UNIQUE STUDY POINT

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Class: VI	**Subject:** Science	**Session:** 2025-26
Chapter: 04 - Exploring Magnets	**Time:** 1½ Hours	**Max. Marks:** 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

Q1. Which of the following is NOT a shape of magnet?

(a) Bar magnet

(b) U-shaped magnet

(c) Ring magnet

(d) Square magnet

Q2. The North pole of a freely suspended magnet points towards:

(a) Geographic North

(b) Geographic South

(c) Geographic East

(d) Geographic West

Q3. When unlike poles of two magnets are brought close, they:

(a) Repel each other

(b) Attract each other

(c) Do not affect each other

(d) Lose their magnetism

Q4. A magnet loses its properties if it is:

(a) Dropped from height

(b) Heated

(c) Hammered

(d) All of the above

Q5. Which instrument is used by sailors to find directions?

(a) Barometer
(b) Magnetic compass
(c) Thermometer
(d) Telescope

Q6. The end of compass needle painted red indicates:
(a) South pole
(b) North pole
(c) East direction
(d) West direction

Q7. A simple iron bar can be magnetized by:
(a) Heating it
(b) Cooling it
(c) Stroking it with a magnet repeatedly in one direction
(d) Keeping it in water

Q8. Artificial magnets are made from:
(a) Plastic
(b) Wood
(c) Iron and other magnetic materials
(d) Glass

Q9. Earth behaves like a:
(a) Small magnet
(b) Giant magnet
(c) Non-magnetic object
(d) Conductor

Q10. When storing magnets, they should be kept:
(a) Near mobile phones
(b) In pairs with like poles together
(c) In pairs with unlike poles together
(d) Alone without any support

SECTION B - Short Answer Questions (2 marks each)

Q11. Name three metals that are attracted by magnets.

Q12. What happens when we break a bar magnet into two pieces? Explain with a diagram.

Q13. How is a magnetic compass useful in finding directions?

Q14. List two precautions that should be taken while storing magnets.

SECTION C - Short Answer Questions (3 marks each)

Q15. A mechanic was repairing a gadget using a screwdriver and steel screws kept falling down. Suggest a solution to this problem based on your knowledge of magnets.

Q16. Describe an activity to show that the poles of a magnet are located at its ends.

Q17. Explain why a magnetic compass deflects when a bar magnet is brought near it. What will happen when the North pole of the magnet is brought near the North pole of the compass needle?

SECTION D - Long Answer Question (5 marks)

Q18. (a) What is a magnetic compass? How is it constructed?
(b) Explain the working principle of a magnetic compass.
(c) How did sailors in ancient times use magnetic devices for navigation? Name the ancient Indian navigation device.

SECTION E - Case Study Based Questions (4 marks each)

Q19. Case Study 1:
A group of students performed an activity in their science laboratory. They took a bar magnet and rolled it over a heap of steel U-clips placed on a table. They observed that many clips got attached to the magnet. They noticed that maximum clips were attached at two specific regions of the magnet, while very few clips were attached in the middle portion of the magnet. They marked the two regions where maximum clips were attached as A and B.

Based on the above case study, answer the following questions:

(a) What are regions A and B called? (1 mark)

(b) Why do maximum clips attach at these two regions? (1 mark)

(c) If the magnet is broken into three pieces, how many poles will each piece have? Explain. (2 marks)

Q20. Case Study 2:
Ravi wanted to test whether magnetic force can act through different materials. He took a magnetic compass and a bar magnet. First, he brought the North pole of the bar magnet near the North pole of the compass needle and observed deflection. Then, without disturbing the magnet and compass, he placed different materials one by one between them - a piece of wood, a cardboard sheet, a thin plastic sheet, and a thin glass sheet. He carefully observed the compass needle each time.

Based on the above case study, answer the following questions:

(a) What did Ravi observe when he placed wood between the magnet and compass? (1 mark)

(b) Did the compass needle behave differently with different materials? (1 mark)

(c) What conclusion can be drawn from this activity? Explain. (2 marks)

DETAILED ANSWER KEY - PAPER 02

SECTION A - Answers to MCQs

Ans 1. (d) Square magnet

Common shapes of magnets include bar magnet, U-shaped magnet, ring magnet, cylindrical magnet, disc magnet, and spherical magnet. Square magnet is not a commonly used shape.

Ans 2. (a) Geographic North

The North pole of a freely suspended magnet points towards the geographic North direction because Earth behaves like a giant magnet.

Ans 3. (b) Attract each other

Unlike poles (North-South) of two magnets attract each other, while like poles repel each other.

Ans 4. (d) All of the above

A magnet loses its magnetic properties if it is dropped from height, heated, or hammered. These actions disturb the alignment of magnetic domains inside the magnet.

Ans 5. (b) Magnetic compass

Sailors use a magnetic compass to find directions at sea. The compass needle always points North-South, helping in navigation.

Ans 6. (b) North pole

The end of the compass needle that is painted red indicates the North pole. This end points towards the geographic North direction.

Ans 7. (c) Stroking it with a magnet repeatedly in one direction

An iron bar can be magnetized by stroking it repeatedly with one pole of a magnet in the same direction. This aligns the magnetic domains in the iron.

Ans 8. (c) Iron and other magnetic materials

Artificial magnets are made from iron, nickel, cobalt, and their alloys. These materials can be magnetized and used to make magnets of different shapes.

Ans 9. (b) Giant magnet

Earth behaves like a giant magnet with magnetic North and South poles. This is why a freely suspended magnet aligns in the North-South direction.

Ans 10. (c) In pairs with unlike poles together

Magnets should be stored in pairs with unlike poles together (North-South), with a piece of wood between them and soft iron pieces across the ends. This helps maintain their magnetism.

SECTION B - Answers to Short Answer Questions

Ans 11.

Three metals that are attracted by magnets are:
1. **Iron** - The most common magnetic material
2. **Nickel** - Another magnetic metal
3. **Cobalt** - The third naturally magnetic metal

Note: Some alloys of these metals are also attracted by magnets.

Ans 12.

When we break a bar magnet into two pieces, each piece becomes a complete magnet with its own North and South poles. A single pole cannot exist independently.

Before breaking: N ========= S
After breaking: N ==== S N ==== S

Even if we break the magnet into smaller pieces, each piece will always have both North and South poles. This is because magnetism is a property of the material's atomic structure.

Ans 13.

A magnetic compass is useful in finding directions because:
1. The needle of the compass is a small magnet that can rotate freely
2. It always aligns itself in the North-South direction due to Earth's magnetic field
3. By knowing the North-South direction, we can easily determine all other directions (East, West, Northeast, etc.)
4. This property has been used by sailors, travelers, and explorers for centuries for navigation

Ans 14.

Two precautions while storing magnets:

1. **Store in pairs with unlike poles together:** Magnets should be kept in pairs with their unlike poles (North-South) on the same side, with a piece of wood between them and soft iron pieces across the ends. This prevents loss of magnetism.

2. **Keep away from heat and harsh treatment:** Magnets should not be heated, dropped, or hammered as these actions can cause them to lose their magnetic properties. They should also be kept away from mobile phones and electronic devices.

SECTION C - Answers to Short Answer Questions

Ans 15.

Solution to the mechanic's problem:

The mechanic can magnetize the screwdriver to solve this problem. When the screwdriver becomes magnetic, the steel screws will stick to it and won't fall down.

How to magnetize the screwdriver:
1. Take a permanent bar magnet
2. Stroke the screwdriver repeatedly with one pole of the magnet in the same direction
3. Repeat this process 30-40 times
4. The screwdriver will become magnetized
5. Now when the mechanic picks up screws with the magnetized screwdriver, they will stick to it

due to magnetic attraction

This is a practical application of magnets in daily life and is commonly used by mechanics and electricians.

Ans 16.

Activity to show poles are at the ends of magnet:

Materials required: Bar magnet, iron filings, sheet of paper

Procedure:
1. Spread iron filings uniformly on a sheet of paper
2. Place the bar magnet horizontally over the iron filings
3. Tap the paper gently and observe the pattern of iron filings

Observation:
- Maximum iron filings stick at the two ends of the bar magnet
- Very few iron filings stick at the middle portion
- The iron filings form a dense cluster at both ends

Conclusion:
Since iron filings are attracted most at the two ends, it proves that the magnetic force is maximum at the ends. These ends are called the poles of the magnet - North pole and South pole. The middle portion has much weaker magnetic force.

Ans 17.

Why compass deflects when magnet is brought near:
A magnetic compass needle is itself a small magnet that can rotate freely. When a bar magnet is brought near the compass, the magnetic field of the bar magnet interacts with the magnetic field of the compass needle. According to the law of magnetic poles, like poles repel and unlike poles attract. This causes the compass needle to deflect from its original North-South position.

When North pole of magnet is near North pole of compass:
When the North pole of the bar magnet is brought near the North pole of the compass needle, the needle moves away or gets deflected in the opposite direction. This happens because like poles (North-North) repel each other. The North pole of the compass needle tries to move away from the North pole of the bar magnet, causing visible deflection.

SECTION D - Answer to Long Answer Question

Ans 18.

(a) What is a magnetic compass and its construction:

A magnetic compass is a device used for finding directions. It works on the principle that a freely suspended magnet always aligns itself in the North-South direction.

Construction:
1. It consists of a small circular box with a transparent cover
2. A magnetized needle in the shape of an arrow is mounted on a pin at the center of the box
3. The needle is balanced on the pin so it can rotate freely

4. The end pointing North is usually painted red
5. Below the needle, there is a dial with directions marked (N, S, E, W, NE, NW, SE, SW)
6. The entire assembly is enclosed in a protective case

(b) Working principle of magnetic compass:

1. The needle of the compass is itself a small magnet with North and South poles
2. Earth behaves like a giant magnet with magnetic poles
3. The Earth's magnetic field interacts with the compass needle
4. The North pole of the compass needle is attracted towards the Earth's magnetic North
5. The needle rotates freely and comes to rest in the North-South direction
6. To use it, the compass box is rotated until the North marked on the dial aligns with the needle
7. Now all other directions can be read from the dial

(c) Ancient navigation and Indian device:

In ancient times, before the development of modern magnetic compasses, sailors relied on natural indicators like stars for navigation. However, during cloudy or stormy weather when stars were not visible, they used magnetic devices.

Ancient Indian navigation device:
The ancient Indian device for navigation was called **Matsya-yantra** (also known as Machchh-yantra, meaning "fish instrument"). It consisted of a magnetized piece of iron shaped like a fish, which was kept floating in a vessel containing oil. The fish-shaped magnet would align itself in the North-South direction, helping sailors determine directions at sea. This device was similar in principle to the modern magnetic compass but had a different design and construction.

SECTION E - Answers to Case Study Based Questions

Ans 19.

(a) What are regions A and B called?
Regions A and B are called the **poles of the magnet** - specifically the North pole and the South pole. These are the two ends of the magnet where the magnetic force is maximum.

(b) Why do maximum clips attach at these two regions?
Maximum clips attach at these two regions (poles) because the magnetic force is strongest at the poles of a magnet. The middle portion of the magnet has much weaker magnetic force, so very few clips attach there. The magnetic attraction is concentrated at the two ends, making them capable of attracting more steel clips.

(c) Number of poles in each piece after breaking:
If the magnet is broken into three pieces, each piece will have **two poles** (one North and one South).

Explanation:
It is not possible to obtain a magnet with a single pole. Magnetic poles always exist in pairs. When we break a magnet, we don't separate the North and South poles - instead, we create new poles at the broken ends. So if we break one magnet into three pieces, we will have three magnets, each with its own North and South poles. This is a fundamental property of magnets - a single North pole or a single South pole cannot exist independently.

Ans 20.

(a) Observation when wood was placed between magnet and compass:
When Ravi placed wood between the magnet and compass, he observed that the compass needle still showed deflection. There was no appreciable change in the deflection compared to when there was no material between them. The magnetic force acted through the wood.

(b) Did compass behave differently with different materials?
No, the compass needle did not behave differently with different materials. Whether it was wood, cardboard, plastic, or glass, the compass needle showed similar deflection in all cases. All these materials allowed the magnetic force to pass through them without any significant obstruction.

(c) Conclusion from this activity:
The conclusion that can be drawn from this activity is that **magnetic force can act through non-magnetic materials**.

Detailed Explanation:
Wood, cardboard, plastic, and glass are all non-magnetic materials - they are not attracted to magnets themselves. However, the activity clearly demonstrated that when these materials are placed between a magnet and a compass (or any magnetic material), the magnetic force passes through them and still affects the compass needle. This means magnetic fields can penetrate non-magnetic materials. This property is very useful in many applications - for example, we can use magnets to pick up a steel paperclip from water without getting the magnet wet, or we can move magnetic objects by moving a magnet on the other side of a non-magnetic barrier.
