PHYSICS

RESONANCE ENGLISH

FULL TEST 3

Exercise

1. One mole of an ideal monoatomic gas is mixed with one mole of an equimolar mixture

of monoatomic and diatomic ideal gases. Find the value of $\lambda = \left(\frac{C_P}{C_v}\right)$ for the final mixture

A. $\frac{8}{7}$

B. $\frac{19}{12}$

C. $\frac{11}{7}$

D. $\frac{8}{5}$

Answer: C

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2. A body covers first $\frac{1}{3}$ part of its journey with a velocity of $2m/s$, next $\frac{1}{3}$ part with a velocity of $\frac{3m}{s}$ and rest of the journey with a velocity $6m/s$. The average velocity of the body will be

A. 3m/s

B. 11/3 m/s

C. 8/3 m/s

D. 4/3 m/s

Answer: A

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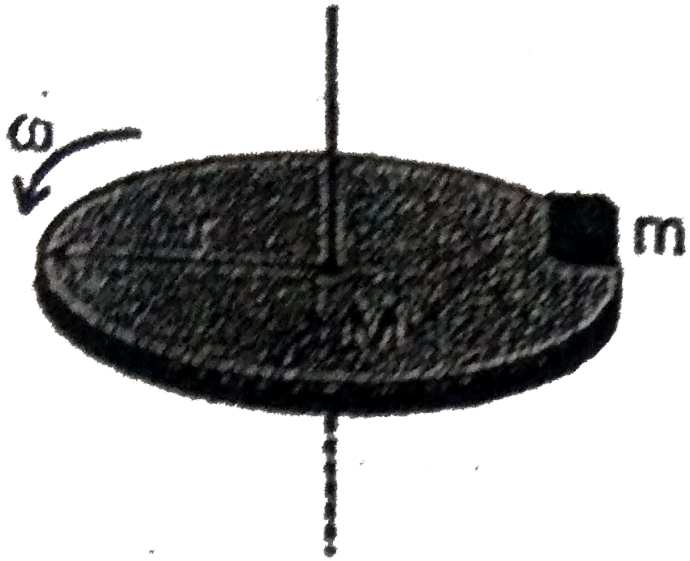
3. A smoothh disc is rotating with uniform angular speed ω about a fixed vertical axis passing through its centre and normal to its plane as shown. A small block of mass m is gently placed at the periphery of the disc. Then (pickup the correct alternative or

alternatives)



A. In comparision to ω the angular speed of the disc now increases

B. in comparision to ω the angular speed of the disc now decreases

C. in comparision to ω the angular speed of the disc now remains same

D. the block will move tangentially and fall of the disc.

Answer: B

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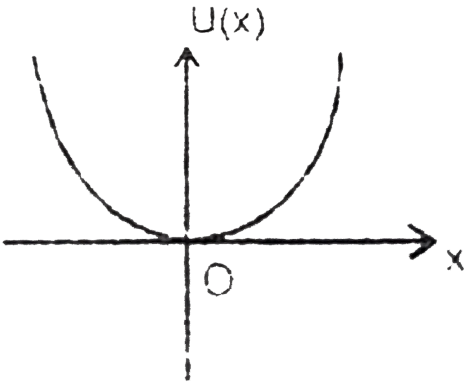
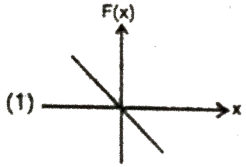
4. Figure shows a plot of potential energy function $U(x) = kx^2$ where x = displacement and k= constant, Identify the correct

conservative force function $F(x)$

where function



A.



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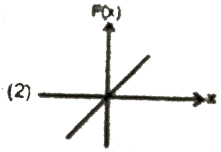

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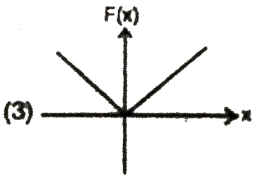
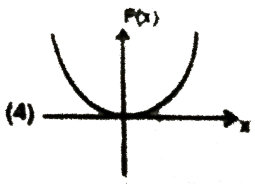


D. 

Answer: A

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5. A girl throws a ball with initial velocity v at an inclination of 45°. The ball strikes a smooth vertical wall at a horizontal distance d from the girl and after rebounding returns to her hand. What is the coefficient restitution between the all and the ball ?

A. $\frac{v^2 - gd}{gd}$

B. $\frac{gd}{v^2 - gd}$

C. $\frac{gd}{v^2}$

D. $\frac{v^2}{gd}$

Answer: B

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6. A 40 cm wire having a mass of 3.2 g is stretched between two fixed supports 40.05 cm apart. In its fundamental mode, the wire

vibrates at 220 Hz. If the area of cross section of the wire is $1.0mm^2$, find its Young modulus.

A. $1.98 \times 10^{11} N/m^2$

B. $2.2 \times 10^{11} N/m^2$

C. $3.96 \times 10^{11} N/m^2$

D. $3.2 \times 10^{11} N/m^2$

Answer: A

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7. A body is executing simple harmonic motion. At a displacement x, its potential energy is E_1 and a displacement y, its potential energy is E_2. The potential energy E at a displacement (x+y) is

A. $E_1 + E_2$

B. $\sqrt{E_1^2 + E_2^2}$

C. $E_1 + E_2 + 2\sqrt{E_1 E_2}$

D. $\sqrt{E_1 E_2}$

Answer: C

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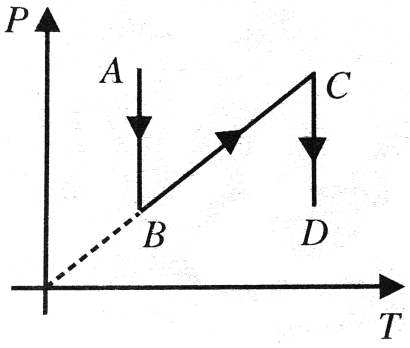
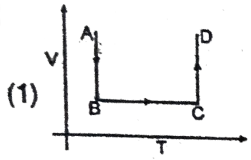
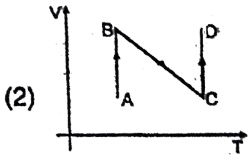
8. $P - T$ diagram is shown in Fig. Choose the corresponding $V - T$ diagram.



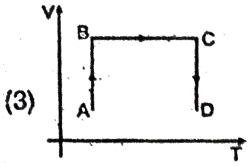
A.



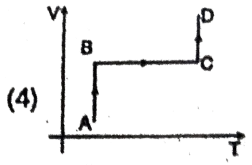
B. (2)



C. (3)



D. (4)



Answer: D

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9. An ice block at $0^{\circ}C$ and of mass m is dropped from height $'h'$ such that the loss in

gravitational potential energy of block is exactly equal to the heat required to just completely melt the ice. Taking latent heat of fusion of ice $= 80cal/gm$, acceleration due to gravity $= 10m/s^2$ and mechanical equivalent of heat $= 4.2J/Cal.$ the value of $'h'$ is

A. 8m

B. 8 km

C. 33.6 m

D. 33.6 km

Answer: D

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10. The length of two metallic rods at temperatures θ are L_A and L_B and their linear coefficient of expansion are α_A and α_B respectively. If the difference in their lengths is to remian constant at any temperature then

A. $L_A / L_B = \alpha_A / \alpha_B$

B. $L_A / L_B = \alpha_B / \alpha_A$

C. $\alpha_A = \alpha_B$

D. $\alpha_A \alpha_B = 1$

Answer: B

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11. A ball is suspended from the top of a cart by a light string of length 1.0 m. The cart and the ball are initially moving to the right at constant speed V, as shown in figure I. The cart comes to rest after colliding and sticking to a

fixed bumper, as in figure II. The suspended ball swings through a maximum angle 60°. The initial speed V is (take $g = 10m/s^2$) (neglect friction)

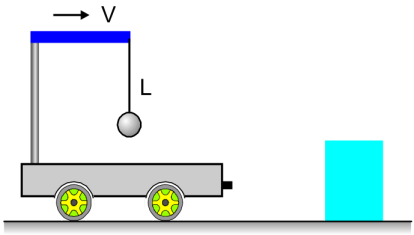

Figure (1) Bumper

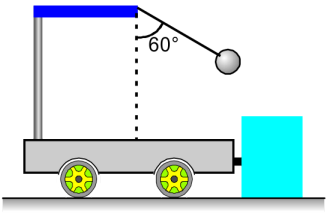

Figure (2) Bumper

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

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

C. $5\sqrt{2}m/s$

D. 4m/s

Answer: A

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12. When an explosive shell travelling in a parabolic path under the effect of gravity explodes in the mid air, the centre of mass of the fragments will move

A. Move vertically upwards and then downwards

B. Move vertically downwards

C. Move in irregular path

D. Move in the parabolic path which the unexploded bomb would have travelled.

Answer: D

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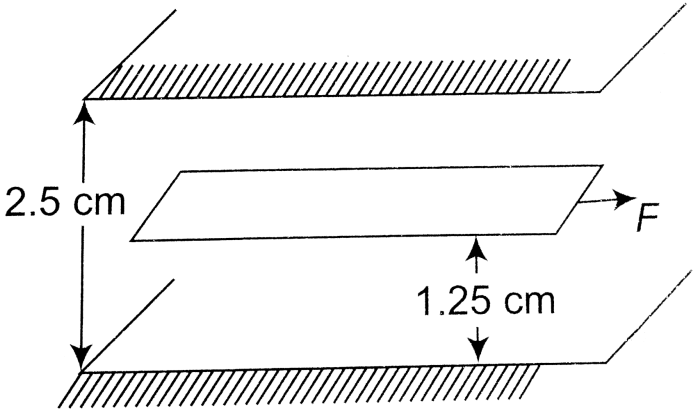
13.



A space $2.5cm$ wide between two large plane surfaces is filled with oil. Force required to drag a very thin plate of area $0.5m^2$ just midway the surfaces at a speed of $0.5\frac{m}{\text{sec}}$ is $1N$. The coefficient of viscosity in $kg - \frac{s}{m^2}$ is:

A. 5×10^{-2}

B. 2.5×10^{-2}

C. 1×10^{-2}

D. 7.5×10^{-2}

Answer: B

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14. Two identical samples (same material and same amount) P and Q of a radioactive substance having mean life T are observed to have activities R_p and R_Q respectively, at the

time of observation. If P is older than Q, Then the difference in their age is

A. $T \ln\left(\frac{A_p}{A_Q}\right)$

B. $T \ln\left(\frac{A_Q}{A_P}\right)$

C. $\frac{1}{T} \ln\left(\frac{A_P}{A_Q}\right)$

D. $T\left(\frac{A_P}{A_Q}\right)$

Answer: B

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15. Two walls of thickness d_1 and d_2 and thermal conductivites K_1 and K_2 are in contact. In the steady state, if the temperature at the outer surfaces are T_1 and T_2 the temperature at the common wall is

A. $\dfrac{K_1\theta_1 d_1 + K_2\theta_2 d_2}{K_1 d_1 + K_2 d_2}$

B. $\dfrac{K_1\theta_1 + K_2\theta_2}{K_1 + K_2}$

C. $\dfrac{K_1\theta_1 + K_2\theta_2}{\theta_1 + \theta_2}$

D. $\dfrac{K_1\theta_1 d_2 + K_2\theta_2 d_1}{K_1 d_2 + K_2 d_1}$

Answer: D

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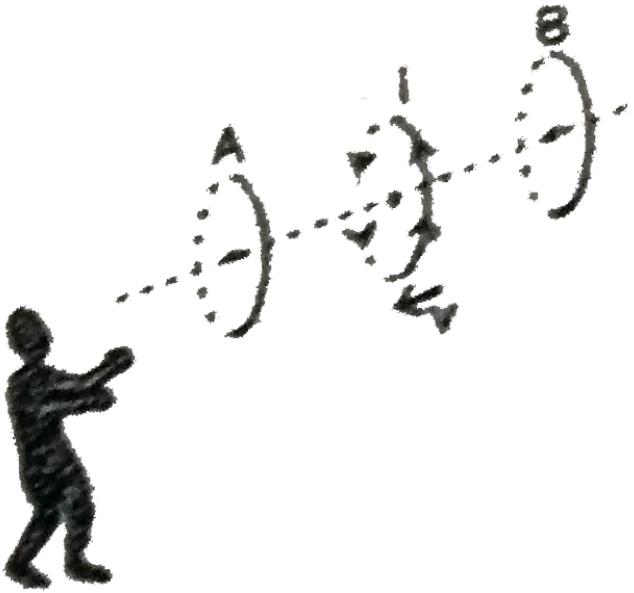
16. Three coaxial circular wire loops and a stationary observer are positioned as shown in figure. From the observers point of veiw, a current I flows counter clockwise in the middle loop, which is moving towards the observer with a velocity v. Loops A and B are stationary.

This same observer would notice that.



A. Clockwise currents are induced in loops A and B

B. Counter clockwise currents are induced in loops A and B

C. A clockwise currents is induced in loop A, but a counter clockwise current is induced in loop B

D. A Counter clockwise current is induced in loop A , but a clockwise current is induced in loop B

Answer: C

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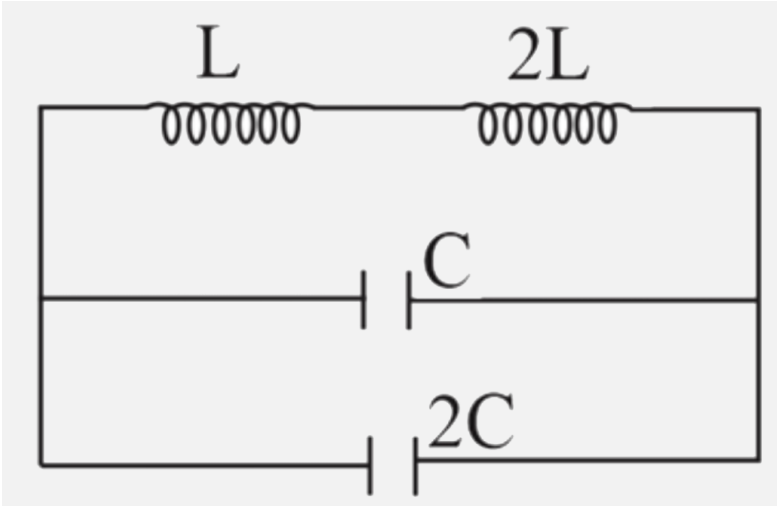
17. The frequency of oscillation of current in the inductor is -



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

B. $\frac{1}{6\pi\sqrt{LC}}$

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

D. $\frac{1}{2\pi\sqrt{LC}}$

Answer: B

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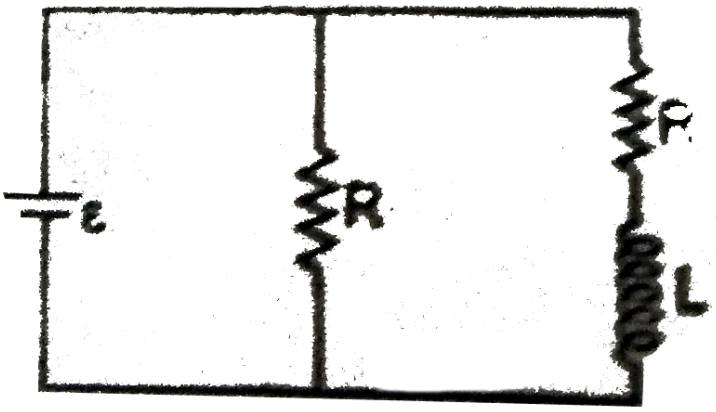
18. In the circuit diagram shown



A. time constant is L/R

B. time constant is 2L/R

C. steady state current in inductor is $2\varepsilon / R$

D. steady state current in inductor is $\varepsilon / 2R$

Answer: A

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19. Find the effective value of current.

$i = 2\sin 100(\pi)t + 2\cos(100\pi t + 30^\circ).$

A. $\sqrt{2}A$

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

C. 4

D. $2\sqrt{2}A$

Answer: A

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20. The electric intesity E, current density j and conductivity σ are related as:

A. $J = E/\sigma$

B. $J = \sigma / E$

C. $J = \sigma^2 E$

D. $E = \sigma^2 J$

Answer: B

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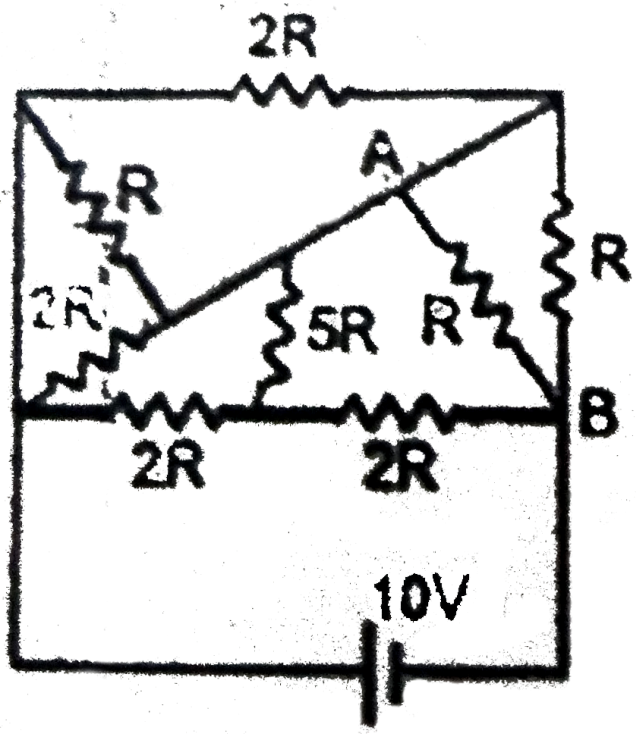
21. In the given electrical circuit, the potential difference between point A and B is (assume the battery is ideal and the conducting wires

have almost zero resistance):



A. 5V

B. 10V

C. 25V

D. 70V

Answer: A

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22. Which of the following is (are) correct? .

A. The image and object are never on opposite side of focus in a spherical mirror

B. A virtual image must be erect

C. An image formed in a plane mirror must have same speed as the object has

D. Laws of reflection are not same for all wave lengths

Answer: A

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23. A point source of light is used in a photoelectric effect. If the source is moved

farther from the emitted metal, the stopping potential

A. will increases

B. will decreases

C. will remains constant

D. will either increases or decreases

Answer: C

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24. The distance of n^{th} bright fringe to the $(n+1)^{th}$ dark fringe in Young's experiment is equal to:

A. $\frac{n\lambda D}{d}$

B. $\frac{n\lambda D}{2d}$

C. $\frac{\lambda D}{2d}$

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

Answer: C

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25. The escape velocity of a sphere of mass m is given by (G= univesal gravitational constant, $M_e =$ mass of the earth and $R_e =$ radius of the earth)

A. $\sqrt{\frac{2GM}{R}}$

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

C. $\sqrt{\frac{2GMm}{R}}$

D. $\sqrt{\frac{GM}{R}}$

Answer: A

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26. A uniform electric field in positive x-direction on exists in space. An uncharged solid conducting sphere is now placed in region of this uniform electric field. The centre of this sphere of radius R lies at origin. Then electric potential at any point on $y - z$ plane (i.e. $x = 0$ plane) due to only induced charged on surface of sphere.

A. will be positive

B. will be negative

C. will be zero

D. may be positive, zero or negative

Answer: C

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27. An electron is revolving around a proton. The total work done in one revolution by electric force on the electron will be zero if the trajectory of the electron is

A. circulary only

B. elliptical only

C. any closed curve

D. not posssible

Answer: C

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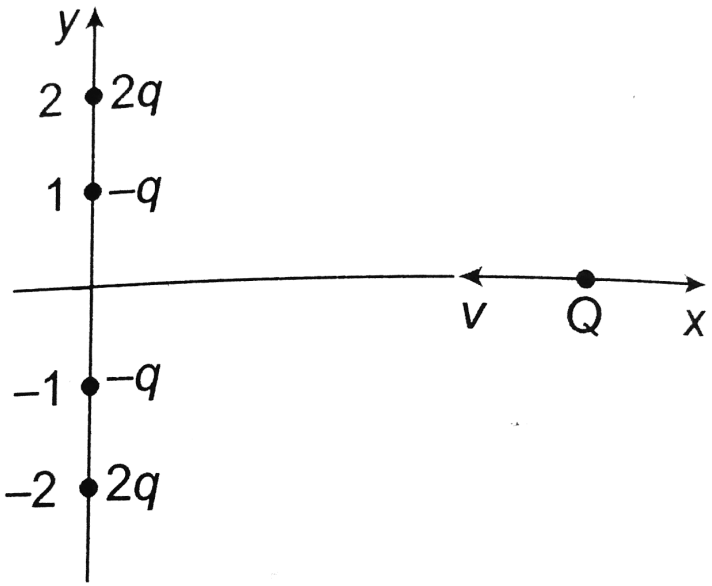
28. Four charges are rigidly fixed along the Y-axis as shown. A positive charge approches the system along the Xaxis with initial speed just

enough to cross the origin. Then its total energy at the origin is



A. zero

B. positive

C. negative

D. data insufficient

Answer: C

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29. Assertion: Capacity of a parallel plate capacitor increases when distance between the plates is decreased.

Reason : Capacitance of capacitor is inversely proporational to distance between them.

A. chances of electrical break down will increases if potential difference between

the plates is kept constant.

B. chance of electrical break down will decreases if potential difference between the plates is kept constant.

C. chance of electric break down will increases if charge on the plates is kept constant

D. chance of electrical break down will decrease if charge on the plate is kept constant.

Answer: A

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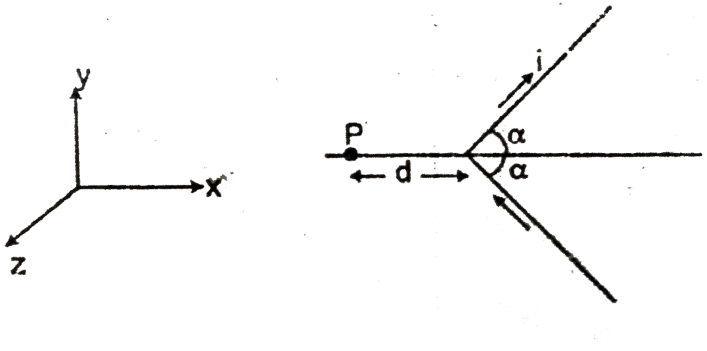
30. The direction of the field B at P is



the V shaped wire is in x-y plane

A. along +x -axis

B. along +z-axis

C. along (-x)-axis

D. along +y axis

Answer: B

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