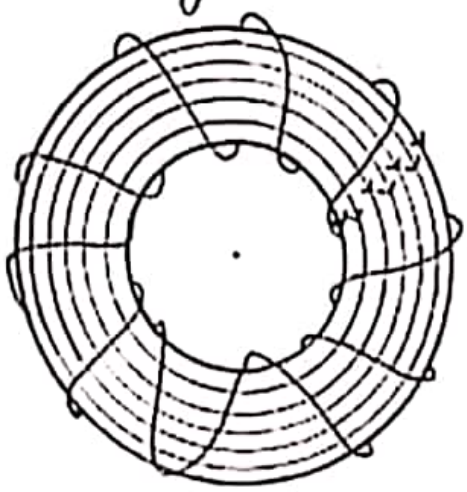
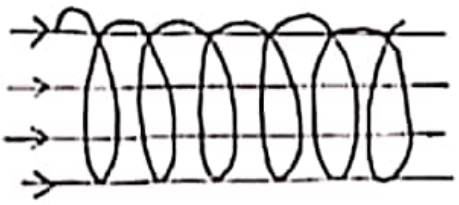
[c] Right →



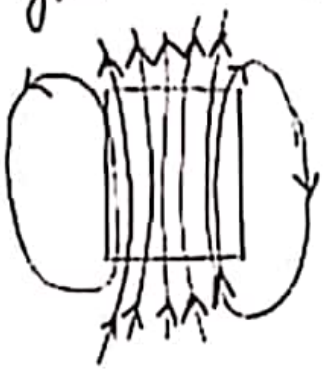
Magnetic field lines are confirmed within the toroid. Here nothing is wrong with the field lines forming closed loops, because each region enclosed a region across which a current passes.

[d] Wrong →



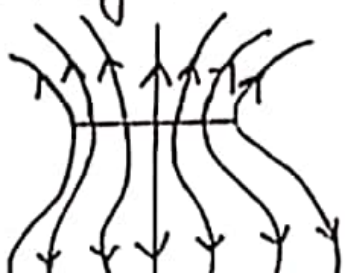
The field lines due to a solenoid cannot be completely straight and confine at ends and outside. This violates ampere's law. The lines must bend at the end so as to form closed loops.

[e] Right : →



All field lines emanate out of the north pole and converge into the south pole. Around both the north and south poles, the net flux of the field is zero.

[f] Wrong :-



These curves cannot represent a magnetic field because all the field lines cannot emanate from the upper plate.

5.4] What is the magnitude of the equitorial and axial fields due to a bar magnet of length 5 cm at a distance of 50 cm from its mid point? The magnetic moment of the bar magnet is 0.40 A m^2, the same as in example 5.2.

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(1) $m = 0.40$ A m^2

$r = 50$ cm $= 0.50$ m

$2l = 5$ cm $= 0.05$ m

⇒ Magnetic field on equitorial line

$$B_{equitorial} = \frac{\mu_0 m}{4\pi r^3}$$

$$= \frac{10^{-7} \times 0.4}{(0.5)^3} = 3.2 \times 10^{-7} T$$

⇒ Magnetic field on Axial line

$$B_{axial} = \frac{\mu_0 2m}{4\pi r^3}$$

$$= \frac{10^{-7} \times 2 \times 0.4}{(0.5)^3}$$

Ans Yes,
The average of the charges in the system may be zero. Yet the mean of the magnetic moment due to various current loops may not be zero. A neutron for example has zero charge but non-zero magnetic moment

5.8 The earth's magnetic field at the equator is approximately 0.4 G. Estimate the earth's dipole moment.

Ans $B = 0.4\ G = 0.4 \times 10^{-4}\ T.$

Radius of earth $= 6.4 \times 10^{6}\ m$

Magnetic field on Equitorial line

$$B = \frac{\mu_0 m}{4\pi r^3}$$

$$m = \frac{B \cdot 4\pi r^3}{\mu_0}$$

$$= 0.4 \times 10^{-4} \times 4 \times 3.14 \times (6.4 \times 10^{6})^3$$

1. Electric Charge and Electric Field

★ Static Electricity and Electrostatic:

- Electrostatic is branch of physics, which deals with the study of charges at rest, the forces, fields and Potential due to these charges.
- Study of static charges, their properties and interaction betⁿ them is called static electricity or electrostatic.
- In simple words, electrostatic is the study of electric charges at rest.

→ Application of Electrostatic:

- In loudspeaker.
- Xerox copying machine.
- Design of cathode-ray tube used in television and radar.
- Electrostatic spraying of paints and powder.

★ Electric Charge:

The fundamental intrinsic property of material by which it exert or experience electric and magnetic effects is called the electric charge.

- It is scalar quantity.

SI Unit: coulomb (C)