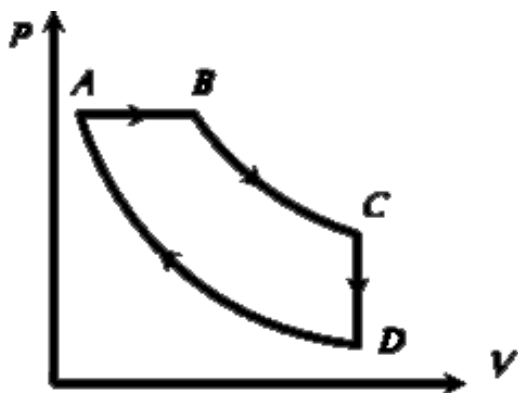
Answer: B

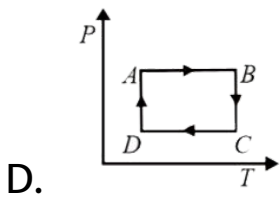


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39. A cyclic process ABCD is shown in the figure P - V diagram. Which of the following curves

represent the same process

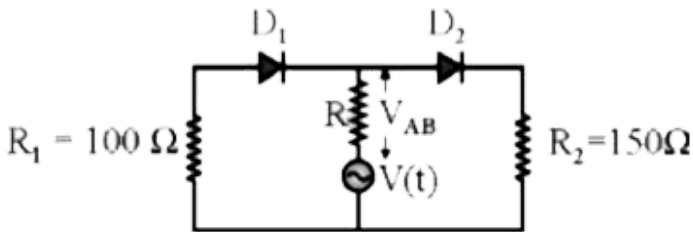




Answer: A

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40. In the circuit given below, $V(t)$ is the sinusoidal voltage source, voltage drop $V_{AB}(t)$ across the resistance R is



A. is half wave rectified

B. is full wave rectified

C. has the same peak value in the positive and
negative half cycles

D. has different peak values during positive
and negative half cycle

Answer: D



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