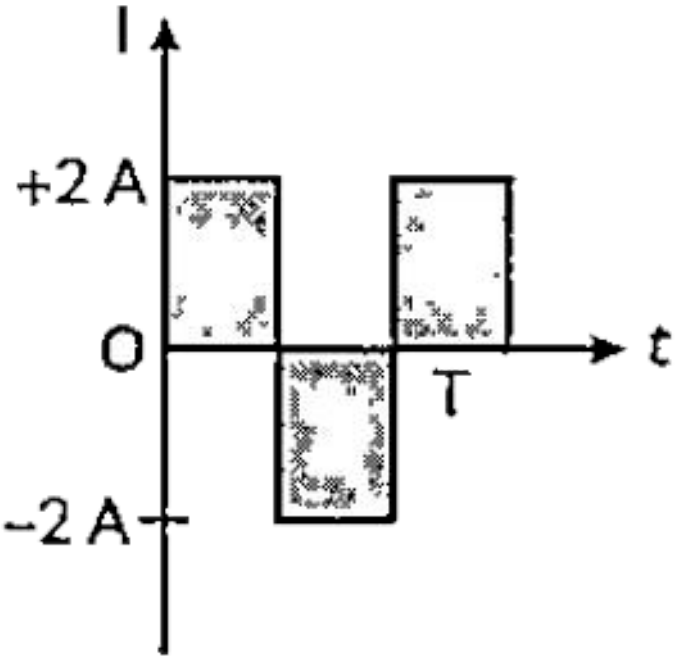
PHYSICS

BOOKS - EDUCART PUBLICATION

SAMPLE PAPER 04 (SOLVED)

Section A

1. The rms value of ac is given by:



A. $1A$

B. $2A$

C. $3A$

D. $4A$

Answer: B

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2. Principle of working of a transformer is:

A. Self-Inductance only

B. Mutual inductance

C. Electrical

D. Both (b) and (c)

Answer: B

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3. The phase angle between current and voltage in a purely inductive circuit is

A. Current lags behind emf by an angle of $\frac{\pi}{2}$

B. Current lags behind emf by an angle of π

C. Current Leads the applied emf by an angle of $\frac{\pi}{2}$

D. Current and applied emf are in same phase.

Answer: B

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4. The magnetic flux linked with square shaped coil of area $10^{-2}m^2$ perpendicular to a magnetic field of 10^3T:

A. 10 Wb

B. 5 Wb

C. 10^5 Wb

D. 10^{-5} wb

Answer: A

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5. An e.m.f. is produced in a coil, which is not connected to an external voltage source. This can be due to

A. The coil being in a time varying magnetic field

B. The coil moving in a constant magnetic field

C. The coil moving in a time varying magnetic field

D. All of the above

Answer: D

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6. Find the inductance of a coil of 100 turns carrying 5 mA producing a magnetic flux of 10^{-5} Wb:

A. 0.02 mH

B. 0.2 mA

C. 2.0 mH

D. 0.08 mH

Answer: A

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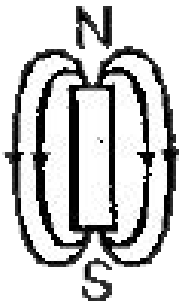
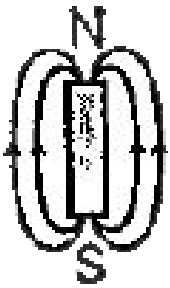
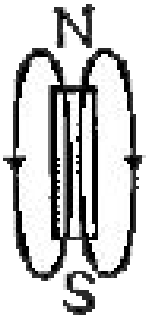
7. Correct representation of magnetic field lines are:

A. 

B. 

C.



D.

Answer: B

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8. At a certain $B_H = \frac{1}{\sqrt{3}} B_v$, dip angle is:

A. 30°

B. 45°

C. 60°

D. 90°

Answer: B

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9. An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?

A. The electron will experience a force at 45° to the axis and hence execute a heli cal path

B. The electron will accelerate along the axis

C. The electron will continue to move with uniform velocity along the axis of the so

lenoid

D. The electron will be circular about the axis.

Answer: C

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10. Work done by a magnetic field on moving charge is:

A. 1

B. 0

C. infinite

D. Magnetic field is 'independent of charge

Answer: B

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11. MAGNETIC FIELD OF A TOROID

A. $B = \frac{\mu_0 NI}{2\pi r}$

B. $B = \mu_0 nl$

C. $B = \mu_0 \frac{l}{n}$

D. $B = \frac{\mu_0 l}{2r}$

Answer: A

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12. The expression of figure of merit of a galvanometer is given by:

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

B. $\frac{NK}{BA}$

C. $\frac{k}{NBA}$

D. $\frac{kB}{NA}$

Answer: C

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13. At temperature T and potential difference V, the drift velocity of electrons is proportional to:

A. $\sqrt{v}$

B. $\sqrt{T}$

C. V

D. T

Answer: C

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14. A sensitive galvonometer:

A. produces less deflection

B. produces more deflection

C. does not produce any deflection

D. increase resistance

Answer: B

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15. If all four resistance and resistance of a galvanometer are equal to R with equal resistance of wheatstone bridge, then equivalent resistance is:

A. R

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

C. 2R

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

Answer: A

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16. Electromotive force is a:

A. potential

B. non-contact

C. P.D.

D. contact

Answer: C

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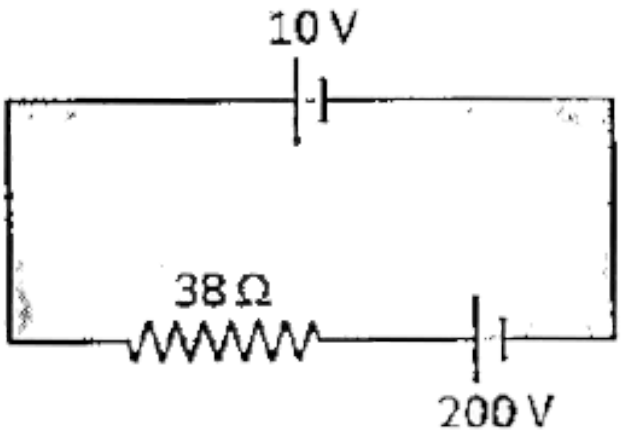
17. Value of current in given circuit is:



A. 50 A

B. 380 A

C. $\frac{210}{38}A$

D. $5A$

Answer: D

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18. Angle between $\vec{E}$ and equipotential surface is always

A. 0° to 180°

B. 0° to 90°

C. 0° always

D. 90° always

Answer: D

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19. Where does the energy of a capacitor reside ?

A. On plate

B. On plate

C. Between plates A and B

D. Outside plates A and B

Answer: C

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20. n equally spaced plates are stacked to make a parallel plate capacitor. If-C is the POLES, capacitance between two adjacent plates, the resultant capacitance is :

A. nC

B. n^2C

C. $(n-1)C$

D. $\frac{C}{n}$

Answer: C

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21. Equipotentials at a great distance from a collection of charges whose total sum is not zero are approximately

A. Ellipsoids

B. Planes

C. Spheres

D. Paraboloids

Answer: C

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22. When we bring two electrons close to each other, the electrostatic potential energy of the system:

A. Increases

B. Becomes zero

C. Remains unchanged

D. Decreases

Answer: A

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23. If two charged spheres are immersed in a liquid of dielectric constant 2, how will the force between them vary?

A. F

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

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

D. 2 F

Answer: C

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24. Maximum torque on a dipole in electric field is given by:

A. pE

B. $\frac{P}{E}$

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

D. $\vec{P} . \vec{E}$

Answer: A

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25. What is the electric flux if a charge is placed in one corner of a Cube of length l :

A. $\frac{q}{\varepsilon_0}$

B. $\frac{q}{8\varepsilon_0}$

C. $\frac{ql}{6\varepsilon_0}$

D. $\frac{ql}{3\varepsilon_0}$

Answer: A

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Section B

1. In a purely capacitive ac circuit, the value of current is:

A. $i_m \sin\left(\omega t + \frac{\pi}{4}\right)$

B. $i_m \cos\left(\omega t + \frac{\pi}{2}\right)$

C. $i_m \sin\left(\omega t + \frac{\pi}{2}\right)$

D. $i_m \cos\left(\omega t + \frac{\pi}{4}\right)$

Answer: C

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2. What is the rms current through bulb rated 100 W for 220 V ac supply of 50 Hz?

A. 0.1 A

B. 50 A

C. 0.9 A

D. 0.45 A

Answer: D

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3. Horizontal straight wire of 10 m extending from East to West is falling with the speed of 5 m/s at 90° to the horizontal component of Earth's magnetic field of 0.30×10^{-4} Wb m 2 The instantaneous emf is:

A. 1.5×10^{-6} V

B. 1.5×10^{-4} V

C. 1.5×10^{-3} V

D. 3×10^{-3} V

Answer: C

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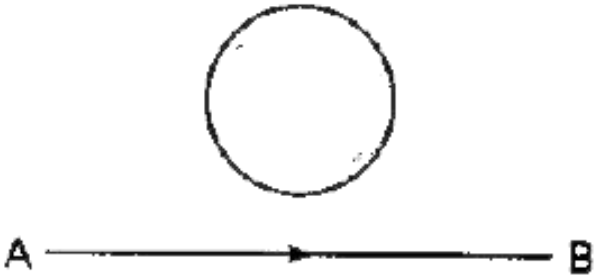
4. Current induced in the given loop due to wire AB is:



.

A. clockwise

B. anticlockwise

C. both (a) and (b)

D. scattered

Answer: A

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5. Square of A meters in an X-Y plane is under magnetic field of B = $\left(B_0, 2\hat{i} + 3\hat{j} + 4\hat{k}\right)T$. The magnitude of flux is given by? B_0 = constant

A. $\sqrt{29}B_0A^2$ Wb

B. $2B_0A^2$ Wb

C. $4B_0A^2$ Wb

D. $3B_0A^2wb$

Answer: C

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6. Two loops in a uniform magnetic field are perpendicular to it. One is at rest and other is in motion. In which of the loop emf is induced:

A. rest loop

B. motional loop

C. both (a) and (b)

D. emf cannot be induced in loops with uni

form magnetic field

Answer: B

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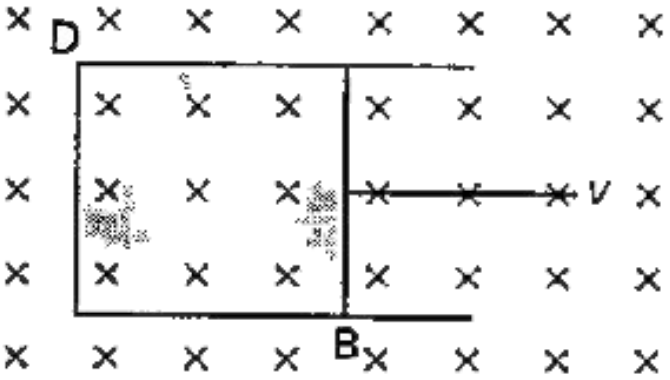
7. A rectangular Loop ABCD with movable arm AB of length 10 cm and resistance 2 Ω is placed in a uniform magnetic field of 0-1 T. The field is perpendicular to the plane of the loop. The resistance of arms CB, BA and CD is negligible.



EMF induced in arm AB is given by:

A. 0.1 V

B. 0.2 V

C. 0.3 V

D. 0.4 V

Answer: B

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8. A copper loop and a silver loop are removed from a magnetic field simultaneously. Find the correct relation:

A. $emf_c > emf_s$

B. $emf_c < emf_s$

C. $emf_c = emf_s$

D. $emf_c \leq emf_s$

Answer: C

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9. Two inductors of inductance L are joined in parallel. The new resistance becomes:

A. 2 L

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

C. L

D. Zero

Answer: B

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10. Constant voltage is applied between the two ends of a uniform metallic wire. The heat developed is doubled if –

A. radius of the wire is doubled

B. length of the wire is doubled

C. both (a) and (b)

D. both length and radius of wire is halved

Answer: C

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11. The physical quantity having the dimensions $\left[M^{-1}L^{-3}T^{3}A^{2}\right]$ is

A. resistance

B. resistivity

C. electrical conductivity

D. electromotive force

Answer: C

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12. 0.2 A current is supplied to the primary circuit. The specific resistance is 4×10^{-7} ohm meter and cross-section area is

$8 \times 10^{-7} m^2$. The potential gradient is equal to:

A. $1 V m^{-1}$

B. $0.5 V m^{-1}$

C. $0.1 V m^{-1}$

D. $0.2 V m^{-1}$

Answer: C

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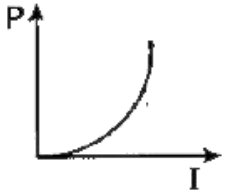
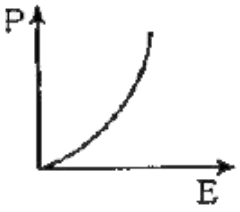
13. If E is the electric field in uniform conductor, I is the current and V_a and P denotes drift velocity and thermal power produced, then which of the following is correct:

A. 

B. 

C. 

D. Both (a) and (b)

Answer: D

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14. Permittivity of water if dielectric 40 is:

A. $3.54 \times 10^{-9} C^2 N^{-1} m^{-2}$

B. $3.54 \times 10^{-10} C^2 N^{-1} m^{-2}$

C. $3 \times 10^{-10} C^2 N^{-1} m^{-2}$

D. 0

Answer: B

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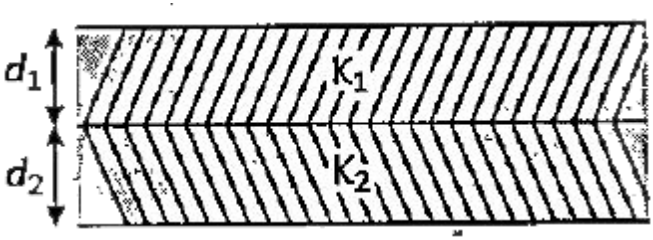
15. Two dielectric blocks in series make a parallel plate capacitor. Blocks are of thickness d_1 and d_2 respectively.



Effective dielectric constant is:

A. $\frac{K_1 d_1 + K_2 d_2}{K_1 + K_2}$

B. $\frac{K_1 d_1 + K_2 d_2}{d_1 + d_2}$

C. $\frac{2K_1 K_2}{K_1 + K_2}$

D. $\frac{K_1 K_2 (d_1 + d_2)}{(K_1 d_2 + K_2 d_1)}$

Answer: D

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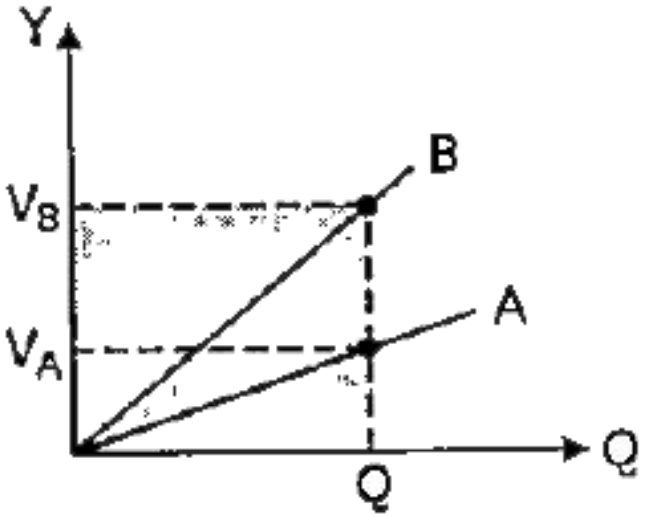
16. Which capacitor has higher capacitance ?



A. Capacitor A

B. Capacitor B

C. Both (A) and (B)

D. Both are equal

Answer: A

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17. Find the charge on parallel plate capacitor having circular plates of radius 8 cm and plate separation 1 mm. The potential difference is 100 V:

A. 1.78×10^{-5} C

B. $2 \times 10^{-9} C$

C. 1.78×10^{-8}C

D. 4.3×10^4C

Answer: C

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18. Force of 12 N is experienced by two charges of +8 μC and - 6 μ C. A charge of + 4 μ C is added. The new force between the charges will be:

A. 2 N

B. 24 N

C. 6 N

D. 12 N

Answer: C

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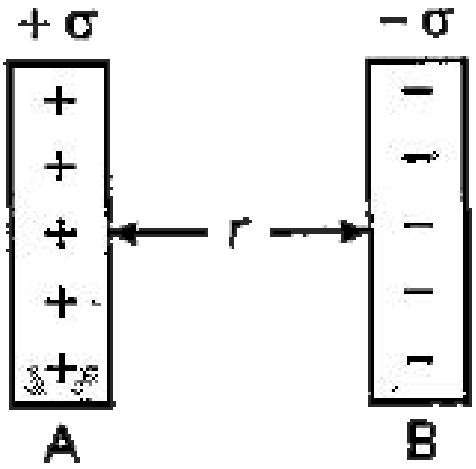

19.

Two large thin metal plates are parallel and close to each other. On their inner surface, plate have surface charge density of opposing magnitude of $17.0 \times 10^{-22} Cm^{-2}$? as shown. Electric field in outer region of first plate is:

A. $17 \times 10^{-22} \dfrac{N}{C}$

B. $1.5 \times 10^{55} \frac{N}{C}$

C. $1.9 \times 10^{-10} \frac{N}{C}$

D. Zero

Answer: D

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20. Given below are two statements labelled as Assertion (A) and Reason (R):

Select the most appropriate answer from the options given below.

Assertion (A): In a non-uniform electric field, a dipole will have translatory as well as rotatory motion.

Reason (R): In a non-uniform electric field, a dipole experiences a force as well as torque.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Both (A) and (R) are true but (R) is not the cor rect explanation of (A).

C. (A) is true but (R) is false.

D. (A) is false and (R) is also false.

Answer: A

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21. Given below are two statements labelled as Assertion (A) and Reason (R):

Select the most appropriate answer from the options given below.

Assertion (A): The resistance of material reduces to half of its initial value when cut into half.

Reason (R): Temperature material of a

conductor and dimension alter the resistivity of a conductor.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Both (A) and (R) are true but (R) is not the cor rect explanation of (A).

C. (A) is true but (R) is false.

D. (A) is false and (R) is also false.

Answer: A

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22. Given below are two statements labelled as Assertion (A) and Reason (R):

Select the most appropriate answer from the options given below.

Assertion (A): Fuse wire must have melting point and resistance.

Reason (R): Fuse is used for small current flow only.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Both (A) and (R) are true but (R) is not the cor rect explanation of (A).

C. (A) is true but (R) is false.

D. (A) is false and (R) is also false.

Answer: A

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23. Given below are two statements labelled as Assertion (A) and Reason (R):

Select the most appropriate answer from the

options given below.

Assertion (A): Electric field is always normal to equipotential surfaces and along the direction of decreasing order of potential

Reason (R): Negative gradient of alectric potential is electric field.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Both (A) and (R) are true but (R) is not the cor rect explanation of (A).

C. (A) is true but (R) is false.

D. (A) is false and (R) is also false.

Answer: B

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24. Given below are two statements labelled as Assertion (A) and Reason (R):

Select the most appropriate answer from the options given below.

Assertion (A): Dissipation of heat inside the cell is due to its internal resistance.

Reason (R): Internal resistance is due to flow of ions in cell through electrolyte.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Both (A) and (R) are true but (R) is not the cor rect explanation of (A).

C. (A) is true but (R) is false.

D. (A) is false and (R) is also false.

Answer: A

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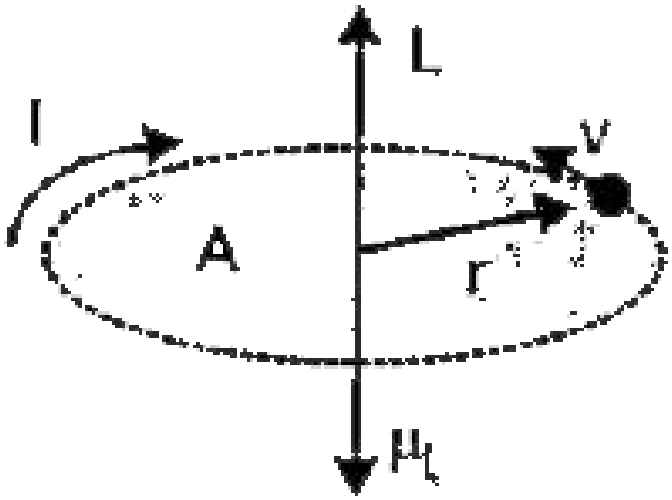
Section C



1.

Value of Bohr magneton is:

A. $9.27 \times 10^{-20} Am^2$

B. $9.27 \times 10^{-23} Am^2$

C. $1.0 \times 10^{-21} Am^2$

D. $9.27 \times 10^{-24} Am^2$

Answer: D

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2. The magnetic field of the earth can be modelled by that of a point dipole placed at the centre of the earth. The dipole axis makes an angle of 11.3° with the axis of the earth. At mumbai, declination is nearlyzero, then.

A. the plane defined by dipole axis and axis passes through greenwich

B. declination averaged over earth must be always negative

C. the declination varies between 11.3° W to 11.3° E

D. at least declination is 0° .

Answer: C

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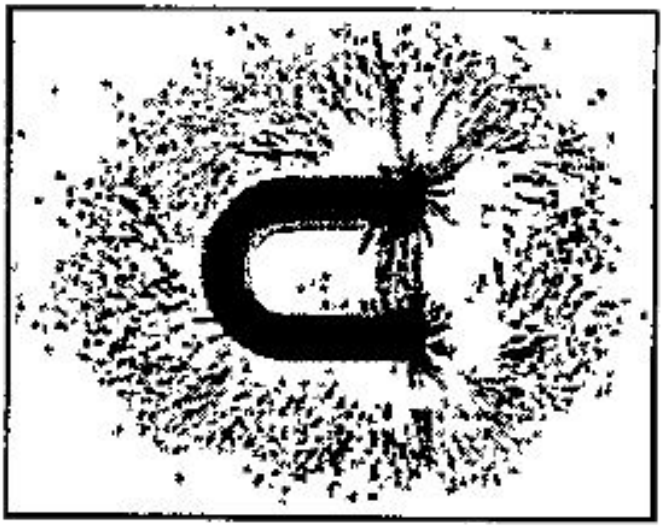
3. Case Study: Read the following paragraph and answer the questions:

In a beam of charged particles, not all particles move with the same speed. A charged porticle with mass m, charge q and speed v 'enters a region of space where.-electric field and magnetic fields are perpendicular to particle's velocity and to each other. Magnetic force is upward with magnitude qVB. When the total force is zero, there is no deflection om $(v) = \frac{E}{B}$



Electron with uniform velocity is projected along the axis of a current carrying solenoid. Then:

A. The electron path will be circular about the axis

B. The electron will be accelerated along the crisis

C. The electron will experience a force at 45° to the axis executing helical path

D. Electron will continue to move with uni form velocity along the axis of solenoid

Answer: D

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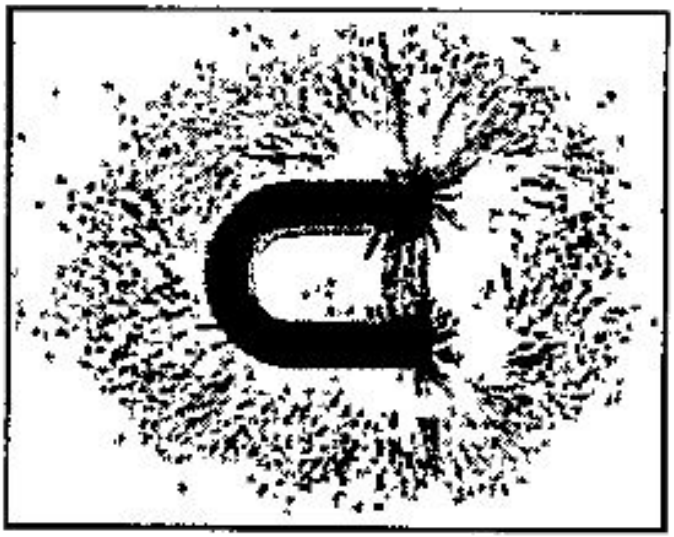
4. Case Study: Read the following paragraph and answer the questions:

In a beam of charged particles, not all particles move with the same speed. A charged porticle with mass m, charge q and speed v 'enters a region of space where.-electric field and magnetic fields are perpendicular to particle's velocity and to each other. Magnetic force is upward with magnitude qVB. When the total force is zero, there is no deflection om $(v) = \frac{E}{B}$



A cubical region of space filled with some uniform electric and magnetic field. An electron and positron enter opposite to each other with velocity v and - V respectively. Then:

A. Both particles gain or loose energy at same rate.

B. Motion of centre of mass is determined by B alone

C. Magnetic force causes acceleration on both particles equally

D. Motion of centre of mass is determined by Bond q.

Answer: B

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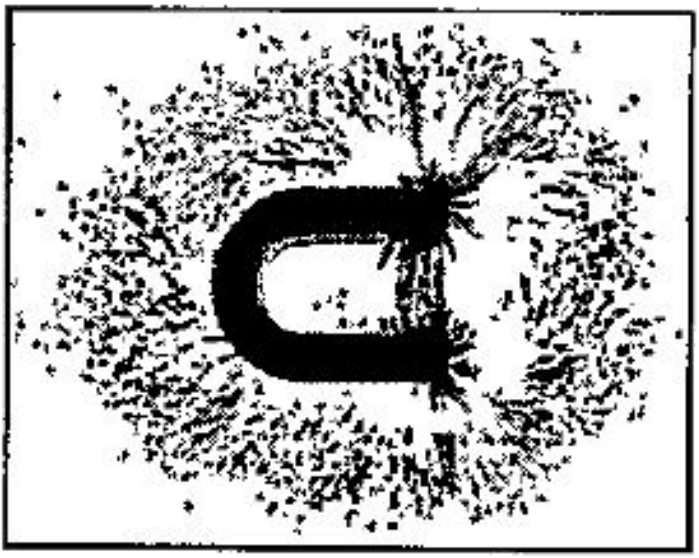
5. Case Study: Read the following paragraph and answer the questions:

In a beam of charged particles, not all particles move with the same speed. A charged porticle with mass m, charge q and speed v 'enters a region of space where.-electric field and magnetic fields are perpendicular to particle's velocity and to each other. Magnetic force is upward with magnitude qVB. When the total force is zero, there is no deflection om $(v) = \frac{E}{B}$



A charged particle goes undeflected in a region of velocity selector containing $\overrightarrow{E}$ and $\overrightarrow{B}$. then:

A. $\overrightarrow{E}$ is not parallel to $\overrightarrow{B}$ and $\overrightarrow{v}$

B. $\overrightarrow{E} \left\| \overrightarrow{B} \right.$, $\overrightarrow{v} \left\| \overrightarrow{E} \right.$

C. $\overrightarrow{E} \mid \mid \overrightarrow{v}$ but not $\overrightarrow{B}$

D. $\vec{E} \mid\mid$ B but not $\vec{v}$

Answer: B

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6. Case Study: Read the following paragraph and answer the questions:

In a beam of charged particles, not all particles move with the same speed. A charged porticle with mass m, charge q and speed v 'enters a region of space where.-electric field and

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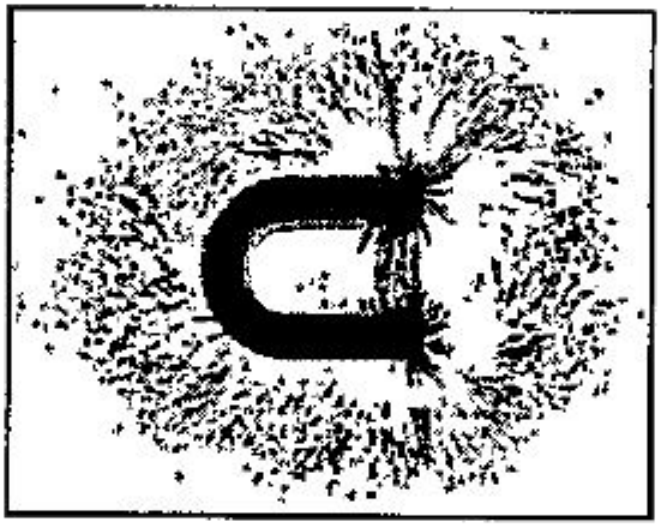

A charged particle enters $\overrightarrow{E} = 50NC^{-1}$ and

$\overrightarrow{B} = 2.5 \times 10^{-5}$ weber m^{-1} . It comes out without any change with velocity of.

A. $10^6 \frac{m}{s}$

B. $2.5 \times 10^6 \frac{m}{s}$

C. $0.5 \times 10^6 \frac{m}{s}$

D. $2 \times 10^6 \frac{m}{s}$

Answer: D

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