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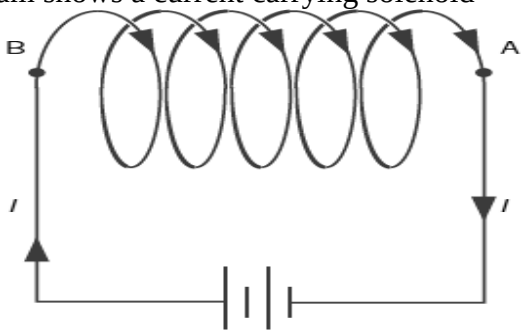
National Institute of Open Schooling
Senior Secondary
Lesson 18 – Magnetism and Magnetic Effect of Electric Current
WORKSHEET – 18

Q1. You must be familiar with basic properties of magnets. Perform activities to explain the properties of magnets. Explain the reason for the directive property of magnets.

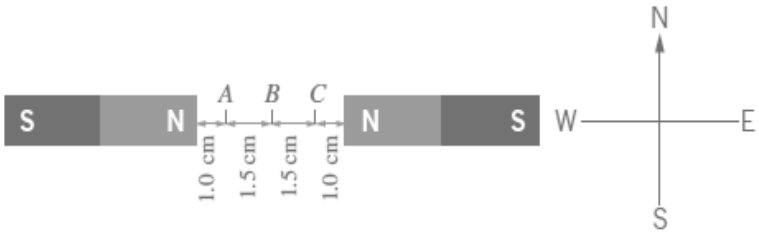
Q2. Interactions between magnets or a magnet and a piece of iron essentially represent action at a distance. This can be understood in terms of magnetic field. Draw the field lines to visualize the direction and magnitude of a magnetic field.

Q3. The following diagram shows a current carrying solenoid-



a) Which end A or B represents the North Pole of the solenoid and Why?
b) What would be the effect on the magnetic field strength of the solenoid if the amount of current is doubled and the radius of the solenoid is reduced to half?

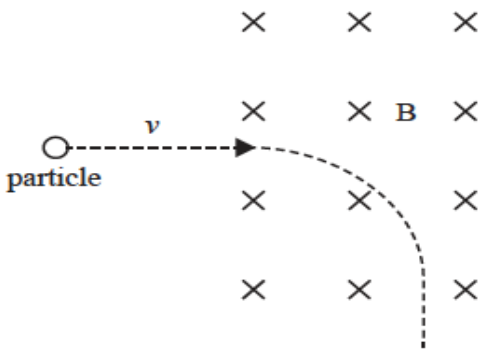
Q4. Two strong bar magnets which produce magnetic fields of equal strength are shown in diagram below:



Ignoring the earth's magnetic field -
a) Estimate the direction of magnetic field at point A.
b) What is the approximate direction of magnetic field at point B and C?

Q.5 A100 cm long solenoid has two layers of windings of 300 turns each. The radius of the lowest layer is 4 cm. The current passing through the solenoid id 5.0 A. Calculate the magnitude of B (a) Near the center of solenoid on and about the axis. (b) Near the ends on its axis. (c) Outside the solenoid near the center of solenoid. Deduce how the magnetic field of a solenoid varies as we move from the center to the axis and then outside the solenoid.

Q6. A particle of mass **m** and charge **q** travelling at velocity **v** is entering into a uniform magnetic field of strength B directed inwards into the plane as shown in figure below -



Explain in your own words why the charged particle is taking a curved path in magnetic field. Explain with reasons, whether the particle is positively charged or negatively charge.

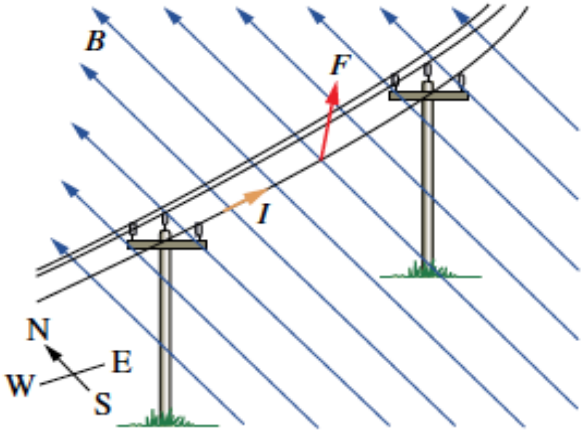
Q.7 Explain in your own words the basic principle and working of a galvanometer. A galvanometer with a coil resistance of 10W shows full scale deflection for a current of 5.0 mA. How can this galvanometer be converted as

a) an ammeter of range 0-5A

b) a voltmeter of range 0-20 V.

Q.8 Take different types of vessels available at your home – copper, steel, iron, aluminum and ceramic. Take a magnet and use this to see which of these is strongly attracted and which one is feebly attracted. On the basis of your observation, classify various materials into diamagnetic, paramagnetic and ferromagnetic materials. Mention two distinct properties of each kind of material.

Q9. A suspended power line is running east-west near the equators as shown in figure below.



Calculate the magnitude of the force due to the earth's magnetic field that acts on this suspended power line carrying a current of 100 A from west to east. Assume that the earth's magnetic field at this point is 5.0×10^{-5} T.

Q.10 Explain Ampere circuital law. Using Ampere Circuital law, find out the expression for the magnetic field due to a solenoid. Draw the field lines due to solenoid. Can a solenoid be assumed to behave similar to a bar magnet? How?

Q.11 Suppose your house is exactly at a point that can be considered as the Earth's magnetic North Pole (behaves like South Pole of magnet). Assuming the strength of the earth's magnetic field at this point is 5.0×10^{-5} T, calculate the magnetic force and direction in the following cases –

a) a 2.0 m length of wire carrying current of 10.0 A vertically up the outside wall of your house.

b) a 2.0 m length of wire carrying a current of 10.0 A running horizontally right to left across the outside wall of your house.

c) A current carrying wire runs horizontally across a table. The conventional direction of the flow of current I is from left to right. Represent through a diagram the direction of the magnetic field around the wire?