

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. Lodestones are:

- (a) Artificial magnets
- (b) Natural magnets
- (c) Non-magnetic materials
- (d) Plastic magnets

Q2. The property by which we can distinguish a magnet from an iron bar is:

- (a) Attraction
- (b) Repulsion
- (c) Color
- (d) Weight

Q3. To protect the poles of a magnet during storage, we use:

- (a) Wooden pieces only
- (b) Plastic covers
- (c) Soft iron pieces (keepers)
- (d) Paper wrapping

Q4. When the South pole of a bar magnet is brought near the South pole of a compass needle, the needle will:

- (a) Not move
- (b) Move towards the bar magnet
- (c) Move away from the bar magnet
- (d) Rotate randomly

Q5. Which of the following is a non-magnetic material?

- (a) Iron
- (b) Nickel
- (c) Rubber
- (d) Cobalt

Q6. In a bar magnet marked with N and S, the North pole is indicated by:

- (a) N
- (b) S
- (c) Both N and S
- (d) Neither N nor S

Q7. The ancient Indian magnetic navigation device was called:

- (a) Chakra-yantra
- (b) Matsya-yantra
- (c) Disha-yantra
- (d) Vayu-yantra

Q8. A bar magnet attracts maximum iron filings at:

- (a) Its center
- (b) Throughout its length equally
- (c) Its two poles
- (d) Its painted surface

Q9. Earth's geographic North pole is:

- (a) Magnetic North pole
- (b) Near magnetic South pole
- (c) Non-magnetic
- (d) Between magnetic poles

Q10. To make an iron needle into a magnet, we should stroke it with a bar magnet:

- (a) In any direction randomly
- (b) In one direction repeatedly with the same pole
- (c) By hitting it hard
- (d) By heating and cooling it

SECTION B - Short Answer Questions (2 marks each)

Q11. Why should magnets not be dropped or hammered?

Q12. What is the difference between lodestones and artificial magnets?

Q13. Why does a compass needle deflect when brought near a magnet?

Q14. Name any two devices where magnets are commonly used in our daily life.

SECTION C - Short Answer Questions (3 marks each)

Q15. A student has three unmarked iron bars. Two of them are magnets. How can the student identify which two are magnets without using any other material?

Q16. Describe an activity to make a simple compass using a magnetized needle and cork floating in water.

Q17. Two ring magnets X and Y are placed on a vertical stand. Magnet X does not fall down and remains suspended in air above magnet Y. Explain this observation with the help of a diagram.

SECTION D - Long Answer Question (5 marks)

- Q18.** (a) What are magnetic and non-magnetic materials? Give two examples of each.
(b) Describe an activity to separate magnetic materials from non-magnetic materials in a mixture.
(c) A boy has iron nails, aluminum foil, plastic buttons, and steel pins mixed together. How can he separate these items using a magnet? Which items will be attracted?

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

Q19. Case Study 1:

During a science fair, students set up an interesting demonstration. They made a "magnetic garland" by taking a bar magnet and bringing it near a chain of small steel paper clips hanging freely. The clips formed a beautiful chain, each clip attracting the next one. When they removed the magnet, the entire chain fell down. They then tried the same activity with aluminum clips, but nothing happened.

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

- (a) Why did steel clips form a chain with the magnet? (1 mark)
- (b) Why did the chain fall when the magnet was removed? (1 mark)
- (c) Why didn't aluminum clips form a chain? Explain the difference between steel and aluminum in terms of magnetic properties. (2 marks)

Q20. Case Study 2:

A teacher performed a demonstration in class. She took three identical bar magnets and arranged them on a table in the shape shown below: One horizontal magnet at the bottom with North pole on the right side. One vertical magnet on the left with North pole at bottom. One vertical magnet on the right side. She asked students to identify the poles of the other two magnets based on the fact that all three magnets were at rest and not moving away from each other.

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

- (a) What must be the pole at the top of the left vertical magnet? (1 mark)
- (b) What must be the pole at the bottom of the right vertical magnet? (1 mark)
- (c) Explain how you determined these poles using the law of magnetic poles. (2 marks)

SECTION A - Answers to MCQs

Ans 1. (b) Natural magnets

Lodestones are naturally occurring magnets discovered in ancient times. They were used by sailors for navigation before artificial magnets were developed.

Ans 2. (b) Repulsion

Repulsion is the property that distinguishes a magnet from an iron bar. A magnet can show both attraction and repulsion, while an iron bar can only show attraction when brought near a magnet.

Ans 3. (c) Soft iron pieces (keepers)

Soft iron pieces called keepers are placed across the poles of magnets during storage. They help maintain the magnetic strength by providing a path for the magnetic field lines.

Ans 4. (c) Move away from the bar magnet

When like poles (South-South) are brought near each other, they repel. So the compass needle will move away from the bar magnet.

Ans 5. (c) Rubber

Rubber is a non-magnetic material. It is not attracted by magnets. Iron, nickel, and cobalt are magnetic materials.

Ans 6. (a) N

In a bar magnet, the North pole is indicated by the letter N, and the South pole is indicated by the letter S.

Ans 7. (b) Matsya-yantra

Matsya-yantra (or Machchh-yantra) was the ancient Indian magnetic navigation device. It consisted of a magnetized fish-shaped iron piece kept in a vessel of oil.

Ans 8. (c) Its two poles

A bar magnet attracts maximum iron filings at its two poles because the magnetic force is strongest at the poles.

Ans 9. (b) Near magnetic South pole

Earth's geographic North pole is near Earth's magnetic South pole. This is why the North pole of a compass needle (which is magnetic North) points towards geographic North.

Ans 10. (b) In one direction repeatedly with the same pole

To magnetize an iron needle, we should stroke it repeatedly in one direction with the same pole of a bar magnet. This aligns the magnetic domains in the needle.

SECTION B - Answers to Short Answer Questions

Ans 11.

Magnets should not be dropped or hammered because:

1. **Loss of magnetism:** When magnets are dropped from height or hammered, the impact disturbs the alignment of magnetic domains inside the magnet. This causes the magnet to lose its magnetic properties partially or completely.
2. **Permanent damage:** The magnetic strength may decrease significantly and in some cases, the magnet may become completely demagnetized. Therefore, magnets should be handled carefully and stored properly.

Ans 12.

Lodestones:

- Natural magnets found in nature
- Discovered in ancient times
- Irregular shape
- Relatively weak magnetic strength

Artificial magnets:

- Man-made magnets created from iron, nickel, cobalt and their alloys
- Made in laboratories and industries
- Can be made in various shapes (bar, U-shaped, ring, etc.)
- Can have much stronger magnetic strength than lodestones

Ans 13.

A compass needle deflects when brought near a magnet because:

1. The compass needle is itself a small magnet with North and South poles
2. When another magnet is brought close, the magnetic fields interact
3. According to the law of magnetic poles, like poles repel and unlike poles attract
4. This force causes the compass needle to rotate and deflect from its original North-South position
5. The direction and extent of deflection depends on which pole of the magnet is brought near which pole of the compass needle

Ans 14.

Two devices where magnets are commonly used:

1. **Refrigerator doors:** Magnets are used in refrigerator door seals to keep the door closed tightly and maintain the cool temperature inside.
2. **Pencil boxes and purse clasps:** Small magnets are used in pencil boxes, bags, and purses to keep them closed securely.

Other examples: Magnetic compass, loudspeakers, electric motors, magnetic board dusters, credit/debit cards, hard disk drives, MRI machines.

SECTION C - Answers to Short Answer Questions

Ans 15.

Method to identify the two magnets:

Step-by-step procedure:

1. Label the three bars as A, B, and C
2. Bring bar A near bar B at different positions and observe
3. Bring bar B near bar C at different positions and observe
4. Bring bar A near bar C at different positions and observe

Analysis:

- If two bars only attract each other at all positions, one is a magnet and other is iron
- If two bars show repulsion at any position, both are magnets (like poles repelling)
- The bar that shows only attraction with both others is the iron bar
- The two bars that show repulsion with each other are the magnets

Key principle: Only magnets can repel each other. An iron bar will always attract a magnet but never repel. Therefore, the pair showing repulsion consists of the two magnets.

Ans 16.**Activity to make a simple compass:****Materials required:**

- Iron sewing needle
- Permanent bar magnet
- Cork piece
- Glass bowl
- Water
- Wooden table

Procedure:

1. **Magnetize the needle:** Place the iron needle on a wooden table. Take one pole of the bar magnet and place it at one end of the needle
2. **Stroke repeatedly:** Move the magnet along the length of the needle to the other end. Lift the magnet and bring the same pole back to the starting point. Repeat this 30-40 times in the same direction with the same pole
3. **Test magnetization:** Bring some iron filings near the needle to check if it has become magnetic
4. **Prepare floating assembly:** Pass the magnetized needle horizontally through a cork piece so that the needle remains balanced
5. **Float in water:** Fill the glass bowl with water and gently float the cork with the needle on the water surface. Ensure the needle stays above water level
6. **Observe alignment:** The needle will rotate and align itself in the North-South direction
7. **Test your compass:** Rotate the cork gently. After it stops, it will again point in the same North-South direction. Your magnetic compass is ready!

Ans 17.

Observation: Magnet X remains suspended in air above magnet Y without falling down.

Explanation:

This happens due to magnetic repulsion between like poles. The arrangement must be such that the like poles of both magnets are facing each other.

Diagram:

Vertical stand

|

| ---- [Ring Magnet X - South pole facing down]

|

| (Air gap - suspended)

|

| ---- [Ring Magnet Y - South pole facing up]

|

Base

Detailed explanation:

1. Both ring magnets are placed on a vertical stand with their holes aligned
2. The South pole of magnet X is facing downward
3. The South pole of magnet Y is facing upward
4. Since like poles (South-South) repel each other, there is a repulsive force between them
5. The repulsive force from magnet Y pushes magnet X upward
6. When this upward magnetic repulsive force equals the downward gravitational force on magnet X, magnet X remains suspended in air
7. This demonstrates the property of magnetic repulsion between like poles

Note: The same effect would occur if both North poles were facing each other.

SECTION D - Answer to Long Answer Question

Ans 18.

(a) Magnetic and Non-magnetic materials:

Magnetic materials: Materials that are attracted towards a magnet are called magnetic materials.

Examples: 1. Iron, 2. Nickel

(Other examples: Cobalt, steel, and some alloys)

Non-magnetic materials: Materials that are not attracted towards a magnet are called non-magnetic materials.

Examples: 1. Wood, 2. Plastic

(Other examples: Glass, rubber, paper, aluminum, copper, gold, silver)

(b) Activity to separate magnetic from non-magnetic materials:

Materials required:

- Mixture containing both magnetic and non-magnetic materials
- A strong bar magnet
- Two containers

Procedure:

1. Take the mixture and spread it on a clean surface
2. Bring a strong bar magnet close to the mixture
3. Move the magnet slowly over the entire mixture

4. The magnetic materials will get attracted to the magnet and stick to it
5. Carefully remove these magnetic materials from the magnet and place them in container 1
6. The non-magnetic materials will remain on the surface
7. Collect these non-magnetic materials in container 2
8. Repeat the process to ensure complete separation

Result: Magnetic and non-magnetic materials are successfully separated based on their magnetic properties.

(c) Separating mixed items using magnet:

When a magnet is brought near the mixture of iron nails, aluminum foil, plastic buttons, and steel pins:

Items that will be attracted:

1. **Iron nails** - Will be strongly attracted (iron is magnetic)
2. **Steel pins** - Will be strongly attracted (steel contains iron and is magnetic)

Items that will NOT be attracted:

1. **Aluminum foil** - Will not be attracted (aluminum is non-magnetic)
2. **Plastic buttons** - Will not be attracted (plastic is non-magnetic)

Separation method:

1. Pass the magnet over the mixture
2. Iron nails and steel pins will stick to the magnet - collect them separately
3. Aluminum foil and plastic buttons will remain - these can be separated manually by hand as they look different
4. This is a practical example of how magnetic separation is used in recycling industries and waste management

SECTION E - Answers to Case Study Based Questions

Ans 19.

(a) Why did steel clips form a chain?

Steel clips formed a chain because steel is a magnetic material (it contains iron). When the bar magnet was brought near, the first clip got attracted and stuck to the magnet. This clip itself became temporarily magnetized and attracted the next clip. Each clip in turn magnetized the next one, forming a chain. This is called magnetic induction.

(b) Why did the chain fall when the magnet was removed?

The chain fell when the magnet was removed because the clips were only temporarily magnetized. They did not become permanent magnets. Once the magnetic field from the bar magnet was removed, the clips lost their induced magnetism and could no longer hold each other. Without the magnetic force, gravity pulled them down.

(c) Why didn't aluminum clips work? Explain the difference:

Aluminum clips did not form a chain because aluminum is a non-magnetic material. Unlike steel (which contains iron), aluminum is not attracted to magnets.

Difference in magnetic properties:

- **Steel:** Magnetic material, contains iron, attracted by magnets, can be temporarily magnetized

through induction, widely used in making temporary magnets

- **Aluminum:** Non-magnetic material, not attracted by magnets, cannot be magnetized, its atomic structure does not allow magnetic properties

This fundamental difference in atomic structure determines whether a material is magnetic or non-magnetic. Only materials containing iron, nickel, cobalt, or certain alloys show magnetic properties.

Ans 20.

(a) Pole at the top of left vertical magnet:

The pole at the top of the left vertical magnet must be **South pole**.

(b) Pole at the bottom of right vertical magnet:

The pole at the bottom of the right vertical magnet must be **South pole**.

(c) Explanation using law of magnetic poles:

Given information:

- Three bar magnets arranged in a shape
- Bottom horizontal magnet: North pole on the RIGHT side, so South pole on the LEFT side
- Left vertical magnet: North pole at BOTTOM
- All magnets are at rest (not repelling)

Analysis using law of magnetic poles:

Like poles repel, unlike poles attract

For the left vertical magnet:

- Its bottom (North pole) is touching the left end of the horizontal magnet (South pole)
- North and South are unlike poles → they attract → stable position ✓
- Therefore, the top of left vertical magnet must be South pole

For the right vertical magnet:

- Its bottom must be touching the right end of horizontal magnet (North pole)
- For stable position without repulsion, unlike poles must meet
- Right end of horizontal magnet is North
- So bottom of right vertical magnet must be South
- North and South are unlike poles → they attract → stable position ✓
- Therefore, the top of right vertical magnet must be North pole

This arrangement ensures all magnets remain at rest because all touching poles are unlike poles that attract each other.