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Introduction

Magnets and Their Importance

Magnets have unique properties that make them essential in various applications, from navigation to everyday items like purses, pencil bo materials, shapes, and behaviours.

Types of Magnets

Natural Magnets

Lodestones: Naturally occurring magnets found in nature, primarily composed of magnetite. They have been used since ancient times for

Artificial Magnets

Soft Magnets: Made from materials like iron that can be easily magnetised but lose their magnetism quickly when the external magnetic

Hard Magnets: Made from materials like neodymium and samarium-cobalt, which retain their magnetism for a long time and are used in

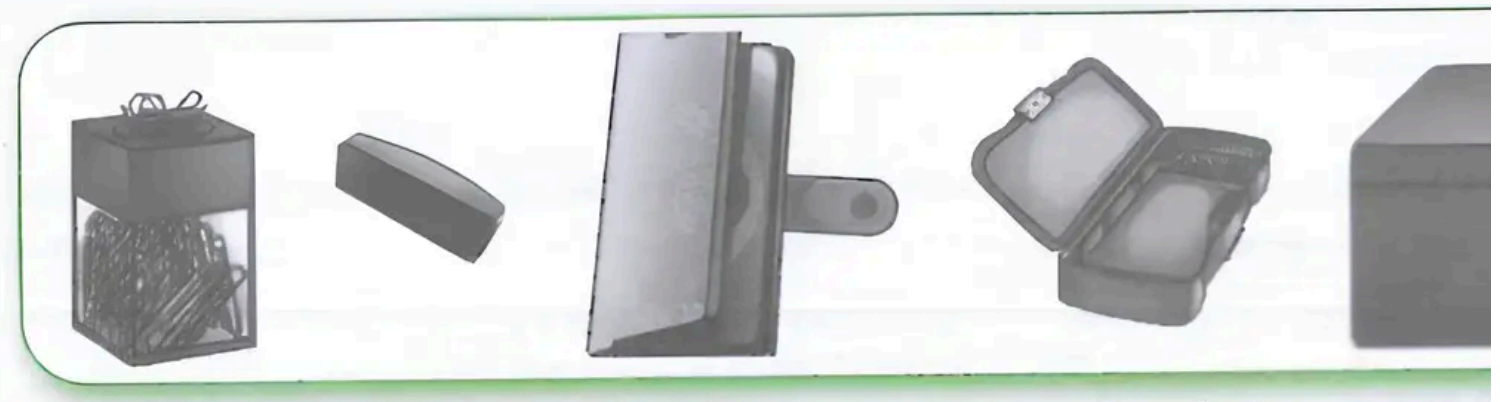


Fig. 4.1: Some common items that have magnet

This image shows six everyday items that have magnets attached to them. Examples include a container holding paper clips, an eraser wit magnetic lid closure, a refrigerator door with a magnet to keep it shut, and small magnetic decorations on a fridge. These examples demor

Magnetic vs. Non-Magnetic Materials

Identifying Magnetic Materials

Objective: Determine which materials are attracted to a magnet.

Materials Needed: Magnet (bar magnet or any shape), various objects such as pencil, eraser, paperclip, plastic toy.

Procedure

1. Prediction: Guess which objects will be attracted to the magnet based on their material (e.g., metal objects are more likely to be attracte

2. Observation: Bring the magnet close to each object and note if the object sticks to the magnet.

Table 4.1: Identifying Materials Att

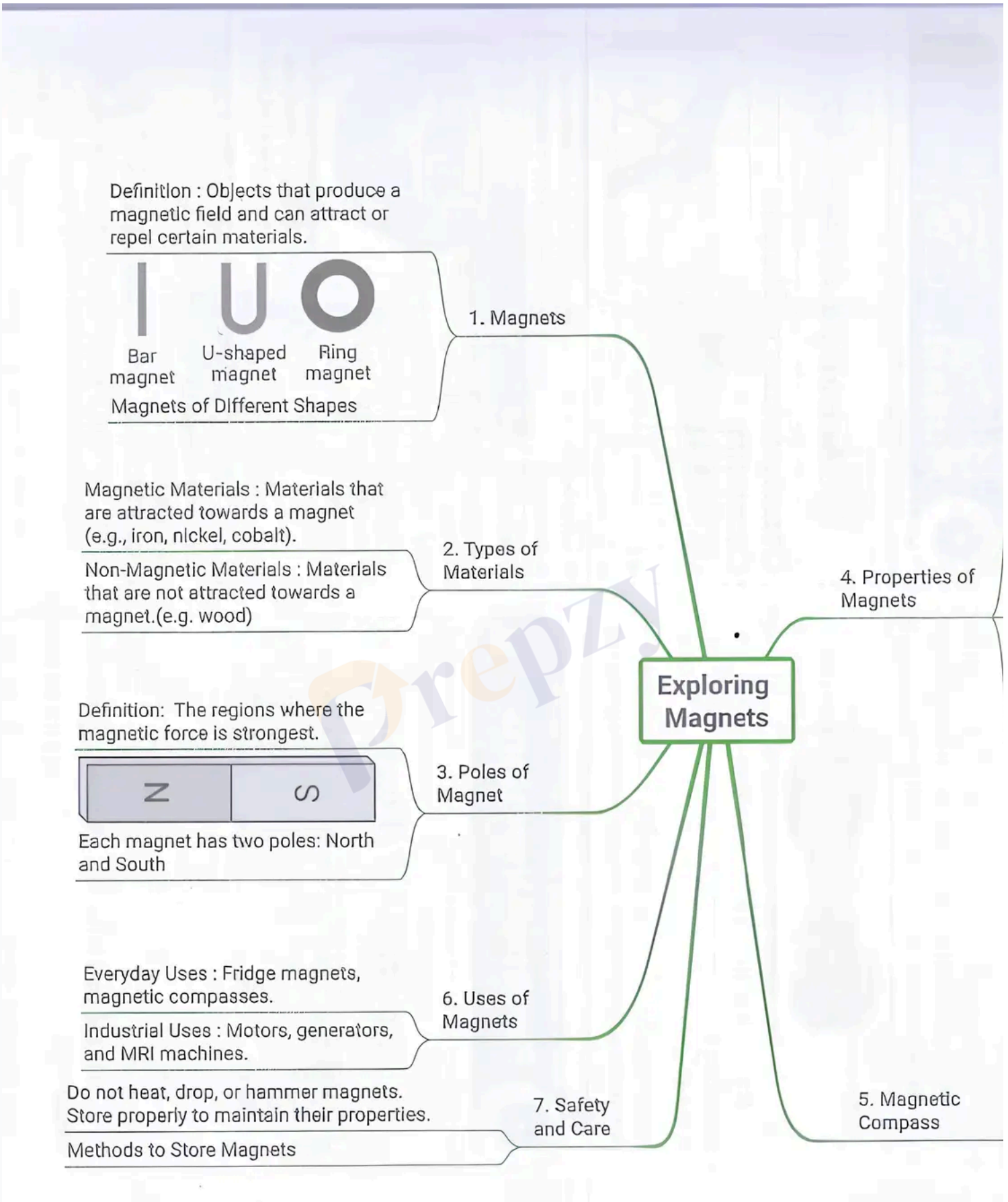
Name of Object	Material (plastic/wood/glass/iron/other)	Att
		Predi
Pencil	Wood	N
Eraser	Rubber	N
Paperclip	Iron	Y
Plastic Toy	Plastic	N

This image shows a table listing four objects, their materials, and whether each is attracted by a magnet based on prediction and observat

Conclusion

Magnetic Materials: Materials like iron, nickel, and cobalt are attracted to magnets because they contain magnetic domains that align wi

Non-Magnetic Materials: Materials like wood, rubber, and plastic are not attracted to magnets because they do not have magnetic prop



This mind map explains key concepts about magnets including shapes, types of materials, poles, properties, magnetic compass, uses, and

Poles of a Magnet

Identifying Poles of a Magnet

Objective: Observe how iron filings align around a magnet to identify its poles.

Materials Needed: Bar magnet, iron filings, sheet of paper.

Procedure

Spread iron filings evenly on the paper. Place the bar magnet on top of the iron filings. Gently tap the paper to make the filings settle.

Observation

Iron filings cluster around the ends of the magnet, creating a pattern that shows magnetic field lines extending from the North to the South

Fig. 4.2: Iron filings sticking

The filings arrange themselves along the magnetic field lines, making the invisible magnetic field visible. Most filings stick closely at the po

Conclusion

The ends of the magnet where the magnetic force is strongest are called poles. A bar magnet has a North pole and a South pole. The magr

Finding Directions

Using a Magnetic Compass

Objective: Demonstrate how a magnetic compass aligns with Earth's magnetic field to show directions.

Materials Needed: Bar magnet, thread, compass.

Procedure

1. Suspend Magnet: Tie the magnet to a thread and let it hang freely.

2. Alignment: Allow the magnet to come to rest and observe its alignment.

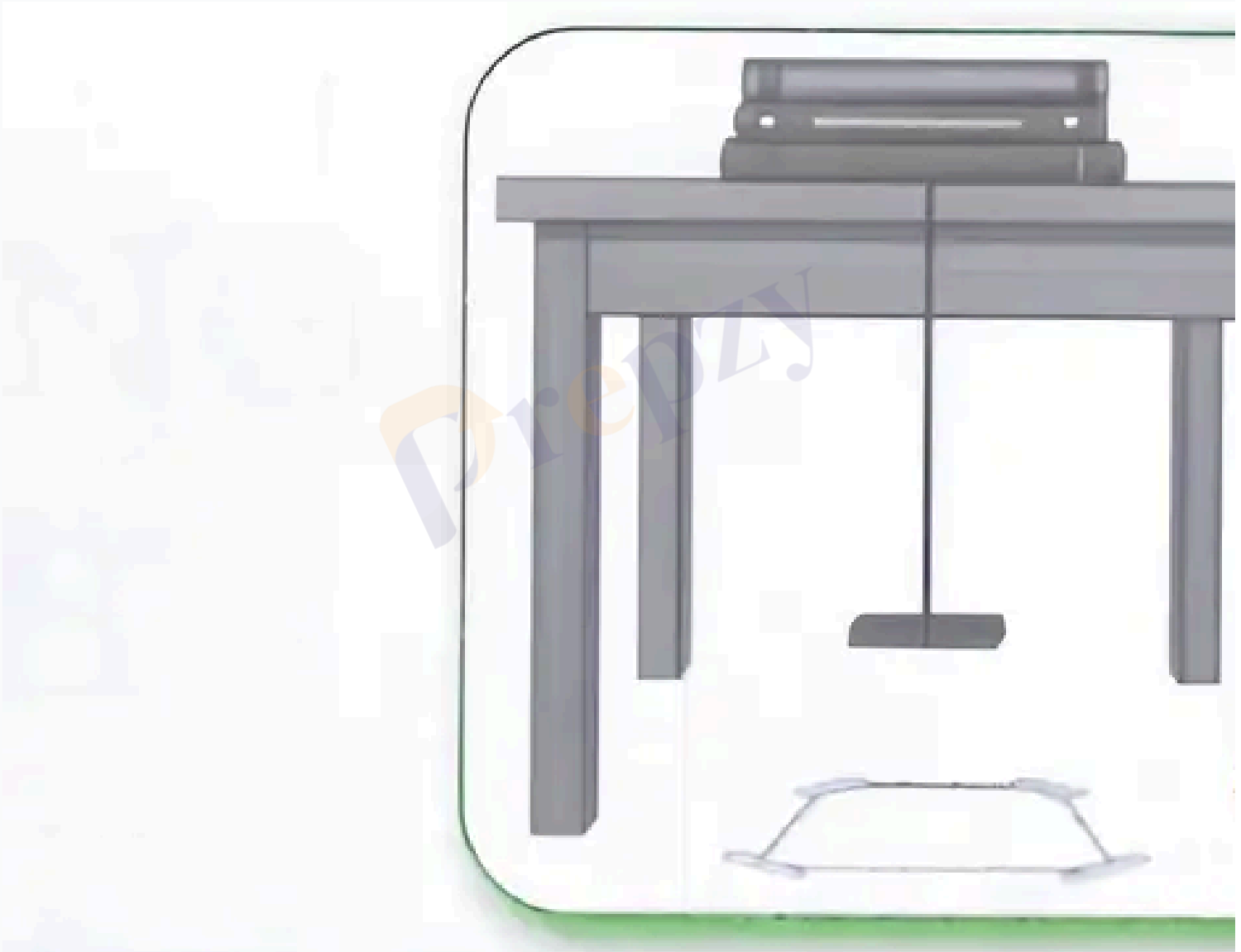


Fig. 4.3: A freely suspended

The suspended magnet will align itself in the North-South direction due to Earth's magnetic field.

Conclusion

A freely suspended magnet aligns with Earth's magnetic field, showing the North-South direction. This principle is used in magnetic compas

Simple Magnetic Compass

Constructing a Simple Compass

Materials Needed: Cork piece, iron sewing needle, permanent bar magnet, glass bowl, water.

Fig. 4.7(a): Ma
iron needle a

Rub the iron needle with the magnet in one direction to magnetise it. This aligns the tiny magnetic regions inside the needle, making it a m

Procedure

1. Magnetise the needle by stroking it with the magnet multiple times.

2. Float the needle by placing it through a cork and placing it on water in a glass bowl.

Observation

The needle aligns itself along the North-South direction when it settles.

Conclusion

This homemade compass demonstrates the same principle as modern compasses, using a magnetised needle to find directions.

Fig. 4.7(b)): A c
needle in a bowl

The needle floating on cork in water can rotate freely and aligns with Earth's magnetic field, pointing towards magnetic north.

Attraction and Repulsion

Testing Magnetic Attraction and Repulsion

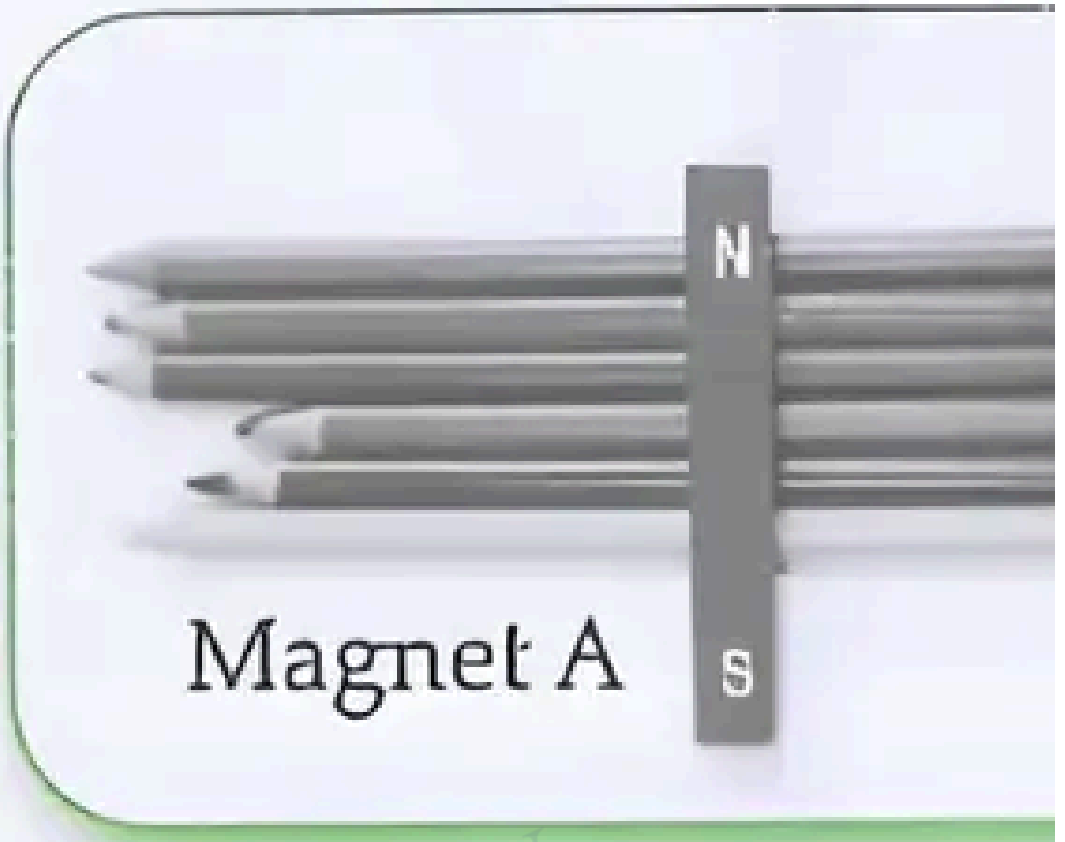
Objective: Observe how different poles of magnets interact with each other.

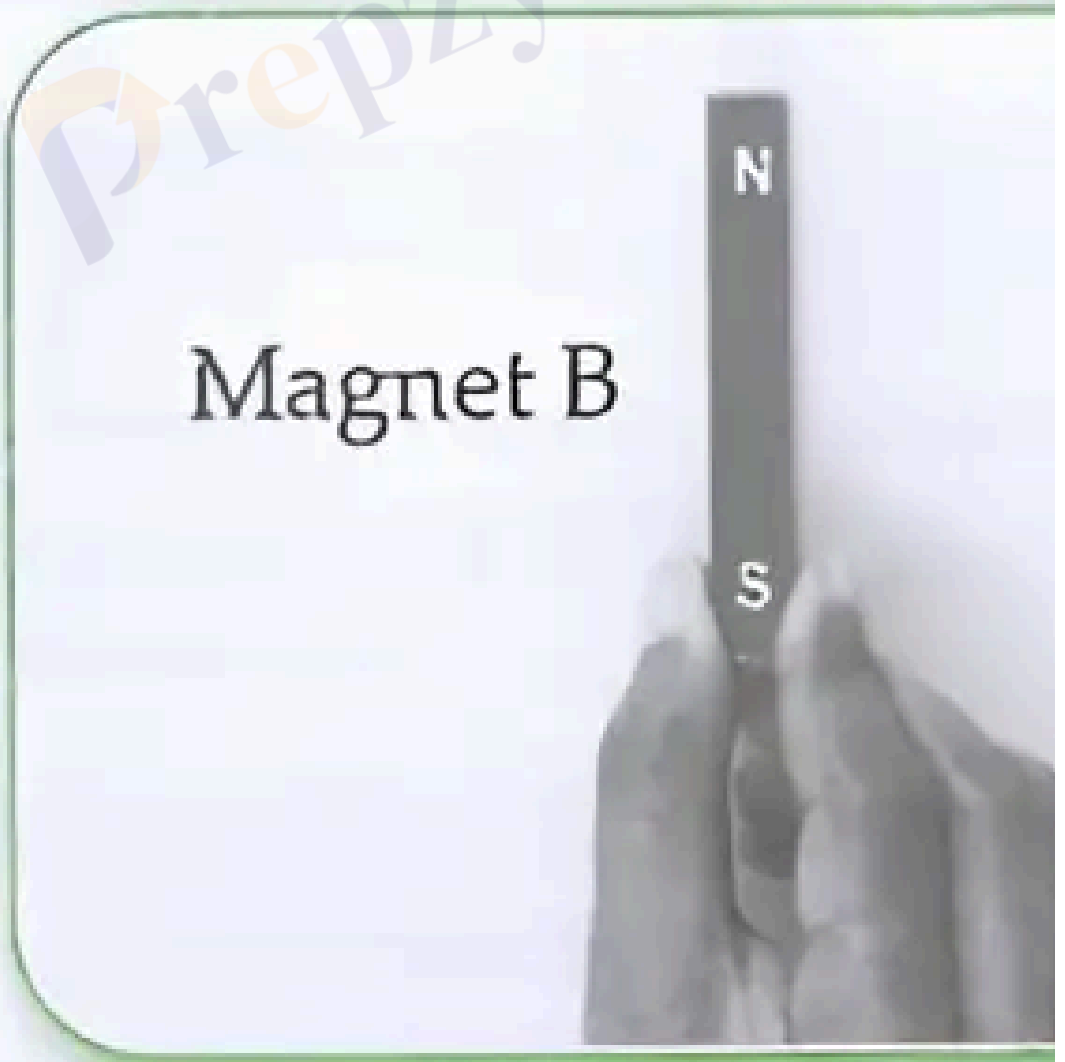
Materials Needed: Two bar magnets.

Procedure

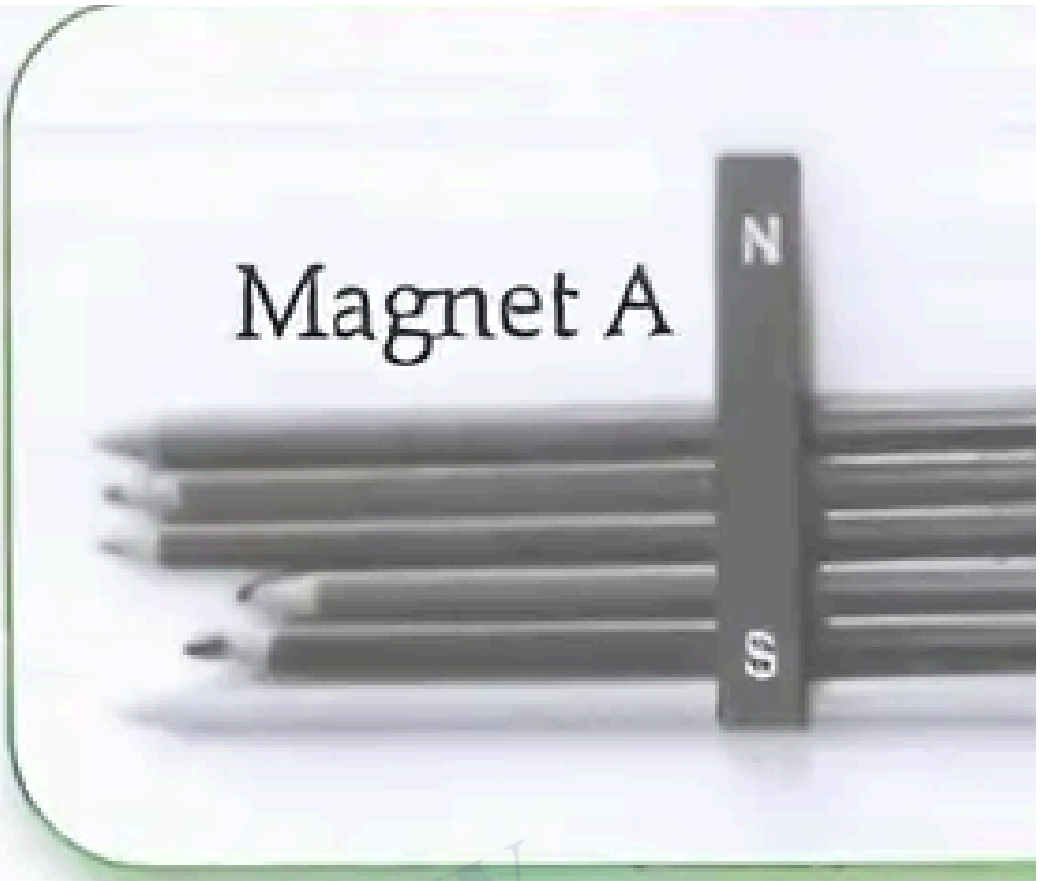
1. Test Attraction: Bring opposite poles of the magnets close and observe attraction.

2. Test Repulsion: Bring like poles close and observe repulsion.





(a)



(b)

Fig. 4.5: Interaction between

Opposite poles attract each other, while like poles repel each other.

Conclusion

Magnets exhibit attraction between opposite poles (North-South) and repulsion between like poles (North-North or South-South).

Magnetic Interaction with Compass

Objective: Observe the effect of a bar magnet on a magnetic compass needle.

Materials: Magnetic compass, bar magnet.

Procedure

1. Place the compass on a flat surface and wait for the needle to stabilise pointing North.

2. Bring the North pole of the bar magnet close to the North pole of the compass needle and observe deflection.

3. Repeat with the South pole of the bar magnet.

Observation

The compass needle deflects away from the North pole of the bar magnet (repulsion) and towards the South pole (attraction).

Conclusion

The compass needle deflects away from like poles and towards opposite poles due to magnetic forces.

Effect of Non-Magnetic Materials

Effect on Magnetic Field

Objective: Determine if non-magnetic materials affect the magnetic field.

Materials Needed: Magnetic compass, various non-magnetic materials (wood, cardboard, plastic, glass).

Procedure

1. Place a non-magnetic material between the compass and a magnet.

2. Observe if the deflection of the compass needle changes.

Table 4.2: Observing the Effect of Non

Material Placed	Obser
Wood	No appreciable ch
Cardboard	No appreciable ch
Plastic	No appreciable ch
Glass	No appreciable ch

Non-magnetic materials like wood, cardboard, plastic, and glass cause no appreciable change in compass needle deflection.

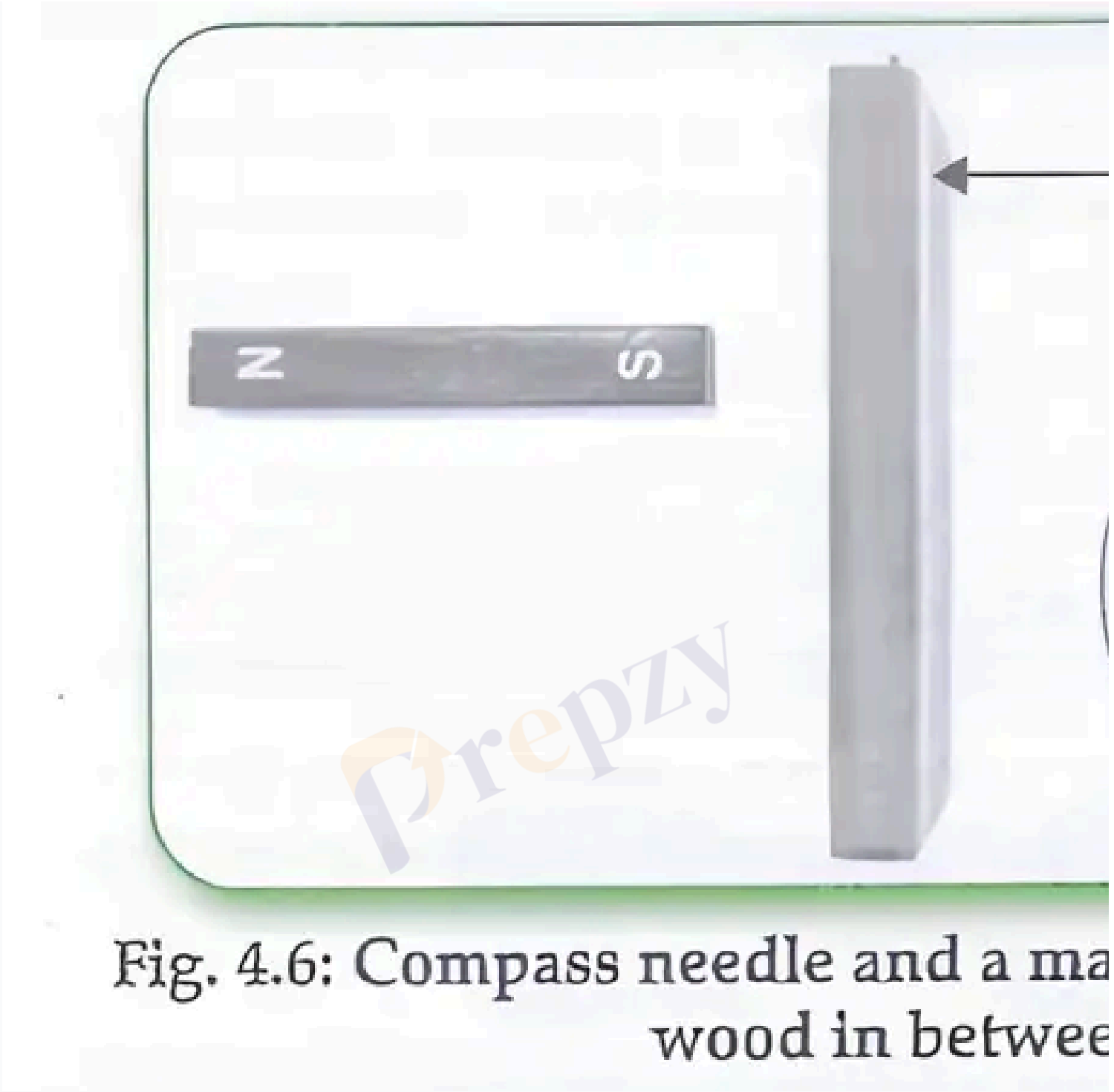


Fig. 4.6: Compass needle and a ma
wood in betwee

Magnetic fields can pass through non-magnetic materials, as shown by the compass needle deflecting even with wood placed between the

Conclusion

Non-magnetic materials do not affect the deflection of the compass needle, showing that magnetic fields pass through these materials.

Fun with Magnets

Magnetic Activities

1. Magnetic Garland: Create decorative garlands using magnets by attaching magnets to decorative items and arranging them on a strir

2. Magnetic Maze: Move steel balls through a maze using a magnet from underneath without touching the balls.

3. Paperclip Picker: Retrieve paper clips from water using a magnet without getting wet.

Solved Examples

Practice Set

- **Level 1 – Easy:** Name two natural magnets and two artificial magnets.
- **Level 2 – Moderate:** Explain why iron is attracted to magnets but plastic is not.
- **Level 3 – Challenging:** Describe how a simple magnetic compass works and why it points North-South.

Answer Key

- **Level 1:** Natural magnets: lodestones; Artificial magnets: soft magnets (iron), hard magnets (neodymium, samarium-cobalt).
- **Level 2:** Iron is attracted to magnets because it has magnetic domains that align with the magnetic field. Plastic does not have these
- **Level 3:** A simple magnetic compass uses a magnetised needle that aligns with Earth's magnetic field. The needle points North-South

Quick Reference Table

Common Mistakes and Misconceptions

Glossary