UNIQUE STUDY POINT

By Sumeet Sahu

www.uniquestudyonline.com

Unique Study Point, Amitesh Nagar, Indore, MP | Contact: 8103405051

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. A magnetic compass is based on the principle that:
(a) Like poles attract
(b) A freely suspended magnet aligns North-South
(c) Magnets attract all metals
(d) Earth has no magnetic field

Q2. Which property helps in identifying a magnet among similar looking bars?
(a) Attraction only
(b) Repulsion only
(c) Weight
(d) Color

Q3. Magnets lose their properties when:
(a) Kept near mobile phones
(b) Heated strongly
(c) Kept in dark
(d) Washed with water

Q4. The strength of a bar magnet is:
(a) Maximum at the center
(b) Uniform throughout
(c) Maximum at the poles
(d) Zero at all points

Q5. When a magnet is suspended freely, it aligns in North-South direction because:

(a) Of gravitational force
(b) Earth behaves like a magnet
(c) Of wind direction
(d) Of its weight

Q6. An iron bar can be converted into a magnet by:
(a) Heating it
(b) Stroking with a magnet in one direction
(c) Dipping in water
(d) Painting it red and blue

Q7. Which of these can be attracted by a magnet?
(a) Plastic scale
(b) Wooden pencil
(c) Steel spoon
(d) Rubber eraser

Q8. The poles of a magnet:
(a) Can exist separately
(b) Always exist in pairs
(c) Can be created singly
(d) Disappear when magnet is broken

Q9. A magnet attracts:
(a) All metals
(b) Only iron, nickel, and cobalt
(c) All non-metals
(d) Plastic and wood

Q10. In a magnetic compass, the needle points North-South because:
(a) It is balanced on a pin
(b) It is painted red and white
(c) It is a magnet and Earth has magnetic field
(d) It is made of glass

SECTION B - Short Answer Questions (2 marks each)

Q11. Write two differences between magnetic and non-magnetic materials.

Q12. Why is it advised to store magnets in pairs with unlike poles together?

Q13. How can you pick up a steel paperclip from water without getting your hand or magnet wet?

Q14. What happens when we bring the North pole of one magnet near the South pole of another magnet?

SECTION C - Short Answer Questions (3 marks each)

Q15. A student wants to make a temporary magnet. Describe the method with steps that the student should follow.

Q16. Explain with an activity how you can show that the magnetic force acts through cardboard.

Q17. A bar magnet has no markings to indicate its poles. How can you find out which end is the North pole? Describe any one method.

SECTION D - Long Answer Question (5 marks)

Q18. (a) State the law of magnetic poles with examples.
(b) Describe an activity to demonstrate attraction between unlike poles and repulsion between like poles.
(c) Why is repulsion considered a sure test of magnetism?

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

Q19. Case Study 1:
A science teacher showed an interesting demonstration. She took a cardboard box and placed a steel ball inside it. Then she moved a strong bar magnet outside the box, below the cardboard. To everyone's surprise, the steel ball inside the box started moving, following the movement of the magnet outside. She then replaced the steel ball with a wooden ball and repeated the demonstration. This time, the wooden ball did not move when the magnet was moved outside the box.

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

(a) Why did the steel ball move inside the box? (1 mark)

(b) Why didn't the wooden ball move? (1 mark)

(c) What conclusion can be drawn about magnetic force from this demonstration? (2 marks)

Q20. Case Study 2:
During a camping trip, Rahul and his friends got lost in a dense forest on a cloudy night. They could not see the stars to find directions. Rahul remembered that he had a small bar magnet in his bag. He also had a bowl, some water, and a piece of cork. Using these materials, Rahul made a simple device that helped them find the North direction and eventually find their way back to the camp.

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

(a) What device did Rahul make? (1 mark)

(b) How did this device help in finding direction? (1 mark)

(c) Describe the steps Rahul must have followed to make this device and how it works. (2 marks)

DETAILED ANSWER KEY - PAPER 04

SECTION A - Answers to MCQs

Ans 1. (b) A freely suspended magnet aligns North-South

A magnetic compass works on the principle that a freely suspended magnet always aligns itself in the North-South direction due to Earth's magnetic field.

Ans 2. (b) Repulsion only

Repulsion is the sure test to identify a magnet because only magnets can repel each other. Iron bars will only show attraction but never repulsion.

Ans 3. (b) Heated strongly

Magnets lose their magnetic properties when heated strongly. The heat disturbs the alignment of magnetic domains. They also lose properties when dropped or hammered.

Ans 4. (c) Maximum at the poles

The strength of a bar magnet is maximum at its two poles (ends) and minimum at the center. This is why iron filings concentrate at the poles.

Ans 5. (b) Earth behaves like a magnet

A freely suspended magnet aligns in North-South direction because Earth itself behaves like a giant magnet with magnetic poles that interact with the magnet.

Ans 6. (b) Stroking with a magnet in one direction

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

Ans 7. (c) Steel spoon

A steel spoon can be attracted by a magnet because steel contains iron, which is a magnetic material. Plastic, wood, and rubber are non-magnetic materials.

Ans 8. (b) Always exist in pairs

The poles of a magnet always exist in pairs. A single North or South pole cannot exist. Even if we break a magnet, each piece will have both poles.

Ans 9. (b) Only iron, nickel, and cobalt

A magnet attracts only magnetic materials like iron, nickel, cobalt, and some of their alloys. It does not attract all metals or non-metals.

Ans 10. (c) It is a magnet and Earth has magnetic field

The compass needle points North-South because it is itself a magnet and Earth has a magnetic field. The Earth's magnetic field interacts with the compass needle causing it to align.

SECTION B - Answers to Short Answer Questions

Ans 11.

Two differences between magnetic and non-magnetic materials:

Magnetic Materials	Non-magnetic Materials
1. These materials are attracted by magnets	1. These materials are not attracted by magnets
2. Examples: Iron, Nickel, Cobalt	2. Examples: Wood, Plastic, Rubber, Copper, Aluminum

Ans 12.

Magnets should be stored in pairs with unlike poles together because:

1. **Prevents loss of magnetism:** When unlike poles are kept together with a wooden piece between them and soft iron pieces across the ends, it creates a closed magnetic circuit. This helps maintain the magnetic strength.

2. **Safety and organization:** Storing magnets properly prevents them from attracting nearby magnetic materials accidentally and keeps them organized and safe for future use.

Ans 13.

Method to pick up steel paperclip from water:

We can use the property that magnetic force can act through non-magnetic materials:

1. Place the magnet outside the glass/container near the wall where the paperclip is floating
2. The magnetic force will pass through the glass (non-magnetic material) and water
3. The paperclip will get attracted and move towards the magnet through the wall of the container
4. Slowly move the magnet upward along the outer wall
5. The paperclip will follow the magnet and come out of water without getting the magnet or hand wet

This works because magnetic force can penetrate non-magnetic materials like glass and water.

Ans 14.

When the North pole of one magnet is brought near the South pole of another magnet:

1. The two magnets will **attract each other**
2. They will pull towards each other with a magnetic force
3. If left free to move, they will come closer and stick together

This happens because North and South are **unlike poles**, and according to the law of magnetic poles, unlike poles attract each other.

SECTION C - Answers to Short Answer Questions

Ans 15.

Method to make a temporary magnet:

Materials needed:

- An iron nail or needle
- A permanent bar magnet
- A wooden table or surface

Steps to follow:

Step 1: Place the iron nail on a wooden table

Step 2: Take one pole (say North pole) of the permanent bar magnet and place it at one end of the iron nail

Step 3: Stroke the magnet along the length of the nail from one end to the other in one direction only

Step 4: When you reach the other end, lift the magnet away from the nail

Step 5: Bring the same pole of the magnet back to the starting point and repeat the stroking motion

Step 6: Repeat this process 30-40 times in the same direction with the same pole

Step 7: Test the nail by bringing iron filings or small pins near it. If they get attracted, the nail has become a temporary magnet

Note: This is called a temporary magnet because it loses its magnetism after some time, especially if dropped or heated.

Ans 16.

Activity to show magnetic force acts through cardboard:

Materials required:
- Bar magnet
- Magnetic compass
- Piece of cardboard
- Flat surface/table

Procedure:

1. **Set up:** Place the magnetic compass on a horizontal table and wait for the needle to come to rest in the North-South direction

2. **Initial observation:** Bring one pole of the bar magnet near the compass needle and observe the deflection

3. **Insert cardboard:** Without disturbing the position of the magnet and compass, carefully place a piece of cardboard vertically between them, perpendicular to the table

4. **Observe:** Watch the compass needle carefully - it still shows deflection even with the cardboard between the magnet and compass

5. **Remove cardboard:** Remove the cardboard and observe that the deflection remains the same

Conclusion:

The compass needle deflects even when cardboard (a non-magnetic material) is placed between the magnet and compass. This proves that magnetic force can act through non-magnetic materials like cardboard. The cardboard does not block or reduce the magnetic force significantly.

Ans 17.

Method to find the North pole of an unmarked magnet:

Using free suspension method:

Materials required:
- The unmarked bar magnet
- A thread or string
- A stand or support to hang the magnet

Steps:

1. **Suspend the magnet:** Tie a thread to the middle of the bar magnet and suspend it freely from a stand. Make sure it can rotate freely without any obstruction

2. **Allow it to settle:** Let the magnet rotate freely and come to rest. It may take a minute or two to stop completely

3. **Observe the alignment:** Once the magnet comes to rest, it will align itself in the North-South direction due to Earth's magnetic field

4. **Identify the North pole:** Determine the geographic North direction using the position of the Sun or any known landmark. The end of the magnet pointing towards geographic North is the North pole of the magnet

5. **Verify:** Rotate the magnet gently and let it come to rest again. It will always align in the same direction, confirming which end is the North pole

6. **Mark it:** Once identified, mark the North pole with 'N' or a specific color for future reference

Principle: This method works because a freely suspended magnet always aligns itself in the North-South direction due to Earth's magnetic field.

SECTION D - Answer to Long Answer Question

Ans 18.

(a) Law of Magnetic Poles:

The law of magnetic poles states that:

1. Like poles repel each other
When two North poles or two South poles are brought close to each other, they push away from each other.

Examples:
- North pole of magnet A + North pole of magnet B → Repulsion
- South pole of magnet A + South pole of magnet B → Repulsion

2. Unlike poles attract each other
When a North pole and a South pole are brought close to each other, they pull towards each other.

Examples:
- North pole of magnet A + South pole of magnet B → Attraction
- South pole of magnet A + North pole of magnet B → Attraction

(b) Activity to demonstrate attraction and repulsion:

Materials required:
- Two bar magnets with marked poles (N and S)
- 5-6 round pencils
- Flat table

Procedure:

Part 1 - Demonstrating Repulsion (Like poles):
1. Place the round pencils on a table parallel to each other
2. Place magnet A on the pencils so it can roll freely
3. Hold magnet B in your hand
4. Bring the North pole of magnet B near the North pole of magnet A
5. Observe that magnet A moves away - this shows repulsion
6. Repeat by bringing South pole near South pole - again observe repulsion

Part 2 - Demonstrating Attraction (Unlike poles):
1. Keep the same setup with magnet A on pencils
2. Now bring the South pole of magnet B near the North pole of magnet A
3. Observe that magnet A moves towards magnet B - this shows attraction
4. Repeat by bringing North pole near South pole - again observe attraction

Observations:
- Like poles (N-N or S-S) → Magnet A rolls away → Repulsion
- Unlike poles (N-S or S-N) → Magnet A rolls towards → Attraction

Conclusion: This activity clearly demonstrates that like poles repel and unlike poles attract.

(c) Why is repulsion a sure test of magnetism?

Repulsion is considered the sure test of magnetism because:

1. Uniqueness to magnets: Only magnets can repel each other. No other material shows repulsion with a magnet. An iron bar or any magnetic material will always show attraction with a magnet but never repulsion.

2. Distinguishing magnets from iron: If we have two similar looking bars and need to identify which is a magnet and which is iron, attraction alone cannot help because:
- Magnet + Magnet → Can show attraction (unlike poles) or repulsion (like poles)
- Magnet + Iron → Will always show attraction only

3. Confirmation of magnetism: When two objects repel each other, we can be absolutely certain that both are magnets. There is no other explanation for repulsion. However, attraction could mean:

- Both are magnets with unlike poles, OR
- One is a magnet and other is iron/steel, OR
- One is a magnet and other is another magnetic material

Example: If we have three identical bars A, B, and C, and we find that A and B repel each other, we can be 100% sure that both A and B are magnets. But if A and C attract each other, we cannot be sure whether C is a magnet or just an iron bar.

Therefore, repulsion is the definitive, sure test to identify whether an object is a magnet or not.

SECTION E - Answers to Case Study Based Questions

Ans 19.

(a) Why did the steel ball move inside the box?
The steel ball moved inside the box because steel is a magnetic material (it contains iron) and is attracted by magnets. Even though there was a cardboard box between the magnet and the steel ball, the magnetic force passed through the cardboard (which is a non-magnetic material) and attracted the steel ball.

(b) Why didn't the wooden ball move?
The wooden ball did not move because wood is a non-magnetic material. It is not attracted by magnets. Since wood does not respond to magnetic forces, the movement of the magnet outside the box had no effect on the wooden ball inside.

(c) Conclusion about magnetic force from this demonstration:

This demonstration leads to two important conclusions:

Conclusion 1: Magnetic force can act through non-magnetic materials
The magnetic force from the bar magnet passed through the cardboard box (a non-magnetic material) and attracted the steel ball inside. This shows that magnetic force can penetrate non-magnetic materials without being blocked or significantly reduced. The cardboard does not act as a barrier to the magnetic field.

Conclusion 2: Magnetic force acts only on magnetic materials
The steel ball responded to the magnet while the wooden ball did not. This confirms that magnetic force acts only on magnetic materials like iron, steel, nickel, and cobalt. Non-magnetic materials like wood, plastic, paper, glass, etc., are not affected by magnetic forces.

Practical applications:
This principle is useful in many situations:
- We can separate magnetic materials from non-magnetic materials in a mixture
- We can use magnets to move steel objects through glass, plastic, or cardboard barriers
- We can pick up magnetic objects from water or other liquids without getting the magnet wet
- Medical applications like MRI use magnetic fields that can penetrate the human body (which is largely non-magnetic)

Ans 20.

(a) What device did Rahul make?
Rahul made a simple **magnetic compass** (or floating compass) using the bar magnet, cork, bowl, and water.

(b) How did this device help in finding direction?
This device helped in finding direction because a freely suspended magnet (or in this case, a floating magnet) always aligns itself in the North-South direction due to Earth's magnetic field. Once Rahul knew which direction was North, he could determine all other directions and find his way back to camp.

(c) Steps to make the device and how it works:

Steps Rahul must have followed:

1. **Preparation:** Rahul took out the bar magnet, cork piece, bowl, and water from his bag

2. **Create floating platform:** He placed the bar magnet horizontally through the cork piece (or on top of it), ensuring the magnet was balanced

3. **Set up water:** He filled the bowl with water to a sufficient level

4. **Float the assembly:** He gently placed the cork with the magnet on the water surface, ensuring it could float freely without touching the sides of the bowl

5. **Wait for alignment:** He waited patiently for the floating magnet to stop rotating and come to rest

6. **Identify North:** Once the magnet stopped moving, one end pointed towards North and the other towards South

7. **Mark the direction:** He marked the North direction using a stick or stone on the ground

How it works:

- The bar magnet is a permanent magnet with North and South poles
- The cork makes the magnet float on water, allowing it to rotate freely without friction
- Earth behaves like a giant magnet with magnetic poles
- The Earth's magnetic field interacts with the bar magnet
- The magnet aligns itself in the North-South direction due to this interaction
- The North pole of the magnet points towards geographic North
- Once North is known, East is to the right, West is to the left, and South is opposite to North

Using this simple device, Rahul was able to determine the correct direction and lead his friends back to safety. This is a practical application of magnetic properties and shows how scientific knowledge can be life-saving in emergency situations.
