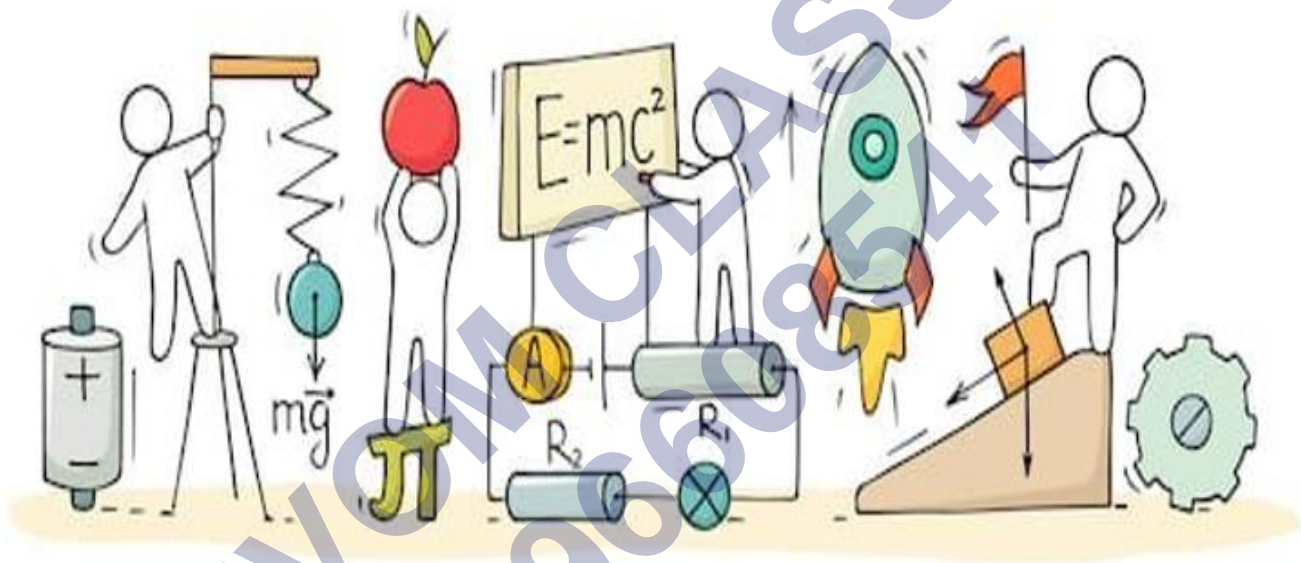


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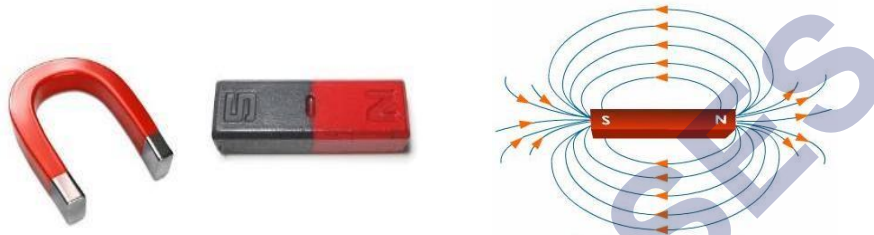
## Chapter 13: Fun with Magnets



## Fun with Magnets

### Magnet

- A magnet is a material or an object which produces a magnetic field.





### Property of a Magnet



When a bar magnet is suspended freely, it always comes to rest in the North-South direction.

### Discovery of Magnets

- The most popular legend for the discovery of magnets is that of an elderly Cretan shepherd named Magnes, who lived about 4,000 years ago.
- To control his herd, he used a stick which got attached to a rock, and he had to pull hard to free the stick.
- This rock was a natural magnet, and it attracted the iron tip of the stick.
- The rock was named magnetite, after either Magnesia or Magnes.
- Magnets made from pieces of iron are known as artificial magnets.
- Artificial magnets are available in different shapes. Examples:

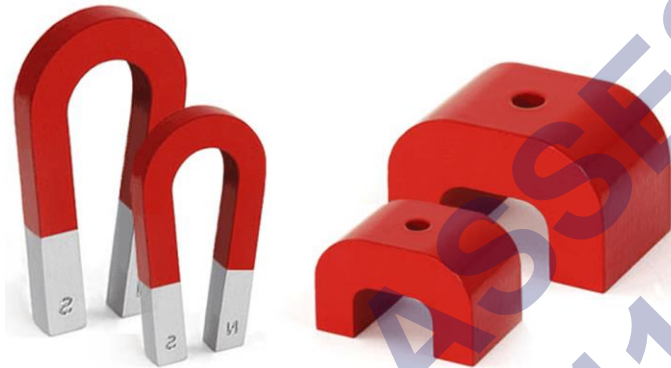
Bar magnet	
Horse-shoe magnet	

Cylindrical or a ball-ended magnet



## Types of Magnets

- Two major types of magnets are: Permanent magnets and temporary magnets.
- **Permanent Magnets:** These magnets retain their magnetism over a long period of time.



- **Temporary Magnets:** These magnets retain their magnetic properties only under certain conditions.



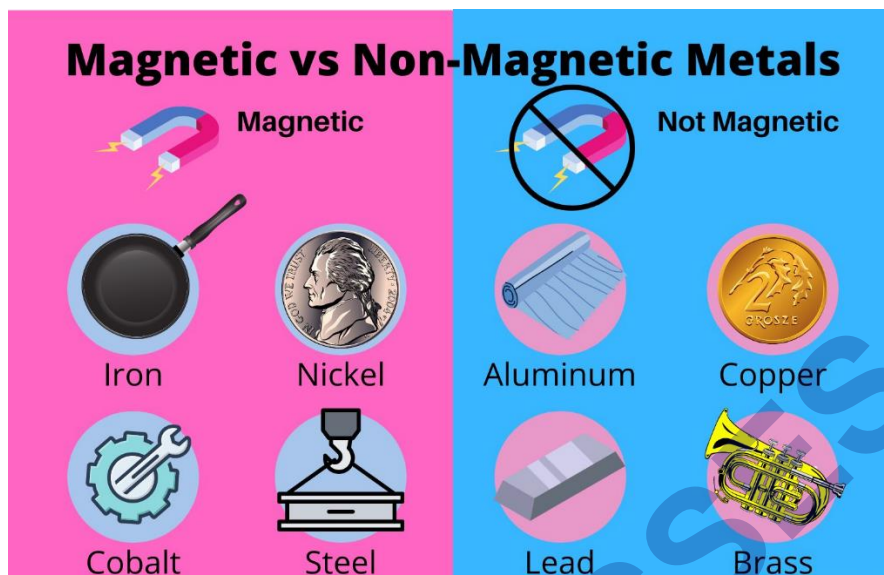
## Magnetic and Non-Magnetic Materials

### Magnetic Material

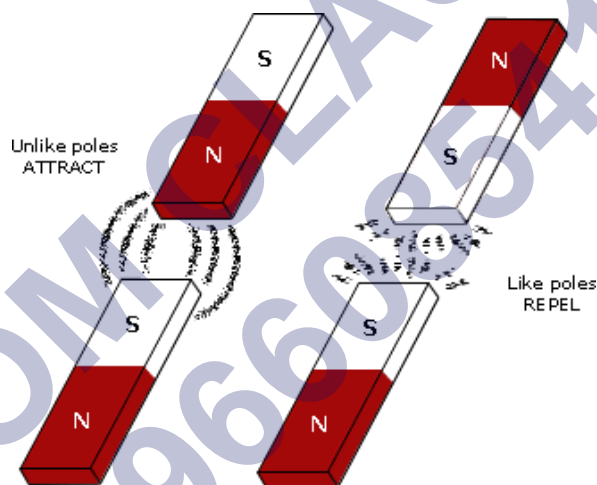
- The material which gets attracted towards a magnet is known as magnetic material.
- Examples: Iron, nickel and cobalt.

### Non-Magnetic Material

- The material which is not attracted towards a magnet is known as non-magnetic material.
- Examples: Paper, plastic, wood and glass.



## Poles of a Magnet



- Magnets have two poles, called the North (N) and the South (S) poles.
- There are no magnets with only one pole.
- The end of the magnet which points towards the North is called the North Pole of the magnet, while the end of the magnet which points towards the South is called the South Pole of the magnet.
- Like poles repel each other, whereas unlike poles attract each other.

## Finding Directions

- A device known as a compass is used as a navigational instrument.
- It is usually a small box with a glass cover.
- It has a dial with directions marked on it, and a magnetised needle is pivoted inside the box, which can rotate freely.



- The compass is kept at a place where directions are to be found and is rotated until the north (N) and the south (S) marked on the dial are at the two ends of the needle.
- The 'N' mark on the compass points to the north. North corresponds to  $0^\circ$ . The angles increase clockwise. So, East is  $90^\circ$ , South is  $180^\circ$  and West is  $270^\circ$ .

### Make your Own Magnet

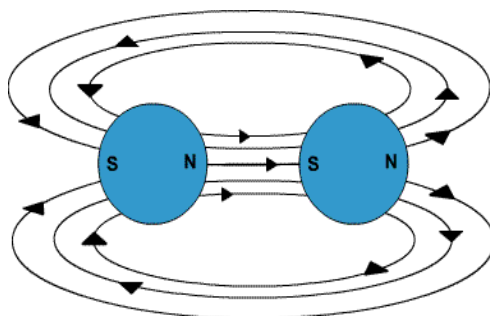


- A magnet can be made using basic materials available at home such as a rectangular piece of iron and a bar magnet by moving it along the length of the iron bar.
- Place a pin or some iron filings near the iron bar to check whether it has become a magnet.

### Attraction and Repulsion between Magnets

**Magnets exert forces of attraction or repulsion on each other.**

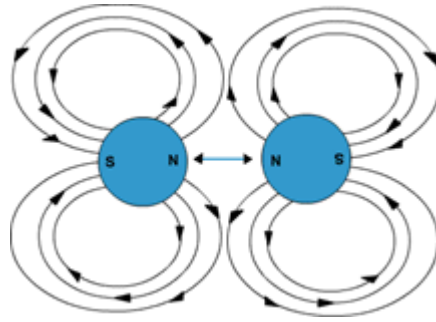
**Attraction:** When two magnets or magnetic objects with different poles are brought close to each other, a force of attraction pulls them together.



- Magnets also attract materials such as iron, nickel and cobalt.

**Repulsion:** When two magnets or magnetic objects with like poles face each other, a force of

repulsion pushes them apart.



## Preserving Magnets

If a magnet is hammered, heated or fallen to the ground, then it loses its magnetism. This phenomenon is called demagnetization. Even if two magnets are placed adjacent to each other by their opposite poles, they lose their magnetism.

To store magnets carefully, we should follow the following steps:

- Keep bar magnets in a wooden box with unlike poles with the same side
- Put a piece of a wood between two magnets to separate them.
- Place magnetic keepers (soft iron bars) to the ends of both magnets.
- Use magnets often to prevent them from self-demagnetization (a phenomenon in which magnets lose their magnetism without getting used over a long period of time).

**Important Note:** Do not go near or inside the MRI room by taking magnets with you.



**Magnets lose their property on heating, hammering and dropping**

## Uses Of Magnets

The uses of magnets are:

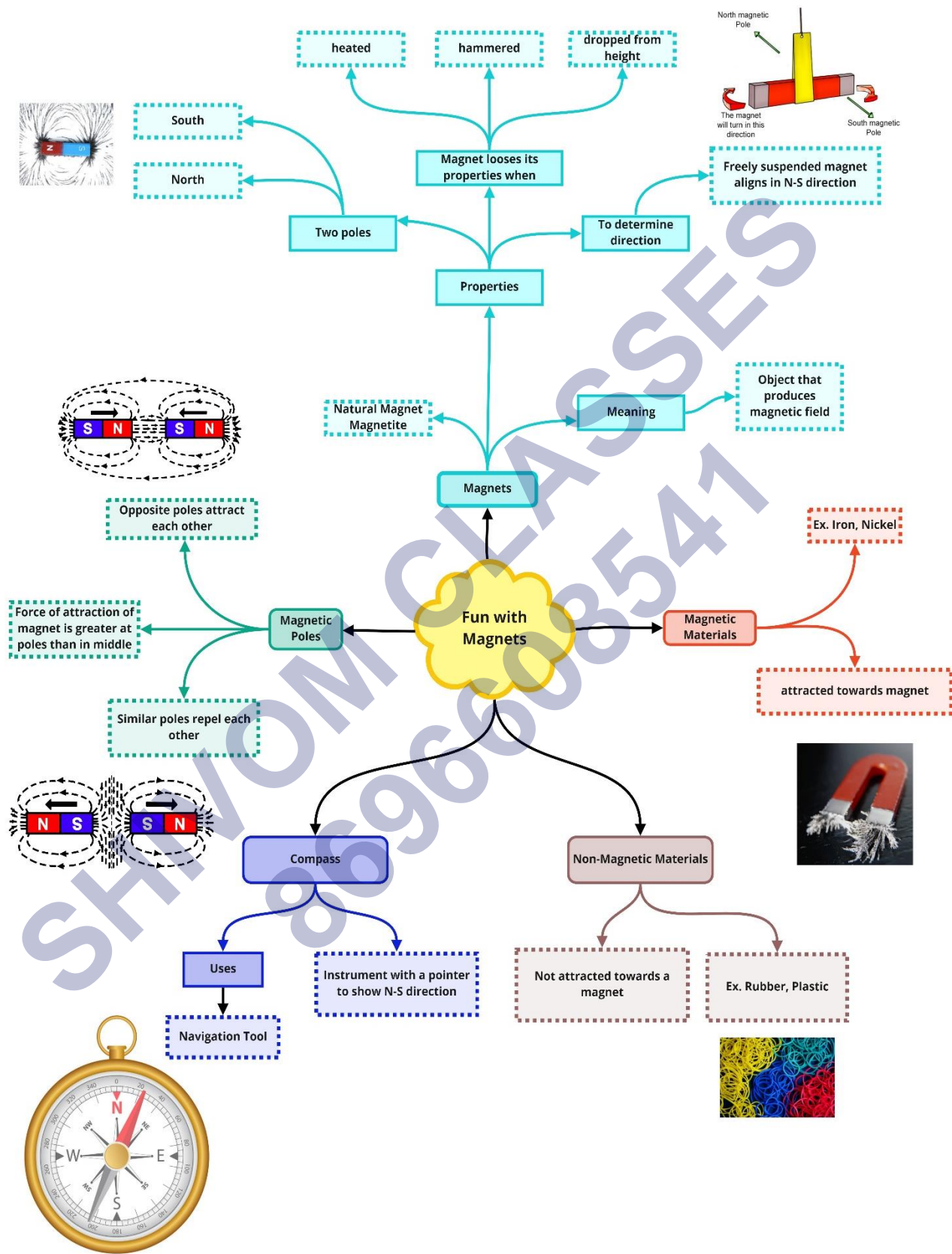
- They are used in the refrigerator doors to close automatically.
- The information of credit and debit cards is stored in the magnetic strip present on them.
- They are used to produce storing devices such as hard discs.



- They are used to separate magnetic substances from a mixture.
- They are used to construct various medical machines such as Magnetic Resonance Imaging (MRI).
- They help dynamo to generate electricity.



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## Important Questions

### Multiple Choice Questions:

Question 1. Which is an example of a magnetic substance?

- (a) Iron
- (b) Nickel
- (c) Cobalt
- (d) All of these

Question 2. Magnets have a shape

- (a) cylindrical
- (b) ball ended
- (c) horse shoe
- (d) all of these

Question 3. When a bar magnet is brought near iron dust, most of the dust sticks

- (a) near the middle
- (b) equally everywhere
- (c) near two ends
- (d) at the middle and ends

Question 4. A freely suspended bar magnet rests in

- (a) north-south directions
- (b) east-west directions
- (c) upside down
- (d) any direction by chance

Question 5. Attraction is seen between the poles of two bar magnets in the case of

- (a) N-pole of one magnet with N-pole of other
- (b) N-pole of one magnet with S-pole of other
- (c) S-pole of one magnet with S-pole of other
- (d) all of these cases will show attraction

Question 6. Which is a natural magnet?

- (a) Magnetite
- (b) Haemetite

- (c) Bakelite
- (d) Copper

Question 7. Choose the wrong statement

- (a) Heat can destroy magnetic properties of a magnet.
- (b) Magnets are made up of different materials and different shapes.
- (c) There is a maximum attraction in middle of a magnet.
- (d) Magnetite does not show magnetic properties.

Question 8. The magnetic properties of a magnet cannot be destroyed by

- (a) hammering
- (b) heating
- (c) dropping on a hard surface
- (d) boiling

Question 9. Which two ends of a magnet are called magnetic poles?

- (a) North pole
- (b) South pole
- (c) North and south pole
- (d) Self demagnetisation

Question 10. Magnets attract

- (a) wood
- (b) plastic
- (c) paper
- (d) iron

### Very Short Question:

1. Name the compound of iron contained in lode stone.
2. Name the shepherd after which magnet was named.
3. How can you separate a magnetic substance from a mixture?
4. At which place on a magnet, its magnetic force is maximum?
5. In which direction does a suspended magnet come to rest?
6. What happens when N-pole of a magnet is brought near the N-pole of a suspended magnet?

### Short Questions:

1. Draw the diagram of (a) Bar magnet (b) Horse-shoe magnet.
2. Identify magnetic and non-magnetic substances from the list given below: Iron, Steel, Nickel, Plastic, Wood, Copper and a Stainless Steel spoon
3. Draw a diagram of a magnetic compass.
4. Write main properties of a magnet.
5. Write two methods by which a magnet can be demagnetised.
6. It is advised to keep the magnets away from television, mobiles, CD and computers Explain why?
7. Few iron nails and screws got mixed with the wooden shavings while a carpenter was working with them. How can you help him in getting the nails and screws back from the scrap without wasting his time in searching with his hands?
8. It is said that repulsion is a sure test for magnetism. Why is it so?

### Long Questions:

1. Show that a magnet has two poles. What are the properties of the poles of a magnet?
2. How can you make an iron strip into a magnet?
3. How was magnet discovered?

### Answer Key-

### Multiple Choice Answers:

1. (d) All of these
2. (d) all of these
3. (c) near two ends
4. (a) north-south directions
5. (b) N-pole of one magnet with S-pole of other
6. (a) Magnetite
7. (d) Magnetite does not show magnetic properties.
8. (d) boiling
9. (c) North and south pole
10. (d) iron

### Very Short Answers:

1. Answer: The compound of iron is iron oxide or magnetite.
2. Answer: Magnets.

3. Answer: By using a bar magnet, the magnetic substance is separated from mixture.
4. Answer: At poles.
5. Answer: Magnet comes to rest in N-S (north-south) direction.
6. Answer: There is repulsion between these two magnets as there is repulsion between like poles.

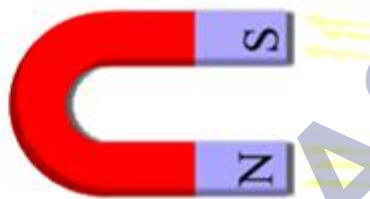
### Short Answer:

1. Answer:

Bar Magnet



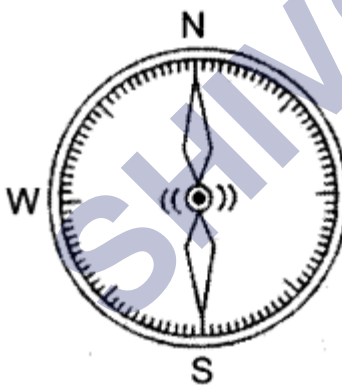
Horse-shoe Magnet



2. Answer:

Magnetic Substance	Non-magnetic substance
Iron, steel, nickel	Plastic, wood, copper, stainless steel spoon

3. Answer:



4. Answer:

- (i) Magnet has two poles—south pole and north pole.
- (ii) Poles of magnet cannot be isolated.
- (iii) Like poles repel each other and unlike poles attract each other.
- (iv) Freely suspended magnet aligns in N-S direction.

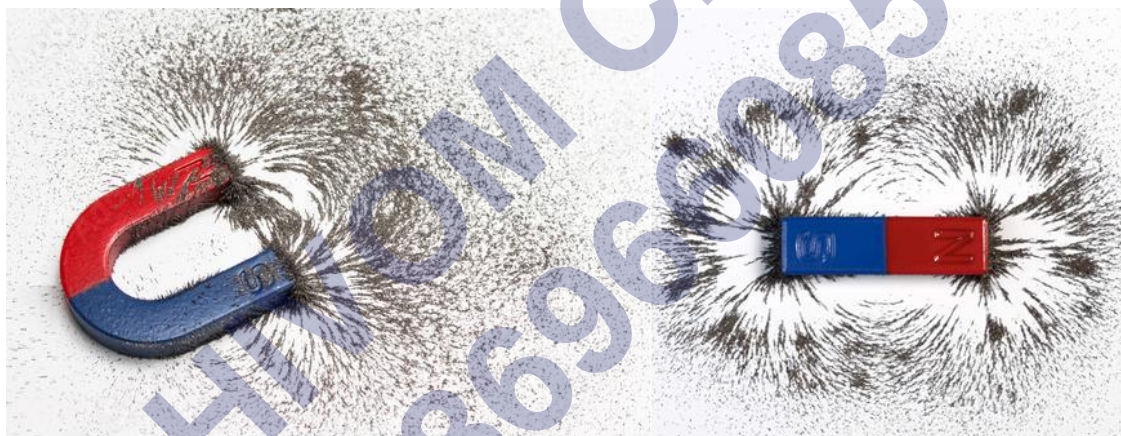
5. Answer:

- (1) By hammering the magnet strongly.

- (2) By heating a magnet strongly and keeping it in the east-west direction.
- Answer: Television, mobiles, CD, computers and many more devices are made up of magnetic materials and magnets in it. If you bring a magnet closer to it then it will spoil these devices.
  - Answer: With the help of a magnet we can attract all iron nails and screws and can separate them from the wooden shavings. As iron nails and screws are magnetic materials and will get attracted to the magnet, whereas wooden shavings are non-magnetic.
  - Answer: To identify the magnet, repulsion (like poles of two magnets repel) is the only test which will let you know whether the given rod is an iron rod or a bar magnet. Because a magnet attracts an iron object and unlike poles of magnets also attract each other.

### Long Answer:

- Answer. We know that pole is the point where the strength of the magnet is maximum. So more and more iron particles will be attracted at poles of a magnet when we bring a magnet near the iron particles. We will observe the crowdness of particles at the ends of magnet. This indicates the presence of two poles in a magnet. Hence poles are present in a magnet in pair. If a magnet is divided into two parts, each part also possesses a pair of poles.



### Crowdness of iron Particles around poles

- Answer: Take a bar magnet and place its pole near one edge of the iron bar. Without lifting the bar magnet, move it along the length of iron bar. Move the magnet again along the iron bar. Repeat it 30-40 times. Check whether it has become a magnet. If not continue the process for some more time.
- Answer: It is said that magnet was discovered in Greece. A shepherd name Magnes used to take a stick with him to control his heard. One day he was surprised to see that he had to pull hard to free his stick from a rock on the mountainside. The rock was natural magnet and it attracted iron tip of shepherd's stick.
- Answer: Materials that allow electric current to pass through them are called conductors. For example: iron, copper etc. Metals are good conductors. Materials that do not allow electric current to pass through them are called insulators. For example-rubber, plastic etc.