FBISE 9th Class Physics New Book Notes Chapter 8

SHORT RESPONSE QUESTIONS

Q1. Can two magnetic field lines intersect each other? Justify your answer.

Ans: No, two magnetic field lines cannot intersect each other. If they would intersect, there would be two directions of the field at the specific point which is not possible. This principle is known as the law of magnetic field lines. Magnetic field lines always follow a continuous path from the north pole of a magnet to its south pole, and they never cross or intersect each other

Q2. A freely suspended magnet always points along north-south direction. Why?

Ans: Earth behaves like a magnet. Earth's south pole attracts the north pole of magnet and Earth's north pole attracts the south pole of magnet towards itself that is why a freely suspended magnet always stay in N-S direction.

Q3. What is the neutral zone or field free region of the magnetic field?

Ans: The neutral zone or field-free region of a magnetic field is a space where the magnetic field strength is negligible or closes to zero. In this area, the magnetic forces exerted by nearby magnetic sources cancel each other out, resulting in minimal magnetic influence.

Neutral zones can be found between magnets with opposing poles facing each other, in specific arrangements of magnetic materials, or in regions where magnetic fields from different sources neutralize each other. These regions are significant in various applications, including magnetic shielding and magnetic levitation, where precise control of magnetic fields is essential.

Q4. Is there any material which does not have any magnetic behavior? Justify your answer.

Ans: Yes, there are materials that do not exhibit magnetic behavior, and they are classified as non-magnetic materials. Non-magnetic materials are those that are not attracted to magnets and do not retain any magnetic properties when exposed to a magnetic field.

Examples of non-magnetic materials include most plastics, wood, glass, rubber, and ceramics. These materials have either no magnetic domains or their magnetic domains are randomly oriented, resulting in no overall magnetic behavior.

Q5. A proton is also a charged particle and spins like an electron. Why its effect is neglected in study of magnetism?

Ans: The effect of a proton's spin on magnetism is often neglected in the study of magnetism because protons are significantly heavier than electrons, leading to a much smaller magnetic moment associated with their spin. Additionally, the number of protons in most materials is much smaller than the number of electrons, further reducing their overall contribution to the material's magnetism. As a result, while protons do possess a magnetic moment due to their spin, their effect is typically overshadowed by the larger and more significant contributions of electrons to the material's magnetic properties.

Q6. What is the geomagnetic reversal phenomenon? Explain.
Ans:

The geomagnetic reversal phenomenon involves the Earth's magnetic field reversing its polarity, where the magnetic north pole becomes the south pole, and vice versa. This process occurs over thousands of years and has happened irregularly throughout Earth's history, with the last reversal taking place about 780,000 years ago.

The magnetic field weakens and may become disordered during a reversal, potentially affecting navigation' and communication systems that depend on magnetic orientation. Despite these changes, geomagnetic reversals are a natural events affecting the biosphere.

Q7. Why the Earth spins about its geographical axis instead of its magnetic axis? Explain.

Ans: The Earth spins about its geographical axis, not its magnetic axis, primarily due to the way it formed and how angular momentum works. During the formation of the solar system, the Earth developed from a rotating disk of gas and dust, which imparted a specific rotational momentum to the Earth. This set the axis of rotation that we now call the geographical axis.
field, which is generated by the motion of molten iron in the Earth's outer core. This magnetic field and its axis can shift and are not tied to the Earth's rotational momentum. Therefore, the stability and conservation of angular momentum dictate that Earth spins about its geographical axis.

Q8. Why the Earth's geographical and magnetic axis are not coincident? Explain.
Ans:
The Earth's geographical and magnetic axes are not coincident due to differences in their underlying causes. The geographical axis is determined by the Earth's rotation and distribution of mass, essentially defining its spin. It remains relatively stable over geological timescales.
In contrast, the magnetic axis is influenced by the movement of molten iron and nickel in the Earth's outer core. This motion generates the planet's magnetic field through the geo-dynamo process. The magnetic field is subject to variations and fluctuations, leading to changes in the orientation of the magnetic axis over time. Thus, while the geographical axis remains constant, the magnetic axis is time. Thus, while the geographical ax. Dynamic, resulting in their misalignment.

Q9. What is the difference between paramagnetic and ferromagnetic materials?
Ans: Difference between paramagnetic and ferromagnetic materials:

Paramagnetic Substances	Ferromagnetic Substances
(I) Substances which are weakly attracted by a magnet are called Paramagnetic substances.	(i) Substances which are strongly attracted by a magnet are called Ferromagnetic substances.

(ii) Paramagnetic materials lose their magnetism on removal of the external field and hence cannot be used to Make permanent magnets.	(ii) Ferromagnetic materials retain some magnetism on removal of external field and hence can be used to make Permanent magnets.
(iii) The susceptibility is positive but small.	(iii) The susceptibility is positive but very high.
(iv) In the absence of electric field, net dipole moment is zero.	(iv) In the absence of electric. net dipole moment is non-zero.

Q10. At what factors the strength of the magnetic field of an electromagnet depends?

Ans: The strength of the magnetic field of an electromagnet depends on several factors:

$$F = ILBSin\,\alpha$$

(i) Current Strength:

(ii) Number of Turns in the Coil:.(iii) Core Material:(iv) Core Length (v) Core Cross-Sectional Area

The given equation show that all of direct relation

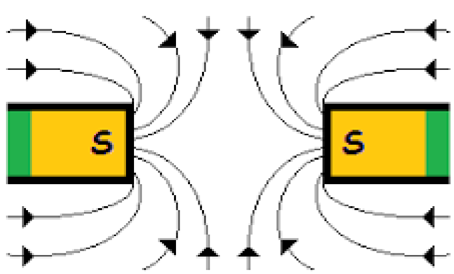
Increasing the number of turns in the coil increases the strength of the electromagnet.

Increasing the current flowing in the coil increases the strength of the electromagnet.

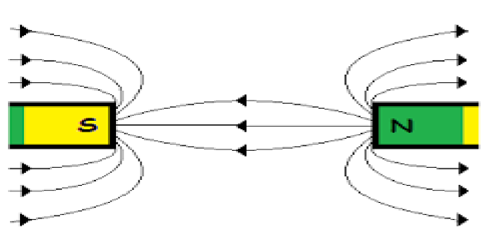
Q11. Draw magnetic field lines of two solenoids placed near each other:
(i) facing same poles to each other (ii) facing opposite poles to each other

Ans:

(i) facing same poles to each other



(ii) facing opposite poles to each other



NUMERICAL PROBLEM

CHAPTER 8

Q1. Find the magnetic field due to a wire at 10 cm, if 1.3 A current is passing through the wire. (Ans. $B = 2.6 \times 10^5$ T)

Solution:
To find the magnetic field due to a long straight wire carrying a current, we can use Ampere's circuital law.
Where,

$$B = \frac{\mu_0 I}{2\pi r}$$

B is the magnetic field,

μ_0 is the permeability of free space ($\mu_0 = 4\pi \times 10^{-7}$ T.m/A),

I is the current passing through the wire, and

r is the distance from the wire to the point where the magnetic field is being calculated.

Given:

$$I = 1.3 \text{ A}$$

$$r := 1 \text{ cm} = 0.1 \text{ m}$$

Now we can plug these values into the formula:

Now we can plug these values into the formula: $B = \frac{\mu_0 \text{I}}{2\pi \text{r}}$

$$\Rightarrow B = \frac{4\pi \times 10^{-7} \text{ T.m/A} \times 1.3 \text{ A}}{2\pi \times 0.1 \text{ m}}$$

Simplifying the expression by canceling π from the numerator and denominator, we get:

$$\Rightarrow B = \frac{4 \times 10^{-7} \text{ T.m/A} \times 1.3 \text{ A}}{0.2 \text{ m}}$$

$$\Rightarrow B = \frac{5.2 \times 10^{-7} \text{ T.m}}{0.2 \text{ m}}$$

$$\Rightarrow B = 2.6 \times 10^{-6} \text{ T}$$

Therefore, the magnetic field is 2.6×10^{-6} T.