Chapter 13

Magnetism

Points to study

13.1 Magnetic and Non-Magnetic Materials
13.2 Poles of Magnet
13.3 Direction Finding Instrument (Compass)
13.4 Properties of Magnet
13.5 Make Your Own Magnet
13.6 Uses of Magnet

It is said that, there was a shepherd named Magnus, who lived in ancient Greece. He used to take his herd of sheep and goats to the nearby mountains for grazing. He would take a stick with him to control his herd. The stick had a small piece of iron attached at one end. One day his stick fell on a rock. He was surprised to find that he had to pull hard to free his stick from the rock. It seemed as if the stick was being attracted by the rock. That rock was a natural magnet and it attracted the iron tip of the shepherd's stick. It is said that this is how natural magnets were discovered. Such rocks were given the name 'magnetite', perhaps after the name of that shepherd. It is also believed that magnetite was first discovered at a place called 'Magnesia'. Magnets which are found in nature are called as natural magnets and the man-made magnets are called as artificial magnets.

13.1 Magnetic and Non-Magnetic Materials

Activity - 1

Take a magnet near these objects and find out whether they are attracted by the magnet or not?

Table 13.1

S.no.	Object	Material from which it is made of	Attracted by the magnet (yes/no)
1.	Scale	Plastic	
2.	Nail	Iron	
3.	Glass	Glass	
4.	Chair	Wood	
5.	Safety-pin	Iron	
6.	Shoes	Leather	

Do you find any material common in the objects which are attracted by the magnet?

The materials which get attracted towards a magnet are called magnetic materials. For example - iron, cobalt, nickel, etc.

The materials which are not get attracted towards a magnet are called non-magnetic materials. For example - glass, wood, leather, etc.

Nowadays, artificial magnets are prepared in different shapes. For example - horse-shoe magnet, bar magnet, cylindrical magnet, etc.

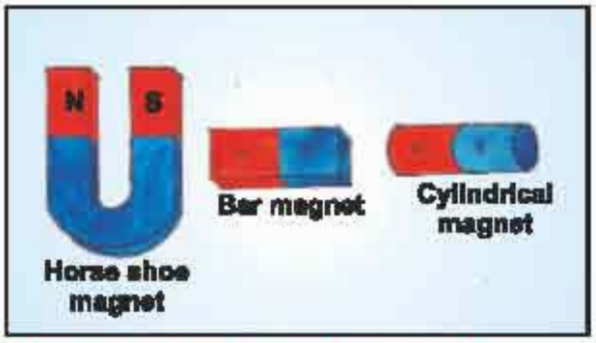

Figure 13.1 Different types of magnets

13.2 Poles of Magnet

Activity - 2

Collect some iron filings by rubbing a magnet in sand. Spread the iron filings on a sheet of paper and place a bar magnet on it.

Are the iron filings evenly attracted by the magnet? You will find that the iron filings are attracted to the region close to the two ends of the magnet. These two ends are called as the two poles of the magnet.

How will you decide which pole of the magnet is the North pole and which pole is the South pole?

Activity - 3

Tie a thread in the middle of a magnet and suspend it from a stand as shown in Fig. 13.2.Let the magnet come to rest. The pole of the magnet that points towards North is called its North seeking pole or North pole.

The other pole which points towards South is called its South seeking pole or South pole.

A freely suspended magnet always comes to rest in a particular direction, which is the North-South direction.

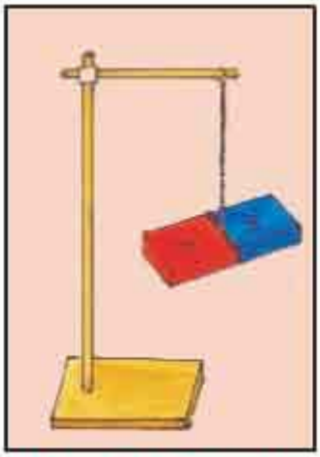

Figure 13.2 A freely suspended bar-magnet

13.3 Direction Finding Instrument (Compass)

Take a compass and observe it carefully. A compass is usually a small box with a glass cover on it. A magnetised needle is pivoted inside the box, which can rotate freely. One end of this needle is North pole and another end is South pole.

It also has dial with directions marked on it. The compass is kept at the place where we wish to know the directions. Its needle indicates the North-South direction when it comes to rest. The compass is then rotated until the North and South marked on the dial are at the two ends of the needle.

Fig. 13.3 Direction finding instrument - compass

13.4 Properties of Magnet

From the above activities, we acknowledged the following properties of a magnet: -

1. A freely suspended magnet always comes to rest in the North-South direction.
2. Magnets only attract magnetic materials (i.e., materials made from iron, cobalt, nickel, etc.).

Let's do it -

Besides these, what are the other properties of magnets?

Activity - 4

Tie a bar magnet in the middle with a thread and suspend it from a stand as shown in Fig. 13.4.Let the magnet come to rest. Now take the South pole of another magnet near the South pole of the suspended magnet. What do you observe? The suspended bar magnet moves backward. This is called as repulsion. Now take the South pole of the magnet near the North pole of the suspended magnet. What do you observe this time? The suspended bar magnet comes closer and even sticks to the other bar magnet. This is called as attraction. What properties of a magnet do you find from this activity?

There is attraction between unlike poles of magnets and repulsion between like poles of magnets.

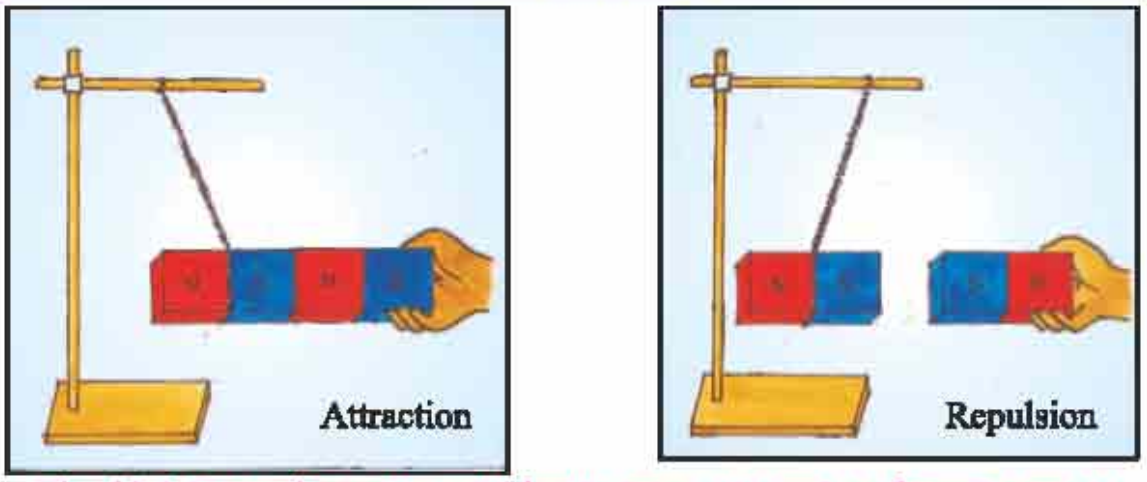

Fig. 13.4 Attraction and repulsion between the poles of two magnets

13.5 Make a magnet from Iron.

You can make magnets by two methods. They are given below: -

Activity - 5

Take an iron nail.Now take a bar magnet and place one of its poles near one edge of the nail.Without lifting the bar magnet, move it along the length of the iron nail till you reach the other end.Now lift the magnet and bring the pole (the same pole you started with) to the same point of the iron nail from which you began.Move the magnet again along the iron nail in the same direction as you did before.Repeat this process about 30-40 times.Bring some iron filings or some safety pins near the iron nail to check whether it has become a magnet.

You will see that the iron nail has acquired the properties of a magnet.

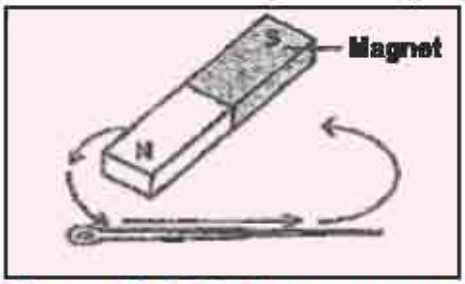

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Figure 13.5 Making a magnet

You can make magnet with battery. Copper wire and nail. Let us do.

Activity - 6

Take an iron nail again. Wrap an insulated copper wire on it. Connect both the ends of the wire to a battery. Take some iron filings or safety pins near the iron nail. Are the iron filings or safety pins attracted towards the iron nail? Now disconnect the wire from the battery and take the iron filings or safety pins again near the iron nail. Are the iron filings or safety pins attracted towards the iron nail this time?

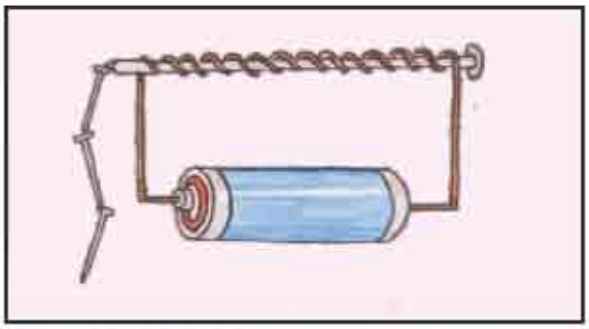

Fig. 13.6 Making an electro-magnet

When an iron nail is connected to a battery through a copper wire, it attracts the iron filings or safety pins. When we disconnect the iron nail from the battery, then it is not able to attract the iron filings or safety pins. A magnet made by this method is called as an electromagnet.

13.6 Uses of Magnet

Magnets are very important in our daily life. Some uses of magnets are: -

1. Compass
2. Magnets are used in speakers.
3. Magnets are used in lifting heavy objects made from magnetic materials by an electronic crane.
4. They are also used in removing small pieces of magnetic materials which fell accidentally in eyes.
5. Magnets are used in electronic bells and electric motors.

Proper storage of magnets is also very important because they become weak with time if they are not stored properly. Follow these guidelines to keep your magnets safe: -

1. Bar magnets should be kept in pairs with their unlike poles on the same side.
2. Bar magnets must be separated by a piece of wood while two pieces of soft iron should be placed across their ends.
3. A piece of iron should be kept across the poles of a horse-shoe magnet.
4. Magnets should not be heated, hammered or dropped from some height as they will lose their properties by these activities.

What have you learnt

1. Magnet attracts Ferromagnetic materials.
2. ach magnet has two magnetic poles - North pole and South pole.
3. Magnets are mainly of two types - (1) natural magnets, and (2) artificial magnets.
4. Opposite poles of two magnets attract each other whereas similar poles repel each other.
5. Magnets have many uses, like in - electric crane, speaker, electronic bell, etc.

Exercises

I. Choose the correct answer from the following -

1) Magnetic material from the following is -

a) Cobalt b) Copper
c) Glass d) Wood ( )

2) A magnet has ..... poles.

a) One b) Two
c) Three d) Four ( )

3) Where is the maximum force of attraction in a magnet?
   a) In the centre b) At the two ends
   c) Can be anywhere d) It is the same everywhere ( )

4) Where is an electric crane used?
   a) To dig a pit
   b) To lift big stones
   c) To lift heavy objects made of iron
   d) None of the above ( )

II. Fill in the blanks -

1) A magnet has a ..... pole and a ..... pole.
2) Man-made magnets are called ..... magnets.
3) Pieces of ..... are attracted towards a magnet.
4) ..... takes place between similar poles of two magnets.

III. Short answer questions -

1) What is a magnet?
2) In which direction a freely suspended magnet comes to rest?
3) Write two uses of magnets.
4) What will happen if a magnet is heated?
5) Draw a well labelled diagram of a compass.

IV. Long answer questions -

1) With the help of diagram explain how to make an electromagnet?
2) Suggest an activity to explain that - similar poles of a magnet repel each other whereas opposite poles of a magnet attract each other. Draw necessary diagrams also.
3) Explain how you will separate wooden dust from the mixture of wooden dust and iron filings.

Practical work

I. Take a plastic or paper cup. Fix it to a stand with the help of a clamp (as shown in the adjoining figure). Keep a magnet inside the cup and cover it with a paper so that it could not be visible. Tie an iron clip with a piece of thread. Tie the other end of the thread to the base of the stand. Take the clip near the base of the plastic or paper cup. You will see that the clip is hanging in air like a kite.

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