PHYSICS

51. A proton moving with a constant velocity passes through a region of space without any change in its velocity. If E and B represent the electric and magnetic fields respectively this region of space may have

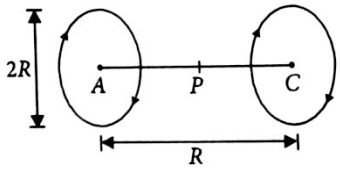
(1) $E = 0, B = 0$ (2) $E = 0, B \neq 0$

(3) $E \neq 0, B = 0$ (4) $E \neq 0, B \neq 0$

(1) (1), (3) (2) (2), (3)

(3) (4), (3) (4) (1), (2), (4)

52. A Helmholtz coil has a pair of loops, each with N turns and radius R. They are placed coaxially at distance R and the same current I flows through the loops in the same direction. The magnitude of magnetic field at P, midway between the centres A and C, is given by[Refer to given figure]

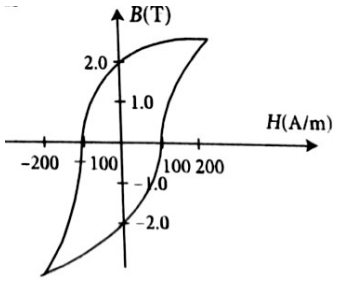


(1) $\frac{4N\mu_0 I}{5^{\frac{1}{2}}R}$ (2) $\frac{4N\mu_0 I}{5^{\frac{3}{2}}R}$

(3) $\frac{8N\mu_0 I}{5^{\frac{3}{2}}R}$ (4) $\frac{8N\mu_0 I}{5^{\frac{1}{2}}R}$

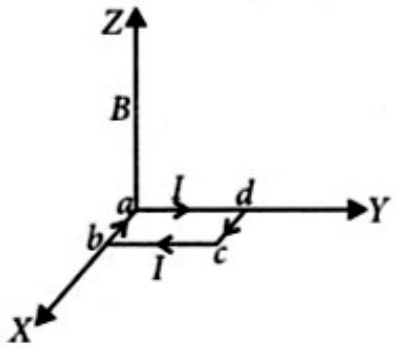
53. The B-H curve for a ferromagnet is shown in the figure. The ferromagnet is placed inside a long solenoid with 1000 turns cm^{-1}. The current that should be passed in the solenoid to demagnetise the ferromagnet completely is

(1) 1 mA
(2) 20 μA
(3) 2 mA
(4) 40 μA

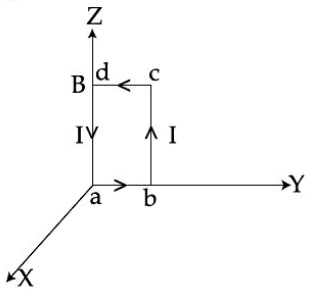


54. A uniform magnetic field B of 0.3 T is along the positive Z-direction. A rectangular loop (abcd) of sides 10 cm × 5 cm carries a current I of 12 A. Out of the following different orientations which one corresponds to stable equilibrium?

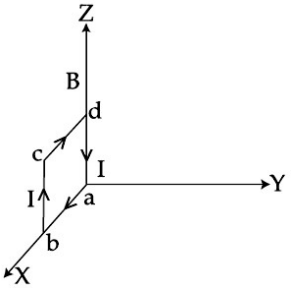
(1)



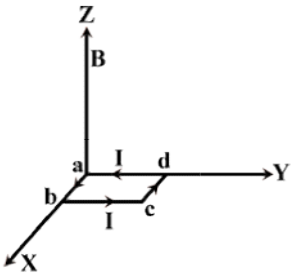
(2)



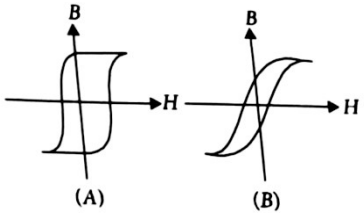
(3)



(4)



55. Hysteresis loops for o magnetic materials A and B are given below



These materials are used to make magnets for electric generators, transformer core and electromagnet core.

Then it is proper to use

(1) A for electric generators and transformers.

(2) A for electromagnets and B for electric generators.

(3) A for transformers and B for electric generators.

(4) B for electromagnets and transformers.

56. A horizontal overhead power line is at a height of 4 m from the ground and carries a current of 100 A from east to west. The magnetic field directly below it on the ground is ($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 2.5×10^{-7} T northward

(2) 2.5×10^{-7} T southward

(3) 5×10^{-6} T northward

(4) 5×10^{-6} T southward

57. A charged particle with charge q enters a region of constant, uniform and mutually orthogonal fields $\vec{E}$ and $\vec{B}$ with a velocity $\vec{v}$ perpendicular to both $\vec{E}$ and $\vec{B}$, and comes out without any change in magnitude or direction of $\vec{v}$. Then

(1) $\vec{v} = \vec{B} \times \frac{\vec{E}}{E^2}$ (2) $\vec{v} = \frac{\vec{E} \times \vec{B}}{B^2}$

(3) $\vec{v} = \frac{\vec{B} \times \vec{E}}{B^2}$ (4) $\vec{v} = \frac{\vec{E} \times \vec{B}}{E^2}$

58. A charged particle of mass m and charge q travels on a circular path of radius r that is perpendicular to a magnetic field B. The time taken by the particle to complete one revolution is

(1) $\frac{2\pi qB}{m}$ (2) $\frac{2\pi m}{qB}$

(3) $\frac{2\pi mq}{B}$ (4) $\frac{2\pi mq}{qB}$

59. Two thin long, parallel wires, separated by a distance d carry a current of i A in the same direction. They will

(1) attract each other with a force of $\frac{\mu_0 i^2}{(2\pi d^2)}$

(2) repel each other with a force of $\frac{\mu_0 i^2}{(2\pi d^2)}$

(3) attract each other with a force of $\frac{\mu_0 i^2}{(2\pi d)}$

(4) repel each other with a force of $\frac{\mu_0 i^2}{(2\pi d)}$

60. Two point charges A and B, having charges +Q and –Q respectively, are placed at certain distance apart and force acting between them is F. If 25% charge of A is transferred to B, then force between the charges becomes

(1) F (2) $\frac{9F}{16}$

(3) $\frac{16F}{9}$ (4) $\frac{4F}{3}$