

8

AIR, WINDS AND CYCLONES

We know that when we ride on a bicycle in the direction of the wind, it is easy to ride the bicycle, but when we go opposite to the direction of the wind, it is very hard and we tire easily.

- Try to guess the reason.
- How else does wind effect and influence our lives?

Sometimes the wind is cold and sometimes it feels pleasant and nice. It can blow clouds and sometimes raises dust. It is sometimes gentle but can be really strong too and blow away things. You read in Class 6 that clothes dry faster on a windy day.

- Write five examples from your daily life that you feel are influenced by wind.

Since wind has so much effect on our lives we have to find out what winds are? How do they arise?

The air around us is rarely still. It moves continuously from one direction to another. The movement is in many directions. This is what we call winds. So we know that wind is moving air.

Let us try to understand something more about air and winds.

Let us do-1: Where do we find air?

Take a bucket full of water and a transparent glass. Take a paper, crumple it into a ball and push it to the bottom of the glass. Invert this glass and immerse it in to the bucket of water



Fig.1

Keep the glass straight and press it so that the glass is completely under water. Take it out and observe what happens.

- Did the paper in the glass get wet or not?
- What would happen if you tilt the glass while immersing it in water? Try it.

Let us do - 2

Fill a bucket with water. Take a bottle with a narrow mouth and immerse it in the bucket till it fills with water (Fig. 2).

- Did something come out of the bottle when water entered it?
- How do you know whether something came out or not?

Would it be correct to say that a glass or bottle that we think is empty is actually full of air?



Fig. 2a



Fig. 2b

After doing activity 1 and activity 2, Rani said that air is everywhere. Any bottle, glass or any other container that appears empty is actually full of air. Nothing can be added to it unless the air inside is removed. It is only when some air is removed that something else can enter. Air occupies the space around us.

- Do you agree with Rani? Discuss with your friends and write the reasons for your answer.
- Give a few more illustrations showing that air needs to be removed from a container before something else can enter it.

What are the steps needed to use a dropper? Explain its functioning.



Fig. 3a



Fig. 3b



Fig. 3c

Does Air exert pressure?

You know that a bicycle tube or tube of any other vehicle can burst when it is over filled with air. How does this happen? What does the excess air do to the tube? Discuss with your friends on how the air in the vehicle's tubes keeps them in shape.

Take a balloon and fill it with air. Keep blowing more and more air into it. What would eventually happen? The balloon expands and after a point bursts.

- Why does it burst?
- Can we say that this activity also shows that air exerts pressure?
- Give reasons for your answer.
- List other experiences of situations

where air exerts pressure. For example these may include a balloon being filled with air, the air filled football that becomes hard, water rising through a hand pump, the tubes of cycle, scooter or car. Think of other examples where we can see that the air exerts pressure.

Let us do - 3:

Take a syringe and draw out its plunger to the limit. Close the nozzle of the syringe with a finger and press the piston.



Fig. 4

Were you able to press the piston?

- Did you feel pressure on your finger while doing so?
- What do you think exerted pressure on your finger?

Air Expands on Heating

Let us do - 4

Take an empty injection bottle and one empty ball point refill. Remove the pin of the refill and insert one of its ends in the cork of the injection bottle as shown in Fig. 5.

Put a water drop on the upper end of the refill. Rub your hands together so that they become warm. Carefully pick up the bottle and hold it in both your hands for some time

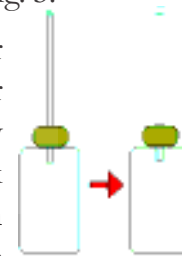


Fig 5

so that the bottle also becomes warm.

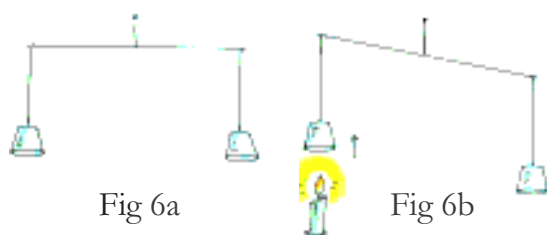
What happens to the water drop?

How does it behave?

Now keep this bottle in a saucer of cold water and observe what happens to the drop. Why does this happen?

- What makes the water drop inflate when the injection bottle is held in cupped hands? What happens to it in cold water?
- Can we infer from the first observation that air expands on heating?
- Can you state what happens to the air in the bottle when it cooled by keeping the bottle in water?

Let us do-5: Hot air is lighter than cold air



Take two paper bags or empty paper cups of the same size. Take a broomstick. Hang the two bags in the inverted position on the two ends of the broom stick. Tie a piece of thread in the middle of the stick. Hold the stick by the thread, like a weighing balance. Put a burning candle below one of the bags as shown in the figure 6 and observe what happens.

Note that we have used paper bags or cups as they are of a light weight and it would be easier to see the results of this experiment if we take any such light objects to hang on the thread.

- Why is the balance of the bags disturbed?

Handle the burning candle carefully.

Let us do -6

Take a balloon and fill it with air. Heat it slowly. What happens?

The balloon expands and the air inside exerts more pressure on the walls.

- If the tied end is opened now, what would happen?

The air from the balloon would slowly escape.

- Why does that happen?

Let us do - 7

Take a balloon. Blow air into it. As we fill it up, it expands and it becomes harder to press the walls of the balloon. The inside air exerts pressure on the walls of the balloon.

Open the mouth of the balloon slightly. What happens?

Air from the balloon comes out. You can open the mouth less or more and control the flow of air. The air in the balloon is at high pressure and it goes towards low pressure area.

You already know that when air moves, it is called wind. Air moves from the region where the air pressure is high to the region where the pressure is low.

The greater the difference in pressure, the faster the air moves. We still have to think why winds occur in nature. How is the pressure difference that causes winds created in nature? Is there a difference in temperature involved? The following activities will help you to understand this.

Let us do – 8

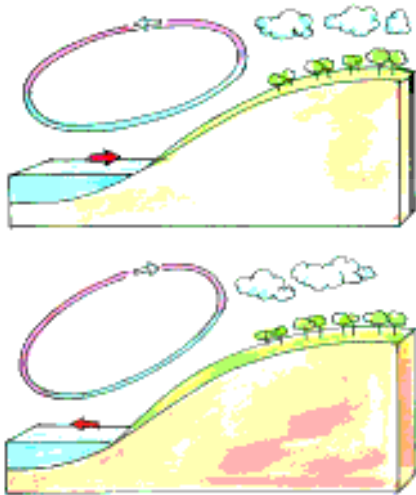
Take an incense stick(agarbati) and light it. Observe the smoke of the incense stick?

- Where does it go?

Observations from above activities indicate that warm air rises up. Also, it is important to remember that on heating the air expands and occupies more space. When something occupies more space, it becomes less dense. The warm air is therefore less dense than cold air. Thus smoke and hot air go up.

Similar to observations of activities done so far, numerous factors contribute to heat air.

When the air rises up, air pressure at the place becomes low and we have many kinds of winds as air comes in to occupy areas of lower pressure. The differential heating of land and water by the sun leads to land and sea breeze.



The land heats up faster than the sea, so warm air rises over the land during the day as it is warmed by the Sun. At certain times of a year, this can create a sea breeze which is a gentle breeze blowing into the land. At night, the land cools faster than the sea, reversing the air flow. This creates a land breeze that blows out to sea.

Effects of Moving air

a. Take a glass and a postcard. Keep the glass on a table and the postcard on the glass. Wave your hand or note book above the post card to displace the air just above the postcard.

What do you observe?

Why did postcard lift up?

Figure – 8(a)



b. Now wet the edges of glass with the post card to it, and hold it inverted with your left hand as shown in figure (8 b) and move your right hand or note book to move

the air form under the paper.



Can you imagine what would happen? Have you ever seen high speed winds blowing over the roofs of houses? If roofs were weak they could be lifted and blown away.

If you have heard or seen any such experiences share it with your friends.

In the activity (9), when we move our hand there is movement of air caused. The moving air creates low pressure. Hence the paper lifts up due to the higher pressure on the paper from air in the glass. When on the other hand we hold the glass facing down, the same thing happens and the air inside the glass pushes the paper out and makes the paper fall down.

WIND - UNEVEN HEATING ON THE EARTH

We have discussed the cause of winds in areas near large water bodies including seas and oceans, What about wind on the other parts of the earth. What are the reasons that different areas have different temperature? Let us try to find more about all these.

Uneven heating takes place on the surface of the earth. There are a number of reasons for this.

A. Uneven heating between the equator and the poles.

You might have learnt in geography that the region close to the equator gets more heat

from the sun. This is because of the direction of the sunlight being straighter close to the equator. The air in these regions gets warmer. The warm air rises, and the cooler air from the regions in the $0-30^{\circ}$ latitude belt on either side of the equator moves in. This movement of air sets forth winds that move over the earth.

We have also seen that the increased wind speed is accompanied by a reduced air pressure and this aids rains.

Let us try to understand how winds are produced, how they bring rain and how they can be destructive sometimes.

B. Uneven heating of land and water

You have read about the sea breeze and the land breezes. In summer, near the equator the land heats up faster and during the day the temperature of the land is higher than the water in the ocean. The air over the land gets heated and rises. This causes the winds to flow from the oceans towards the land. These are monsoon winds. This is usual during the months of June to September.

The direction of the wind flow gets usually reversed in the months from December to early March. The wind flows from the land to ocean as the sea cools more slowly..

The winds from the oceans carry water and bring rains. Farmers in our country depend mainly on rains for their harvests. We can also generate energy from high speed wind. Thus we can see the usefulness of winds in our life.

• Write other uses of wind you can think of

Do winds also cause harm? Let's see how? You may be familiar with the word cyclone. During the months of May-June or October-November reports about them can be seen in

the news papers/ T.V.

CYCLONES

Cyclones are a form of violent storms on Earth. People call these storms by names such as typhoons, hurricanes etc. depending on where they occur. Let us try to understand the phenomenon of cyclone through the following activity.

Let us do - 10:



Fig. 9

Take a glass containing water and two straws. Keep one straw in the water and another in horizontal direction as shown in figure 9 and blow through the horizontal straw.

- Can you say what happens to water?
- What do you observe?
- Why is the water spray coming out from the straw? Discuss with your friends.

When you blow over the straw the water comes out due to low pressure which forms inside the straw. So the water from the glass reaches up in the straw due to high pressure.

We see that the increased wind speed is accompanied by a reduced air pressure.

How Cyclones May Form

Tropical cyclones are like giant engines that use warm moist air as fuel. The warm moist air rises upward from near the surface. The warm air rises causing an area of lower air pressure below. Air from surrounding areas

of high air pressure pushes into the low pressure area. Then this “new” air becomes warm and rises too. As the warm air continues to rise, the surrounding air swirls-in to take its place and the water from the sea surface also comes up with the air as you have seen in activity 10. As the warmed moist air rises and cools off, the water in the air forms clouds.

The whole system of clouds and winds spins and grows, fed by the ocean’s heat and water evaporating from the surface. See the figure (10)

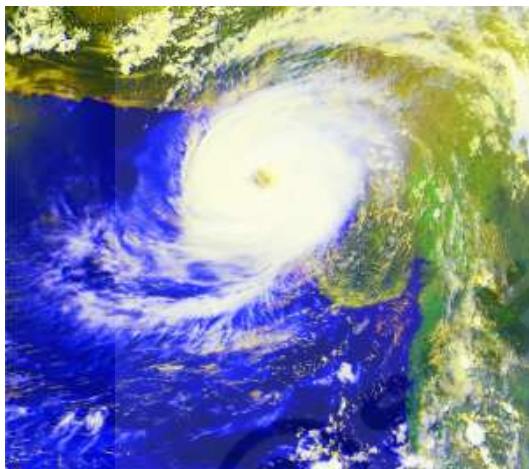


Fig. 10

These kinds of satellite images help us to predict the path of the cyclones to some extent.

Factors Contributing to Cyclone:

Factors like wind speed, wind direction, temperature and humidity contribute to the development of cyclones. In India cyclones usually occur in the month of May-June and October-November. More cyclones tend to occur on the eastern side i.e. towards Bay of Bengal

DESTRUCTION BY CYCLONES:

Cyclones can be very destructive. The main effects of cyclones include heavy rain and, strong wind. The destruction of a cyclone depends mainly on its intensity, its size and its

location.



Fig. 11

- Have you heard or seen any experiences of cyclones? Write about these in your notebook.
- Collect information regarding cyclones from news papers. Prepare a scrap book with news paper cuttings followed by small report prepared by you.

CYCLONES – Do’s and Don’ts:-

- We should not ignore the warnings issued by the meteorological department through T.V., Radio or news papers. Pass on the information to others and ignore rumors.
- When a cyclone alert is on for your area, continue normal working but stay alert to the radio warnings.
- We should make necessary arrangements to shift essential household goods, domestic animals and vehicles, etc. to safer places.
- Switch off electrical mains in your house.
- Keep ready the phone numbers of all emergency services like police, fire brigade, and medical centers.
- Pack essentials for yourself and your family to last a few days, including

medicines, special food for those who would need it. This may include babies and elders.

Post cyclone measures

If you are staying in a cyclone hit area-

- Strictly avoid any loose and dangling wires.
- Do not drink water that could be contaminated. Always store drinking water for emergencies.
- Do not go out for the sake of fun.
- Cooperate and help your neighbours and friends.

Advanced Technology has helped and these days we are better protected. In the early part of last century, coastal residents may have had less than a day to prepare or evacuate their homes from an oncoming cyclone. The world today is very different. Thanks to satellites and radars, a cyclone alert or cyclone watch is issued 48 hours in advance of any expected storm and a cyclone warning is issued 24 hours in advance. The message is broadcast every hour or half an hour when a cyclone is near the coast. Information about cyclones will be given by the Indian Meteorological Department (IMD).

We have learnt that all storms are low pressure systems. Wind speed plays an important role in the formation of storms. It is, therefore, important to measure the wind speed. The instrument that measures the wind speed is called anemometer. (See extended activities to make your own anemometer)

KEY WORDS:

Wind, Expansion, Anemometer, Cyclone, Low pressure, High pressure

What we have learnt:

- Air is everywhere.
- The moving air is called wind.
- Air around us exerts pressure.
- Air expands on heating and contracts on cooling.
- Warm air rises up whereas comparatively cooler air tends to sink towards the earth's surface.
- As warm air rises air pressure at the place is reduced and the cooler air moves into that place.
- Uneven heating on the earth causes wind movements.
- Cyclones may be caused due to wind traveling at high speed due to difference in air pressure.
- It has become easier to study cyclones with the help of advanced technology like satellites and radars.

Improve your learning

Fill the missing words in the blank spaces in the following statements.

1. Wind is _____ air.
2. Winds are generated due to _____ heating on the earth.
3. Near the earth's surface _____ air rises up whereas _____ air comes down.
4. Air moves from a region of _____ pressure to a region of _____ pressure.
5. Suggest two methods to find out wind direction at a given place.
6. State two experiences that make you think that air exerts pressure. (Other than

those given in the text).

7. While constructing a house, where do we construct ventilators; why?
8. Explain why holes are made in banners and hoardings hanging in the open.
9. How will you help your neighbours in case cyclone approaches your village/town?
10. In the day time, when we go to the sea the air blows towards us and does not go towards the sea. Explain.
11. Which of the statements given below is correct?
 - a) In winter the winds flow from the land to the ocean.
 - b) In summer the winds flow from the land towards the ocean.
 - c) A cyclone is formed by a very high pressure system with very high speed winds revolving around it.
 - d) The coastline of India is not vulnerable to cyclones.
12. Read the following procedure and make your own anemometer.

Collect the following items

- (a) 4 small paper cups (b) Two strips of the cardboard 20 cm long, 2 cm width (c) Gum (d) Stapler (e) Sketch pen (f) sharpened pencil

Take a scale draw crosses under the cardboard strips as shown in figure 12.

Fix the strips at the centre, putting one over the other they make a '+' sign. Now fix the cups at the ends of the strips. Colour one cup with sketch pen. All four cups should face in the same direction.

Push a pin through the centre of the strips

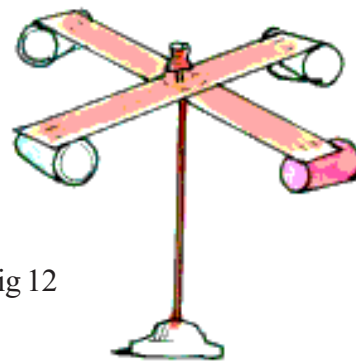


Fig 12

and attach the strips to the sharpened pencil. Check that the strips rotate freely and when you blow on the cups.

Your anemometer is ready. Counting the number of rotations for a minute will give you an estimate the speed of the wind.

13. Collect some articles and photographs from news papers and magazines about storms and cyclones. Make a story on the basis of what you learnt in this chapter.
14. Interview eye witnesses to collect the actual experiences of people affected by a cyclone.
15. More fun with air

A. do the following activities and write your findings

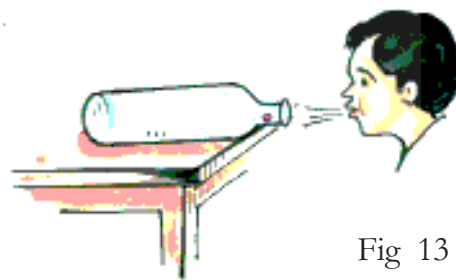


Fig 13

Take an empty bottle and place it on the table as shown in figure 13. Place a cotton ball just inside its mouth. Now try to blow air on the ball to send it into the bottle, and then try the activity with bottles of different sizes. Throw

a challenge to your friends whether they can send the cotton ball inside the bottle by blowing air. Are you surprised? Why did this happen? Think about it and discuss with your friends.

B. Can you blow out the ball from funnel?



Fig 14

Take a funnel and ball, keep the funnel in your mouth as shown in figure 14. Keep the ball in the funnel. Blow air through the funnel and try to send out the ball from funnel. What happens? Have you succeeded in sending the ball out?



Fig. 15

And then place the ball on your hand and put the funnel over the ball as shown in figure 15. Now blow air forcefully through funnel and try to blow out the ball from the funnel (while blowing air, remove hand).

- What did you observe?
- What did you expect?
- What happens?

Try to answer and discuss with your friends.

C. Flow of air



Fig 16

Take a large plastic bottle and a two holed rubber cork that fits firmly into its mouth. Also take two glass tubes. Tie a coloured balloon to the lower end of one of the glass tubes. Insert the glass tubes into the two holes of the cork. The glass tubes should fit tightly in the holes.

Close the mouth of the bottle with the cork and seal it with sealing wax to make the bottle airtight. The balloon should be inside the bottle as shown in Fig. 16.

Now suck air out of the bottle through the tube that doesn't have a balloon attached to it.

- What happens to the balloon?
- Why do you think this happened?