Homi Bhabha Curriculum for Primary Science
Pilot Version

SMALL SCIENCE

TextBook
Class IV

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Small Science
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GENERAL PREFACE

Not a day passes in our country when somebody somewhere has not criticized our system of education, particularly our school education. A great many ills and inadequacies of the system probably flow from extraneous causes and need socio-political initiatives that go beyond mere reforms in school curriculum. But some problems do arise directly from the curriculum - text books, teaching and evaluation practices. There is then a need to keep these problems in view and continually try to devise new curricula to overcome them.

Efforts in curricular reforms and innovations are not new to our country. Nearly every decade or so, there have been initiatives at the Central and State levels to effect changes in curricula. Several independent school networks and voluntary groups have brought out their own textbooks and related materials. There is no doubt that significant progress has been made by the country in increasingly better conceptualization of the school curriculum at primary, middle and secondary levels. The paradigms of school curriculum in India have steadily evolved and become more relevant and modern. Unfortunately, the over-all deterioration of the system due to extraneous factors has tended to obscure these gains. Also, and most important for our purpose here, there is a large gap between the generally agreed objectives of the curriculum and their actual translation into textbooks and teaching practices.

Homi Bhabha Curriculum is basically an attempt to close this gap as much as possible. It is not conceived to be a revolutionary curriculum. The broad aims of the curriculum are much the same as those articulated in countless reports and articles of different education departments and agencies. The idea is not to produce a fanciful, 'museum-piece' curriculum that nobody would adopt, but to attempt to discover a sound and wholesome curriculum that is practical to implement in our school system. 'Practical' is, however, not to be regarded as a euphemism for the status quo. As the users will find out, the alternative textbooks of the Homi Bhabha Curriculum are full of radical unconventional ideas that we believe are both urgent, necessary and, given enough efforts, feasible. But rather than describe here what we believe to be these innovative aspects, we leave the users, students and teachers, to find and experience them. In the simplest and most favourable situations, devising a curriculum and translating it into books, laboratories and teacher manuals is a daunting task. In the complex parameters and constraints that govern our country's educational system, the task is formidable. Only time will tell if and to what extent the Homi Bhabha Curriculum is an effort in the right direction.

Arvind Kumar

PREFACE TO SMALL SCIENCE: CLASS IV

The series of students' and teachers' books for the Homi Bhabha Curriculum are the outcome of more than two decades of research and field experience at the Homi Bhabha Centre for Science Education (HBCSE). During these years, several projects have been undertaken to study problems related to pedagogy, students' conceptions, communication in the classroom, text and picture comprehension and cross-cultural issues in science learning. All the members of HBCSE, past and present, have in some way contributed to this curriculum.

Primary school students, particularly in rural areas, have rich, interactive experiences of the natural world. But lacking systematisation and clear expression, their observations and skills do not contribute to school learning. Urban students from literate homes, on the other hand, are often encouraged to ignore their natural surroundings, and to concentrate on bookish learning. As a result, most students miss out on the combination of systematic observation, analysis and articulation, which is essential for science learning.

The aim of the Homi Bhabha primary science curriculum is to engage students and teachers together in a joyful and meaningful learning experience. The curriculum is built out of simple, thematically organised, activities and exercises. The TextBook, WorkBook and Teacher's Book for each Class are meant to promote active learning in every sense. To use these books, students must get out of the mind-set of copying the correct answers from the blackboard or from other students. Small Science should not be just read, it should be done.

Any good curriculum should be dynamic, ready to face criticism and to change according to the needs of students and teachers. Please do send us your ideas and suggestions for improvement.

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The School of Mathematics, TIFR, who allowed use of their computer facilities

My daughter Rohini, son Harishchandra and many good friends, who were so supportive during some difficult times.

Jayashree Ramadas

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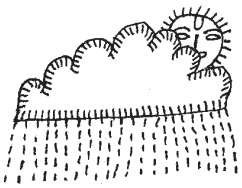

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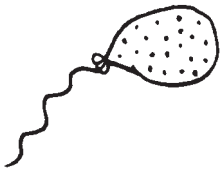

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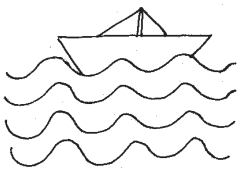

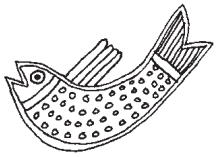

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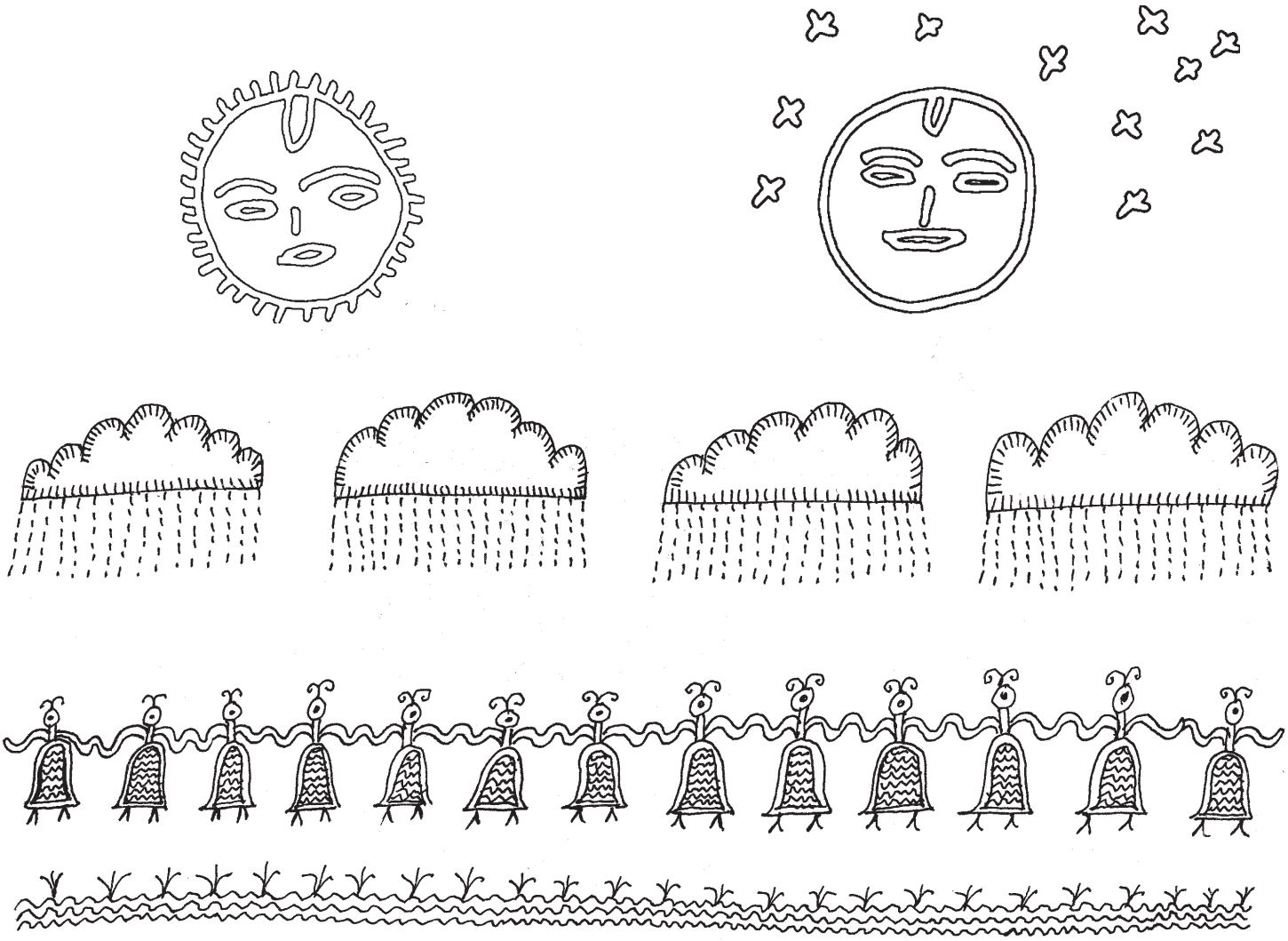


UNIT 1

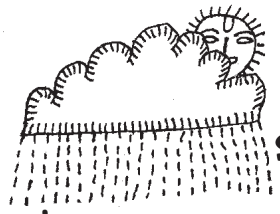
SKY AND WEATHER

It's hot today! ... I'm wet with sweat! ...
Hoohoo it's cold!... Listen to the rain fall! ...
Whoosh comes the wind! ...

Do you notice the weather every day?
Does it change from morning to night,
and from day to day?
Can you guess what the weather will be like
in your vacations?
Or in the beginning of your next school year?

And the sky: so much happens there,
in the day and at night!
Clouds, sun, moon and stars come and go.
How will the sky look this afternoon?
When will the sun set?
What shape of moon will you see tonight?

The sky tells some wonderful stories.
Watch, listen, do and think, and you will find them out!



CHAPTER 1

SUN, WIND, CLOUDS AND RAIN

The rains are coming!

It was a hot day in June. Mini and Apu were sitting in the shade eating cucumbers. "How dry and dusty everything looks!" said Mini.

"Yes," replied Apu. "Did you see the pond? The water is all gone and the floor is cracked up with the heat."

"Amma says that any day now, the monsoon winds will reach us. The winds will bring thick dark clouds. They will cover the sky, and then it will rain!"

"Ooh, that will be fun!" Apu replied, "We can get wet in the first rain. There might even be thunder and lightning ..."

Heat all around
Even leaves have stopped speaking
Then: a storm wind blows!

The sky darkens, cools
Suddenly on a dry leaf
The raindrops patter

Watching the weather

1. The weather

a. Look out of the window. Answer these four questions in your WorkBook on page 3:

(i) Is the sky cloudy or clear?
(ii) Is the weather warm or cold?
(iii) Is it windy or calm?
(iv) Is it rainy or dry?

When you answer these questions, you describe the weather for today. Was yesterday's weather similar or different?

b. Complete this story. Wherever you find a . . . △ . . . add descriptions related to the weather. You might describe the colours in the sky, the shape of the clouds, whether and how the clouds were moving, the heat, cold and the effects of the weather on plants, animals and other things.

It was a beautiful Sunday morning . . . △ . . . Mini and Apu went outside. They saw . . . △ . . . They decided to fly a kite . . . △ . . . Suddenly . . . △ . . . (What happened next?)

After telling the story, write a title for it on page 3 in your WorkBook.

2. Weather calendar

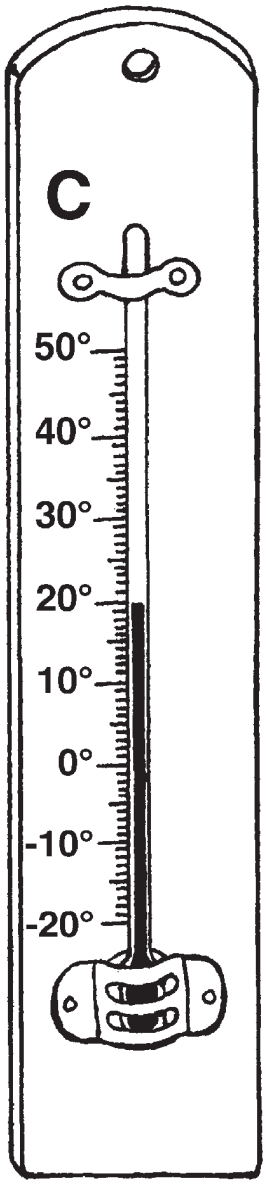
a. A design of a calendar is given on pages 3-7 in your WorkBook. Fill in the year and the month. Write the dates in the boxes.

b. Observe the weather every day and fill it in the calendar. At the top of the date box note any other important happenings of that day.

3. Warm or cold

a. A thermometer measures temperature. It tells you how hot or cold something is. Find a thermometer that can measure the temperature of air around you. Does the temperature change through the day?

We measure length in metres, weight in kilograms and time in seconds. How do we measure temperature?



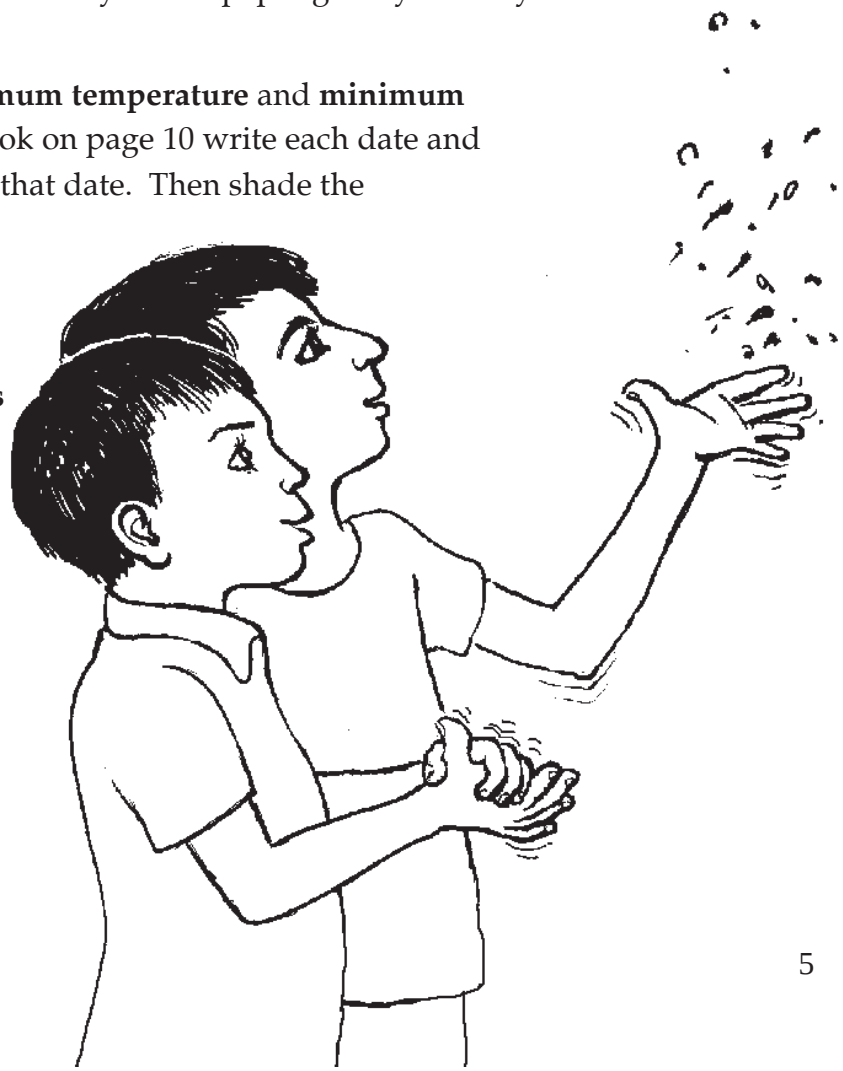
a thermometer

Apu measured the temperature at different times of the day. This is what he found. Colour the thermometers on page 9 in your WorkBook to show these temperatures in degrees Celsius (°C).

Time	Temperature (°C)
6:00 am	8°
9:00 am	12°
12:00 pm	20°
3:00 pm	24°
6:00 pm	21°
9:00 pm	18°
12:00 am	15°
3:00 am	11°

b. Find out the temperature for one week from the radio or TV weather report or a newspaper. Remember that today's newspaper gives yesterday's temperature.

Find out the meaning of **maximum temperature** and **minimum temperature**. In your WorkBook on page 10 write each date and the maximum temperature on that date. Then shade the temperatures in the graph.



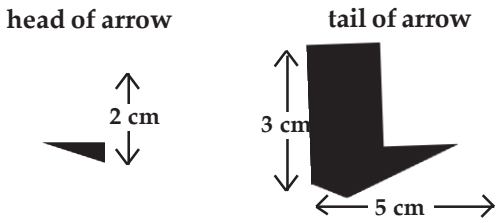
4. Which way the wind blows

a. Crush a dry leaf and throw up the pieces. See if the wind blows them to one side. Can you tell which way the wind is blowing?

b. Make a wind vane to tell which way the wind is blowing.

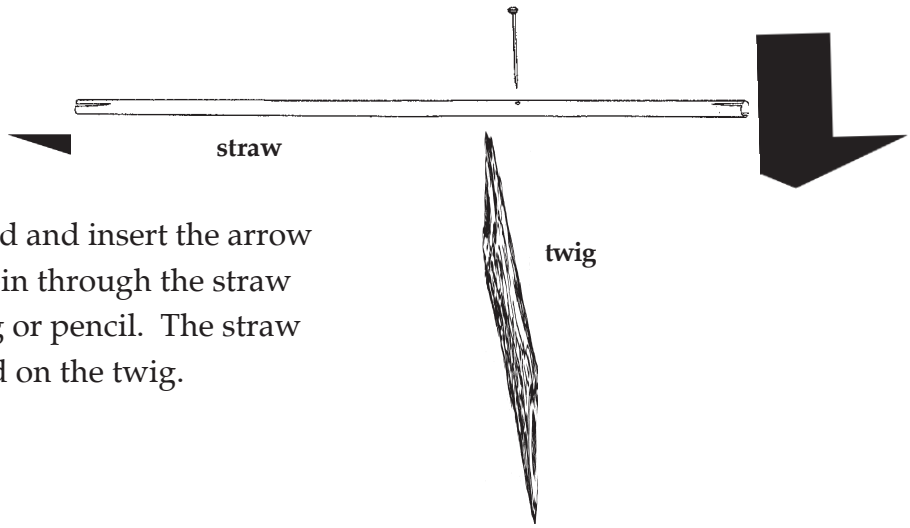
You will need:

a twig with a soft centre **or** a pencil with an eraser at one end
a drinking straw
a pin
a piece of card paper

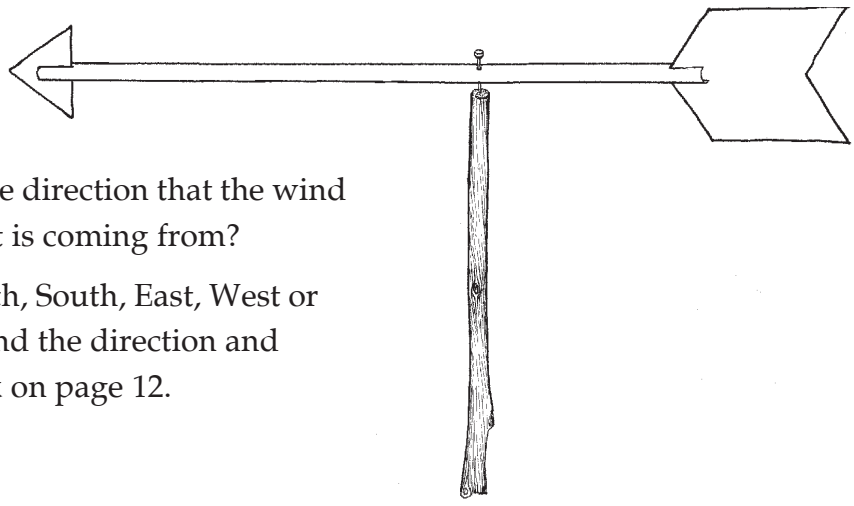


Cut these arrow shapes from the card paper.

Notice that the tail of the arrow is longer and wider than the head.



Slit the straw at each end and insert the arrow shapes in it. Push the pin through the straw into one end of the twig or pencil. The straw should remain balanced on the twig.



This is your **wind vane**. Take it outdoors and hold it in the breeze.

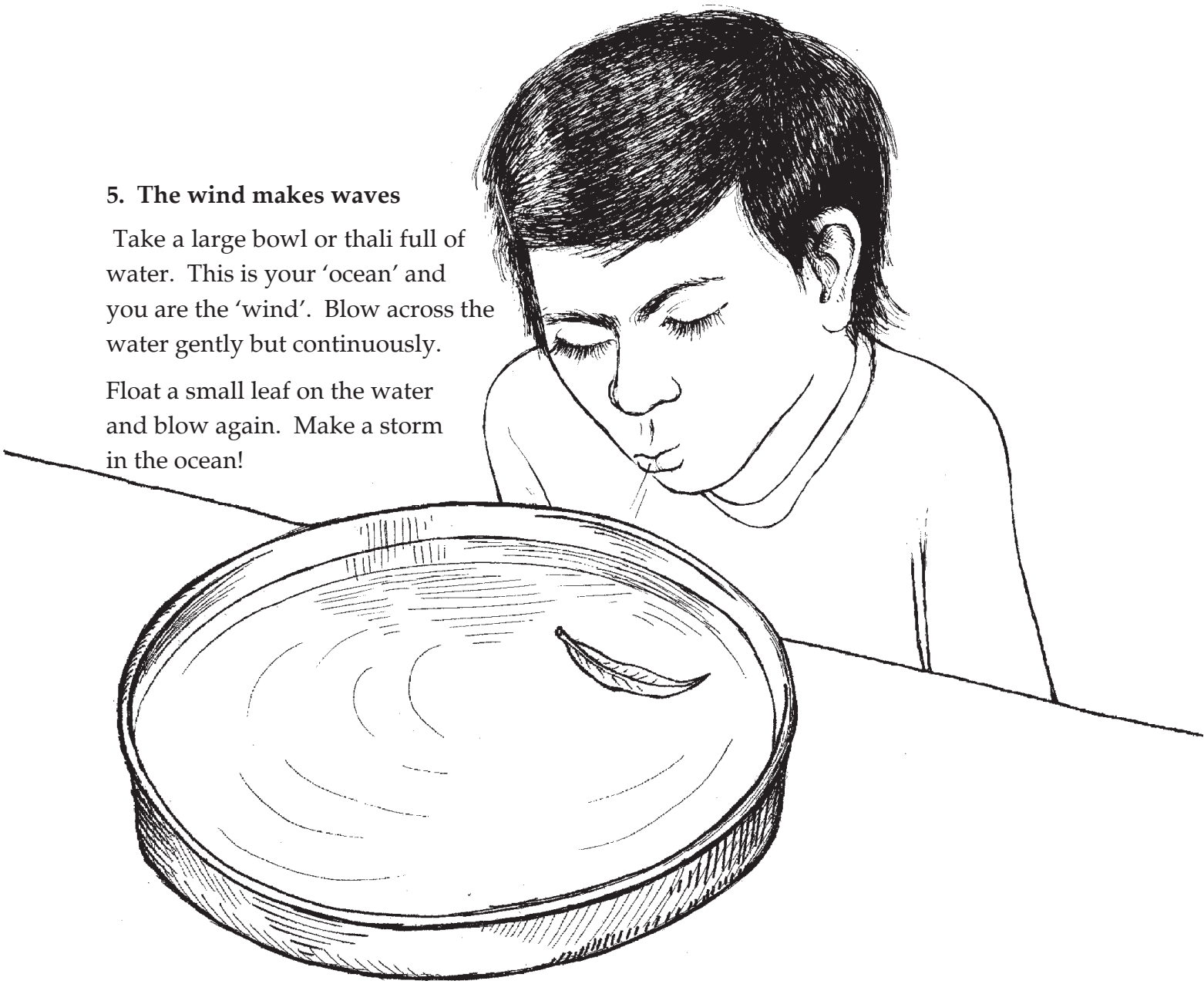
Is the arrow pointing in the direction that the wind is going, or the direction it is coming from?

Is the arrow pointing North, South, East, West or in any other direction? Find the direction and write it in your WorkBook on page 12.

5. The wind makes waves

Take a large bowl or thali full of water. This is your 'ocean' and you are the 'wind'. Blow across the water gently but continuously.

Float a small leaf on the water and blow again. Make a storm in the ocean!



6. Sky and clouds

Do these activities on four different days (see WorkBook page 13):

a. Watch the sky for clouds. Write down some words to describe the clouds. You can describe: the colour of the clouds, how big they look, their shapes and how much of the sky they cover. Draw the shapes of the clouds as you are looking at them. Do the shapes change?

b. Watch the colour of the sky. Is it always blue? Is the entire sky of one single colour? Does the colour of the sky change from day to day? Describe how the colour changes through the day - in the morning, afternoon, evening and night.

Think! Think!

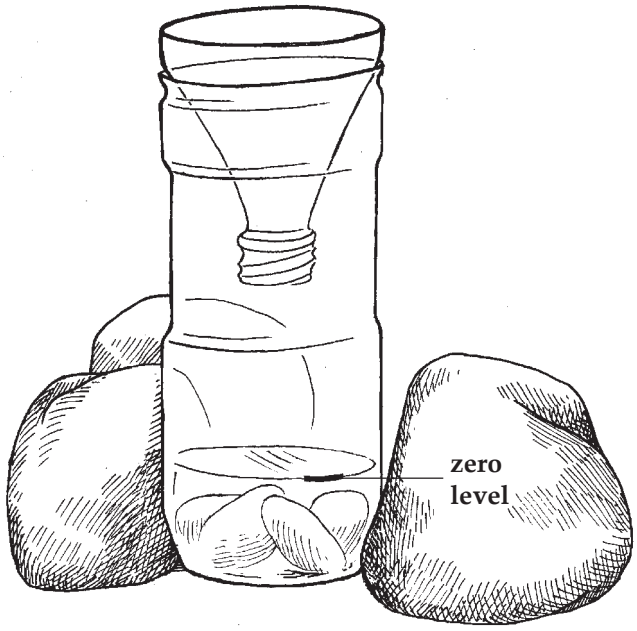
What do you think clouds are made of?

What makes clouds move in the sky?

7. Measure the rain

a. Find a large plastic bottle. Cut off the top and invert it into the lower part. This is your **rain gauge**.

If you cannot find a bottle, use any tins or jars with upright sides. Put some stones in these containers. Add enough water to cover the stones. Mark the 'zero' level of water.



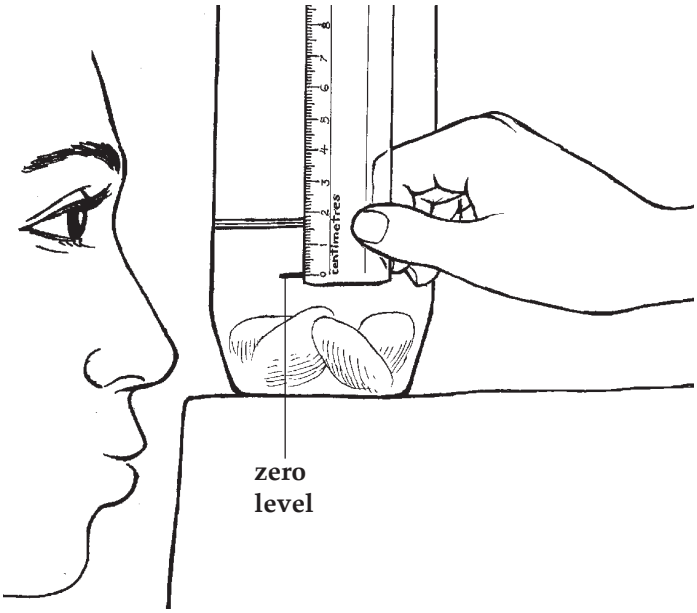
Keep the containers in different places out in the rain - for example, on a terrace, or in an open ground. Support the containers with stones or bricks. Make sure that rain can fall into them freely. Note the date and time on page 14 in your WorkBook.

Each day, measure how much the water level has risen in your container. Note this measurement in the Table and Graph in your WorkBook on pages 14-15. Empty the container back to the zero level.

Did the water level remain unchanged on any day?

Did the water level decrease on any day? Guess why.

Was the change in water level about the same in every group's container?



8. Humid or dry?

On some days you perspire a lot. Your wet clothes stay wet for a long time. These are humid days.

On other days your skin feels very dry. Wet clothes dry soon. These are dry days.

Try to guess which days are very humid and which days are very dry. See if your friends agree.

Clouds and rain

Clouds are made up of tiny drops of water. They move with the wind.

When clouds cool, the water drops in them come together to form bigger drops. These drops are very heavy, so they fall down. We call it rain.

Sometimes pieces of ice fall with the rain. This is called hail.

In very cold places in winter, white flakes of snow fall down instead of rain.

Weather is important for farming

To plant crops we need rain. Seeds need water to sprout. Crops need water to grow.

But if it rains at harvest time, crops can be damaged. Rain can damage grain and fruit. Groundnuts rot in wet ground. Cotton bolls get wet and dirty.

Know these words

weather	thunder	breeze	hail	flood
monsoon	lightning	gale	snow	drought
		storm	mist	
			fog	

EXERCISES

Name and draw

1. Rain
2. Colours of the rainbow

Interesting questions

Answer questions 1-4 after completing the chart on pages 18-19 of your WorkBook.

1. In which months of the year do you have winter?
2. In which months of the year do you have summer?
3. In which months of the year do you have a rainy season?
4. In which months do you have school sports, outings or picnics? Why?
5. Name some fruits and vegetables that we get in winter and in summer.
6. On what kind of day (hot, cool, cold, wet, etc.) would you wear clothes made out of: cotton, nylon, wool or plastic?
7. Which of these things happen when the temperature is low?
   Butter is soft
   You feel cold
   You sweat a lot
   Coconut oil becomes solid
   You wear thin clothes
8. Write down some things that happen on a very hot day.
9. Write down some things that happen on a rainy day.
10. Which of these things would you **not** do on a rainy day?
    Swim in a river
    Graze the cattle
    Write a letter
    Play outdoors
    Do some cooking
    Wash a lot of clothes

11. Which of these things happen best on a windy day?
    Boats sail
    Rivers flow to the sea
    Windmills work
    Clothes dry faster
    Birds fly
12. Name some ways in which wind is useful to us.
13. Name some things that happen in a storm.
14. In what kind of weather is it dangerous for fishermen to go fishing in the sea?

Classroom discussion

1. Which time of the year do you think has the best weather? Why do you think so?
2. How do different animals behave on a very hot or a very cold day? Are they quiet or active? Do they look for shelter?
3. What is a flood? Have you or your parents seen a flood? Have you heard of floods in other places? When and where did these floods take place? What were the reasons for the floods? What happened then?
4. What is a drought? Have you or your parents experienced a drought? Have you heard of droughts in other places? When and where did these droughts take place? What were the reasons for the drought? What happened then?

What's the same? What's different?

1. A chart describing summer is given in your WorkBook on page 26. Complete it. Make a similar chart for winter.

Talk and write

1. Remember some poems or songs about any of the seasons. Make up some new ones of your own.
2. Describe a thunderstorm to your friend. Your friend will ask you some question about the thunderstorm. Answer these questions.

Play with words

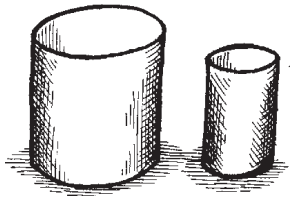
1. Find different words which mean **wind**. Arrange the following words from **weak wind** to **strong wind**:
   gale cyclone breeze storm
2. Find words for these:
   Light, fine rainfall
   Pieces of ice that fall with rain
   Fluffy frozen water from the sky
   The rainy season
   The sound with lightning
3. Match each day with what happens on that day

Rainy day	No dark shadows
Hot day	You cannot see very far
Cloudy day	Clothes take long to dry
Foggy day	Ghee flows easily

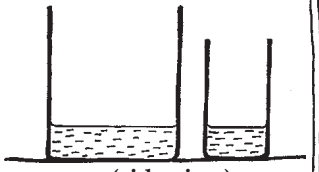
Ask and find out

1. In which different months of the year do farmers sow seeds? Why?
2. Find out what the weather is usually like on any five festival days celebrated in your area.
3. Have you ever heard of **lou (लू)** and **aandhi (आंधी)**? What kinds of weather conditions are these? Do you have names in your own language for unusual weather conditions?

Figure it out



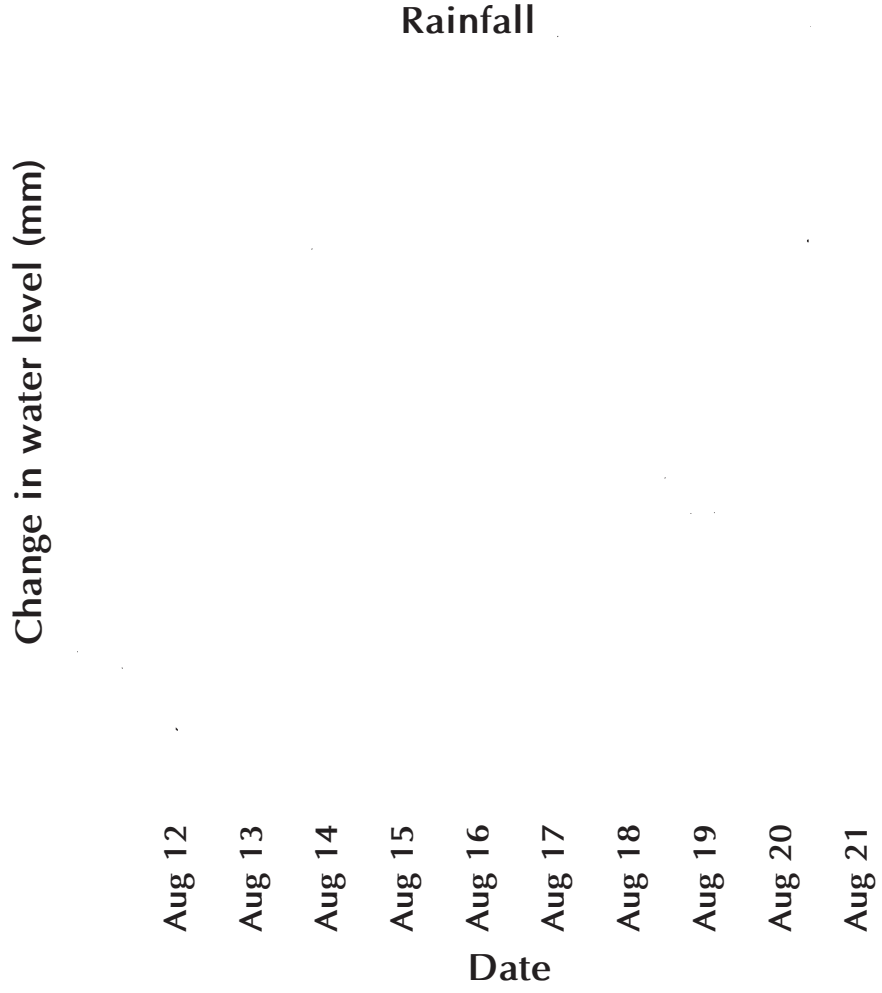
1. Suppose you have two containers, one wide and the other narrow. Both have upright sides. You keep them together out in the rain. Would the height of the water collected in both containers be the same, or different? Why?
2. Now suppose both containers have water up to a height of one centimetre. Would the **amount** of water in them be the same or different?



(side view)

3. Suppose you keep two identical containers: one on the terrace and one in the open ground. Would they collect the same or different amounts of water?

4. Mini and her friend Varsha put their rain gauge out on Aug 11. They measured the change in water level every day for ten days and recorded it in this graph.



Use the graph to answer these questions:

a. How much change in water level did they find on Aug 12?
b. How much rain did they record on Aug 13?
c. How much rain did they record on Aug 14?
d. On which days did they record 24 mm of rain?
e. On which days did they record the most rain?
f. On which days did they record the least rain, or none at all?
g. What do you think happened on Aug 20?
h. How much did it rain between Aug 11 and Aug 21?
i. On which days did they record 6 mm of rain?

5. Mini, Varsha and Khurshid made the weather chart that is shown in the WorkBook on page 32. From the chart find out how many days had sun and how many had rain. Follow the instructions in your Workbook to fill the dates in the circles.

Show and tell

1. Bring something that you can find only during a particular season or time of year. Show it to the class and tell about it.

Ask a question

1. Ask questions about the weather. Think of how you will try to find the answers.

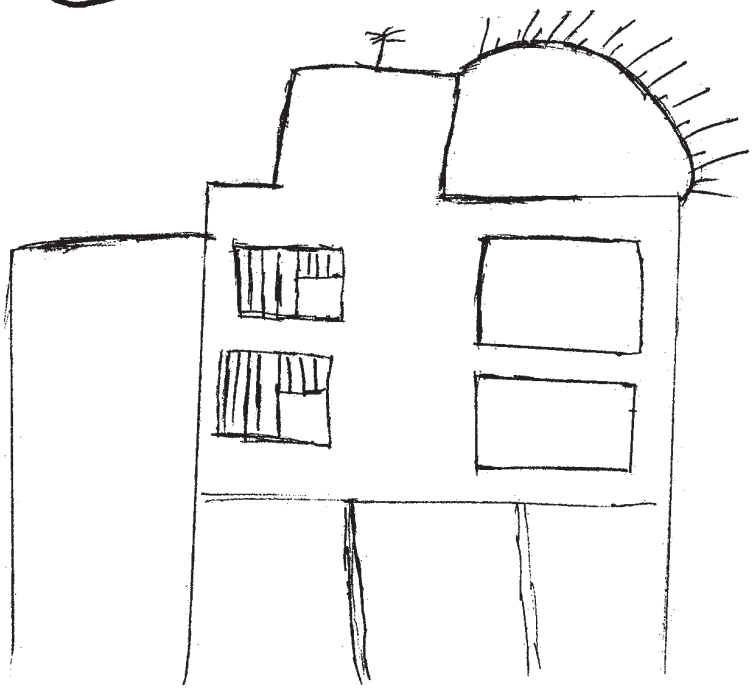
DID YOU KNOW?

In October and November every year cyclones form over the Bay of Bengal. A cyclone is a huge rotating storm. It could be hundreds of kilometres wide. Cyclonic winds blow very fast - up to 300 kilometres per hour (three times as fast as an express train). They make huge waves and blow sea water far into the land, causing floods, uprooting trees, destroying houses and killing tens of thousands of people.

CHAPTER 2

DAY SKY, NIGHT SKY

Watching the sky



1. Here comes the sun!

a. Watch the sunrise and sunset. In which direction did the sun rise? In which direction did it set? (WorkBook pages 36-37)

b. Find out the time of sunrise and sunset every day for at least one week. You might find these times from a newspaper, an almanac, an older person, or by watching for yourself. Do this for one week in summer and one week in winter.

Did the sun rise at the same time every day? Did it set at the same time every day?

What can you say about the times of sunrise and sunset in summer and winter?

In the circle in your WorkBook shade the night time between **sunset** and **sunrise** for one day in summer and one day in winter.

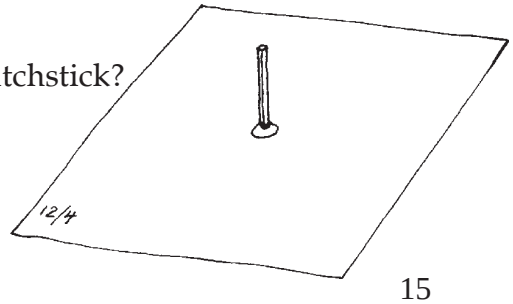
What can you say about the length of the days in summer and winter?

2. Shadow play

a. Stand in a sunny, level place in the morning. Ask your friend to measure the length of your shadow. Do the same around noon and in the late afternoon.

b. Stand a matchstick at the centre of a sheet of paper using thick glue or dough. Write the date on one corner of the paper and keep it in the sun. Mark the shadow of the matchstick at several times during the day. Write the time next to each shadow (WorkBook pages 38-39).

When did your matchstick give the longest shadow? When did it give the shortest shadow?



Was your match shadow ever the same length as your matchstick? If not, guess when it would be the same length.

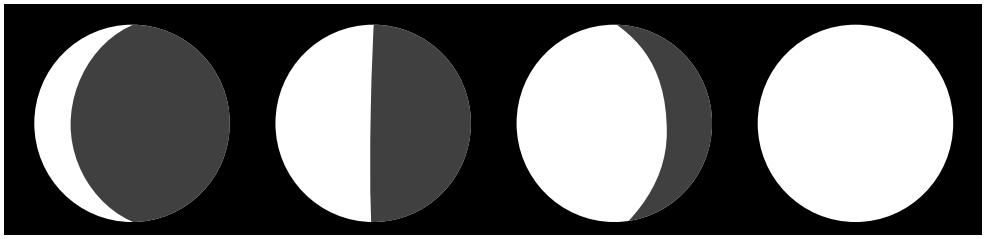
Did the other students' matchsticks give the same length shadows as yours? If not, why not?

c. Play this game with sunlight or some other bright source of light. Make shadows on a wall or the ground. Now ask a friend to stand behind you and make shadows using different things. Guess what the thing is by looking at the shadow.

3. Moon watch

a. Watch the moon. Does the moon also rise and set? In which direction did the moon rise? In which direction did it set?

b. Watch for the moon every night. Draw its shape in the calendar on page 40 in your WorkBook.



crescent moon **half moon** **gibbous moon** **full moon**

On which dates did you see a crescent moon?

On which dates did you see a half moon?

On which dates did you see a gibbous moon?

On which dates did you see a full moon?

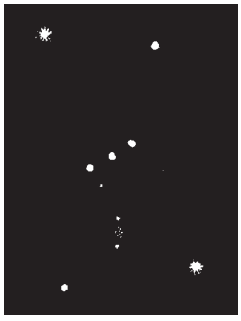
Did you ever see the moon during daytime? What was its shape then?

On which dates did you not see the moon at all? Why?

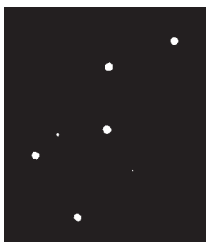
4. Starry night

a. You can recognise stars from the patterns they make in the sky. These patterns of stars are called **constellations**. Look for the constellations Orion (*Mruga*), Cassiopeia (*Sharmishtha*), and the Great Bear (*Saptarishi*) in the pictures on the next page.

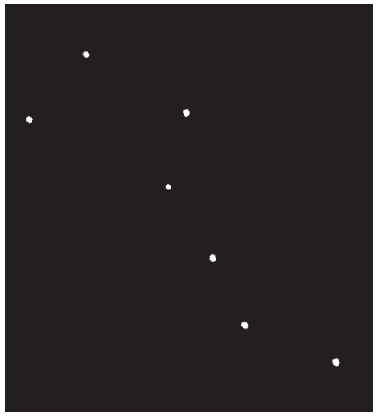
b. Look for constellations in the sky. Find the same constellation again after one hour (WorkBook page 41).



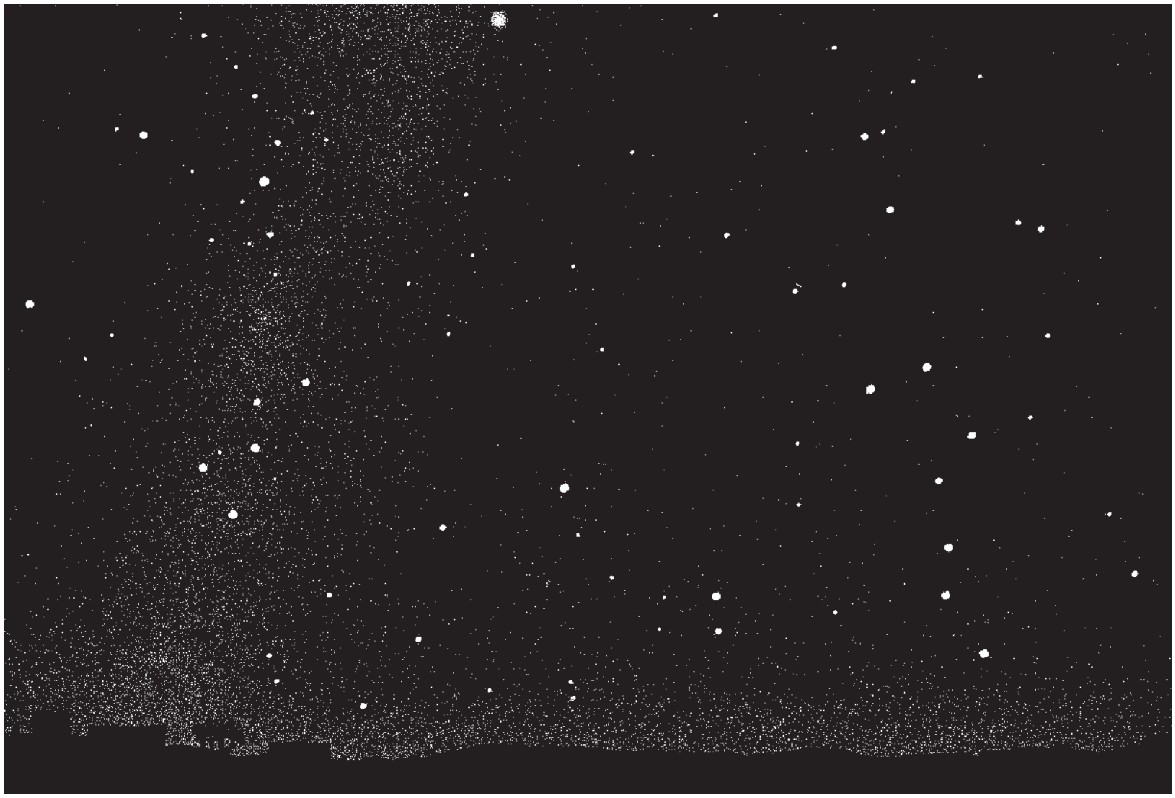
Orion



Cassiopeia



The Great Bear

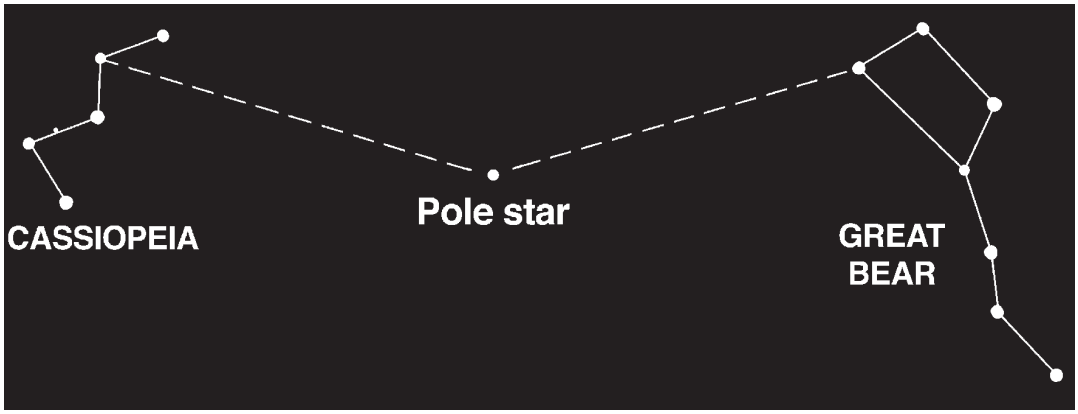


This is how the northern sky looks at around 8.30 pm in February.

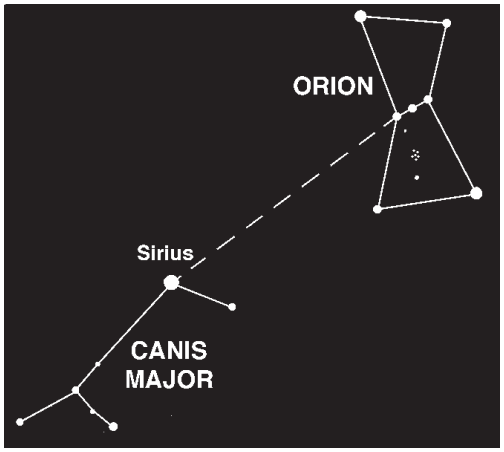
This is how the southern sky looks at around 8.30 pm in February.

c. Find these stars in the night sky: the Pole Star (*Dhruv Tara*) and Sirius (*Vyadh*).

You see the Pole Star (*Dhruv Tara*) in the northern sky. It is the only star that never seems to move. Use Cassiopeia and the Great Bear as guides to find the Pole star.



Sirius (*Vyadh*) is part of the constellation Canis Major. Use Orion to find Sirius.



d. Planets look like stars but they do not twinkle. Look for some planets in the sky.

Think Think!

A lighted lamp looks brighter at night than it does during the day. Mini said, "Lamps give more light in the night". What do you think?

Apu thinks that there are stars in the sky even during daytime, but you cannot see them. What do you think?

Know these words

crescent moon	constellation
gibbous moon	star
full moon	planet

EXERCISES

Name and draw

1. Draw the shape of the moon on some festival days, for example: Buddha Purnima, Dussera (Vijaya Dashmi), Bakri Id, Guru Parb (Guru Nanak Jayanti), Diwali.

What's the same? What's different?

1 Give two similarities and two differences between:

a. The sun and the moon
b. A stick and its shadow
c. The moon when it is rising and when it is high in the sky
d. Sunrise and sunset

Talk and write

1. Remember some poems or songs about the moon, sun or stars. Make up some new ones.

Ask and find out

1. In the **Name and draw** exercise you have drawn the shape of the moon on some festival days. Find out about other special days that are celebrated on particular days of the moon.
2. Find out some stories about the constellations.

Figure it out

1. Match the happenings on the left with the two seasons on the right:

Long day, short night	
Short day, long night	Winter
The sun rises early	
The sun rises late	Summer
The sun sets early	
The sun sets late	

2. Match the events on the left with the times on the right:

The full moon rises	Around sunrise
The full moon sets	
A crescent moon rises	Around sunset
A crescent moon sets	

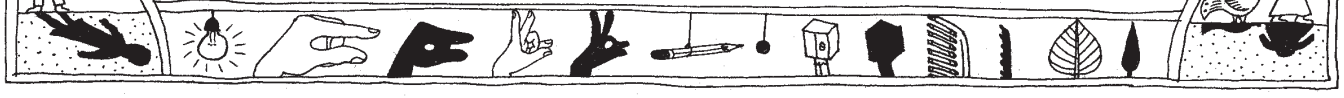
3. Match the events on the left with the two directions on the right:

The sun rises	
The sun sets	
The moon rises	East
The moon sets	
A full moon soon after sunset	West
A full moon just before sunrise	
A crescent moon soon after sunset	

4. Follow the instructions in your WorkBook to draw stars on the graph. Look at the sky pictures to find which constellation you have made.
5. Look at the pictures in the WorkBook and guess what time it is in each picture.

Ask a question

1. Ask questions about day and night. Think of how you will try to find the answers.



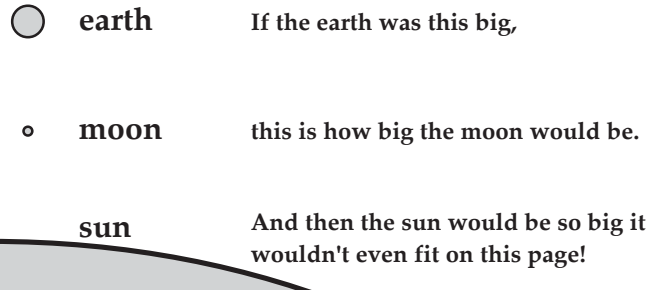
DID YOU KNOW?

The earth is shaped like a big round ball. We live on this ball.

The moon is a ball that is smaller than the earth.

Our sun is a very big and very hot ball of gas. It is many times larger than the earth.

Stars too are hot balls like our sun but they are much, much further away from us. Many stars are bigger and brighter than our sun.

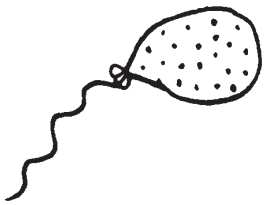


UNIT 2

AIR

It's fun to play with; you cannot live without it,
yet you never see it!
It makes things bump, and bounce, and fly,
and burp, and sing.
It's not solid or liquid, but it is something, a material,
all those gases mixed together!

Play with it, learn about it.
Find out how to keep it clean.
Remember, your life depends on it!



CHAPTER 3
FUN WITH AIR!

Airy story

Mini came quietly into the room. She looked as if she was hiding something. Her mouth was full.

"What are you eating?" demanded Apu. "I want it too!"

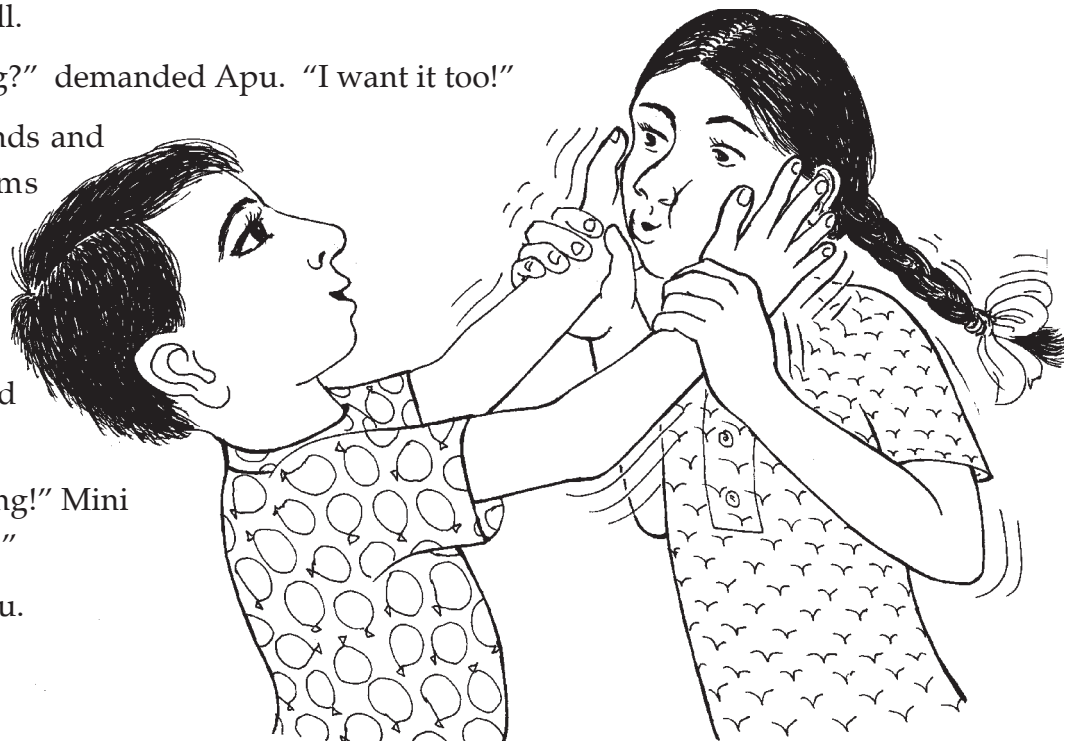
Mini took Apu's hands and smacked his palms against her cheeks.

"Phrroop!" came the funny sound.

"It was nothing!" said Apu, disappointed.

"Yes, it was something!" Mini laughed. "It was air!"

"Air!" exclaimed Apu.



It's everywhere,

It's all around,

In corners, cracks,

And under the ground.

It bubbles, it blows,

It creeps and it flows,

It whistles, it sings,

Lifts birds on their wings.

Run, and you will feel it!

But never will you see it,

It looks like nothing, but it's there,

Rushing, pushing everywhere!

Air all around!

1. Air inside everything

a. Take a paper or plastic bag. Open it. Check to be sure it is empty. Squeeze and press on it. You can easily flatten it.

Open the bag again. This time close the mouth of the bag tightly. Now is it easy to squeeze the bag?

What is inside the bag?

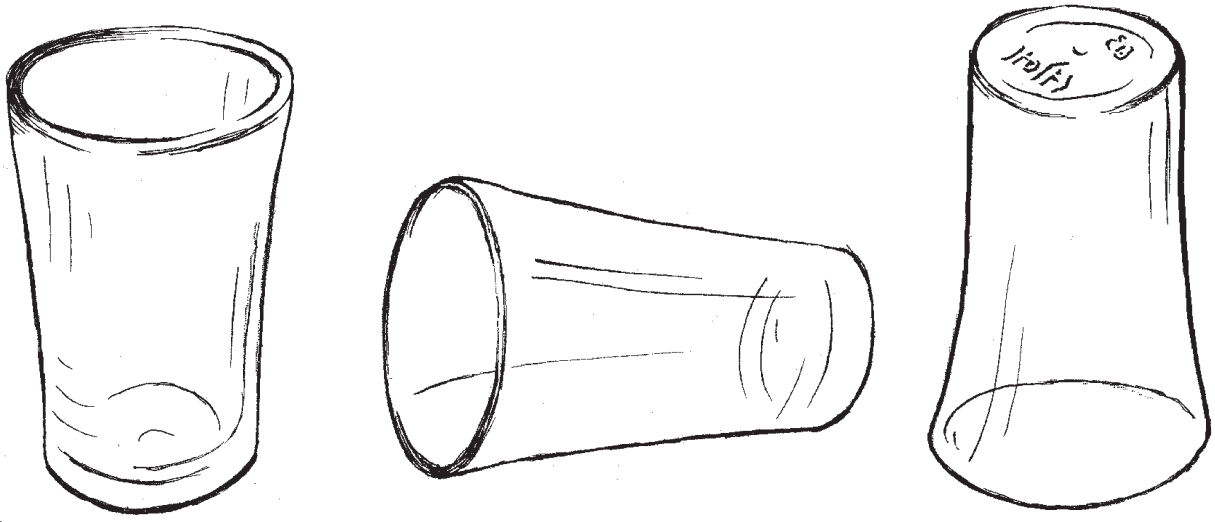
b. Hit the bag against the palm of your other hand. *Phutt!*

Describe what happened.

(WorkBook page 49)

c. Take three glasses. Keep one of them upright. Keep the second glass on its side. Hold the third glass upside down. *Think* about what happens to the air inside these three glasses. Make your own guesses.

Is there air in all three glasses? Does the air inside the glasses stay inside them always? Does it come out of the glasses? Does air from the outside get in?



Think! Think!

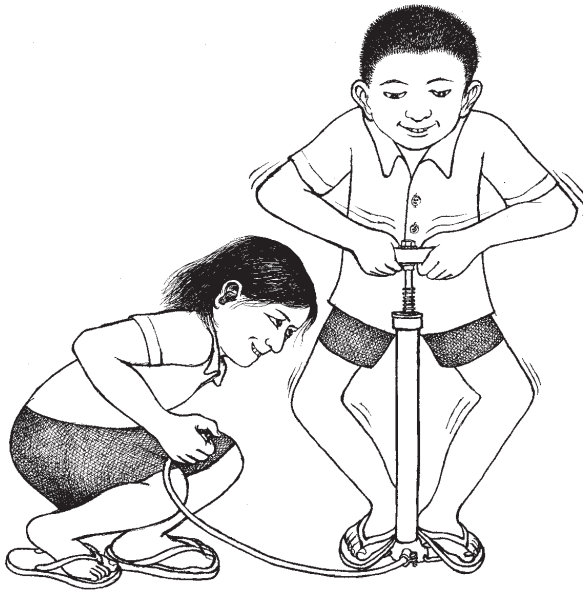
It is easy to squeeze the bag when its mouth is open, but difficult when its mouth is closed. Why?

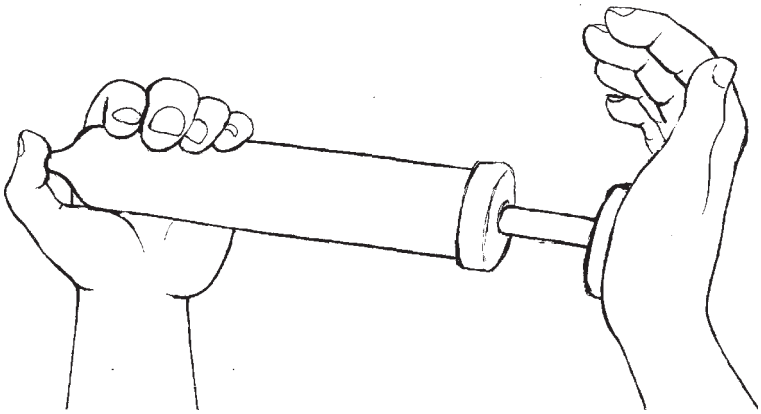
What made the "phutt" sound? Did the bag tear? Why or why not? Name some other ways of making sudden sounds.

Suppose the three glasses were filled with water instead of air. From which of the glasses would the water flow out? Is there a difference between the way water flows and the way air flows?

2. You can squeeze air

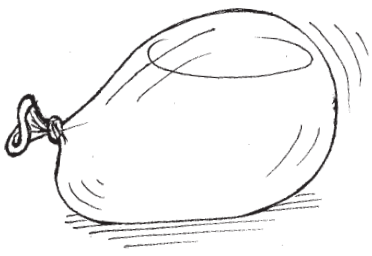
Take a bicycle pump, pichkari, or a syringe without the needle. Close its mouth tight and push the piston in hard. Then let go of the piston. Describe what happened on page 50 in your WorkBook.

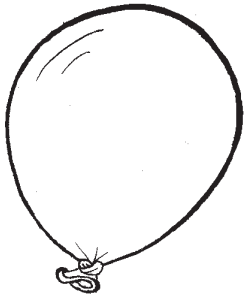


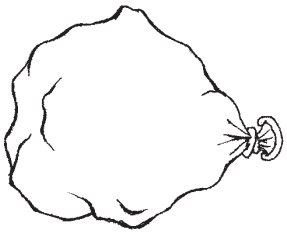


Think! Think!

We fill air inside balloons, footballs, cycle tyres and many other things. What would happen if we filled these things with something else? Imagine what would happen if they were filled with water, or sand, or crumpled paper . . .?







3. Air moves and pushes things

a. Moving air is called wind. List some things that you have seen moving with the wind. (WorkBook page 50)

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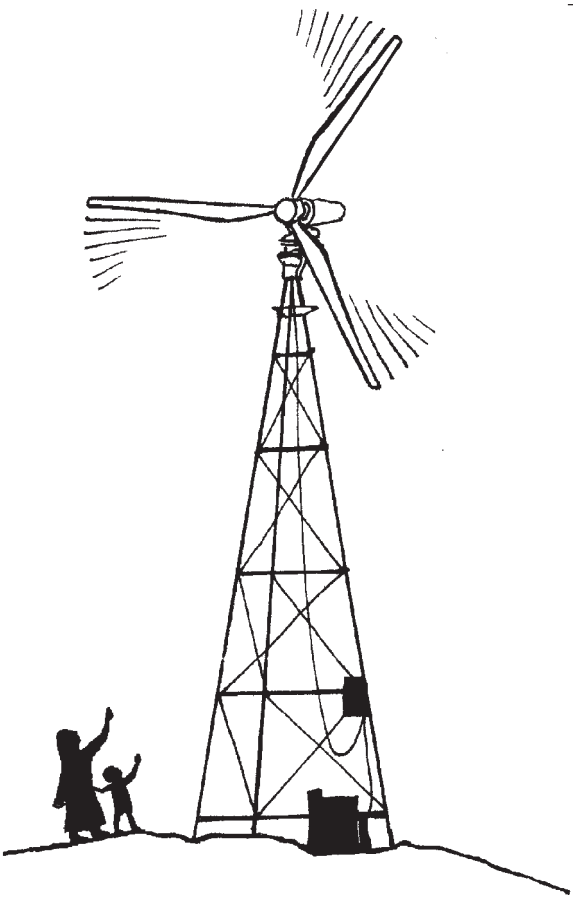
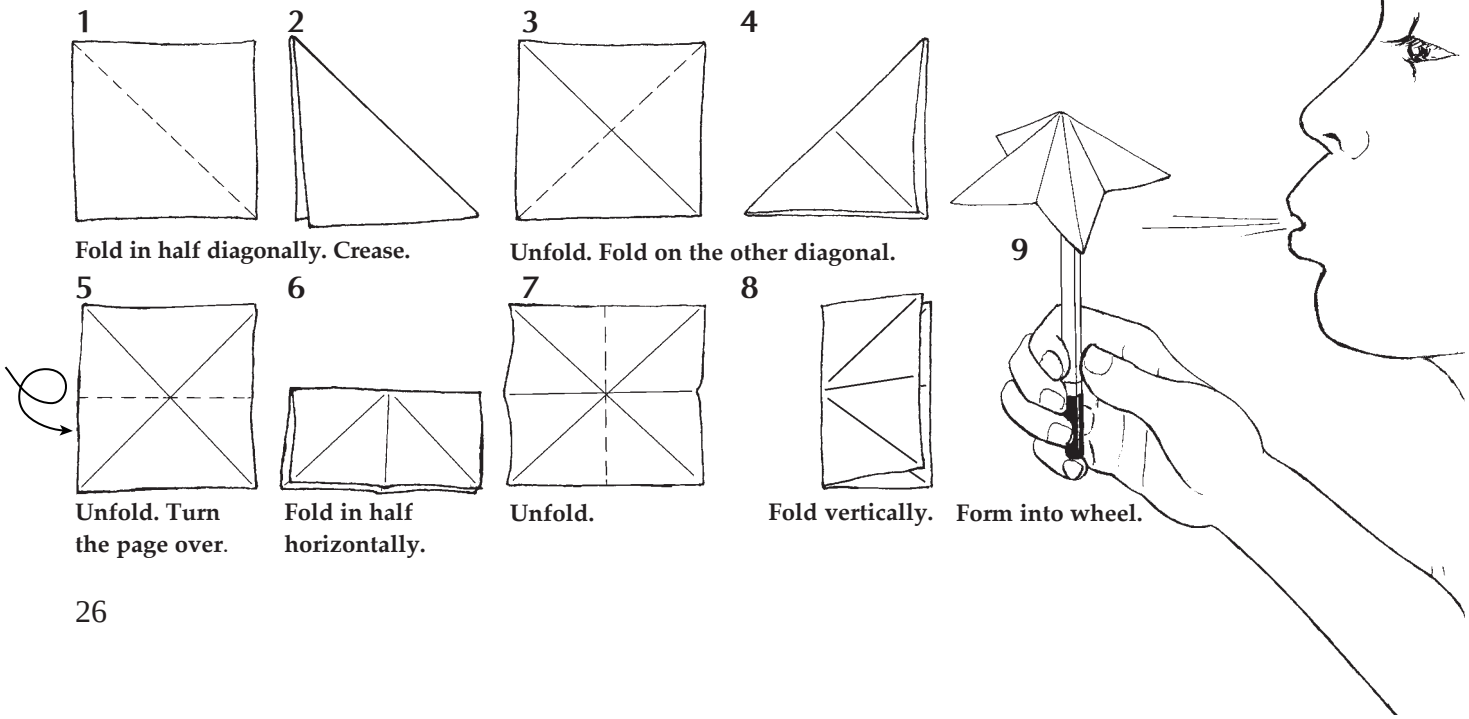


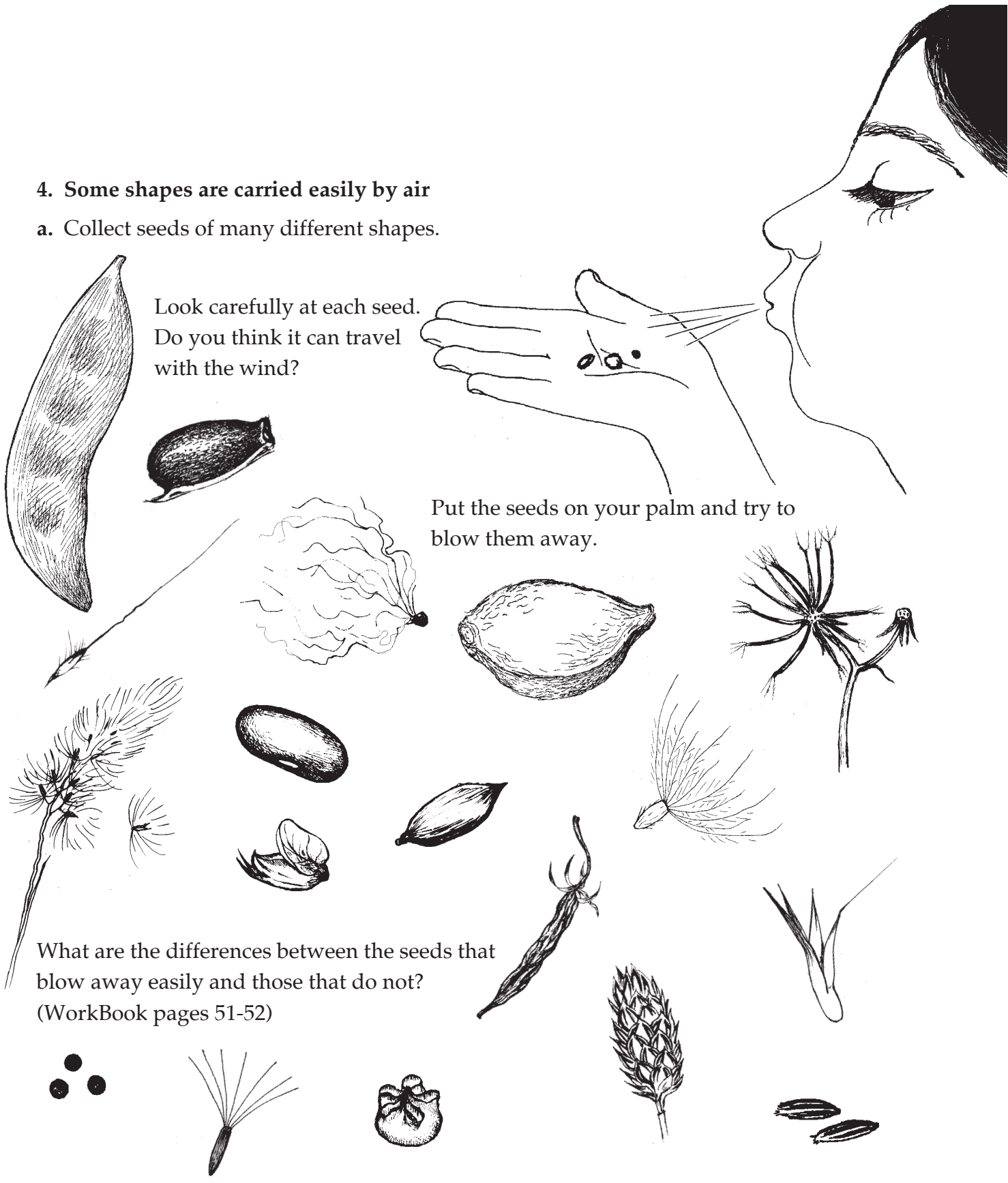
b. Hold a large open newspaper or a sheet of cardboard. Now run. If there is a wind blowing, run with wind. Then run against the wind. Feel the difference.

c. Make a **wind wheel**. Fold a 6 cm square piece of paper as shown. Put it on the point of a pencil and blow gently on one side. Describe what happens.



4. Some shapes are carried easily by air

a. Collect seeds of many different shapes.

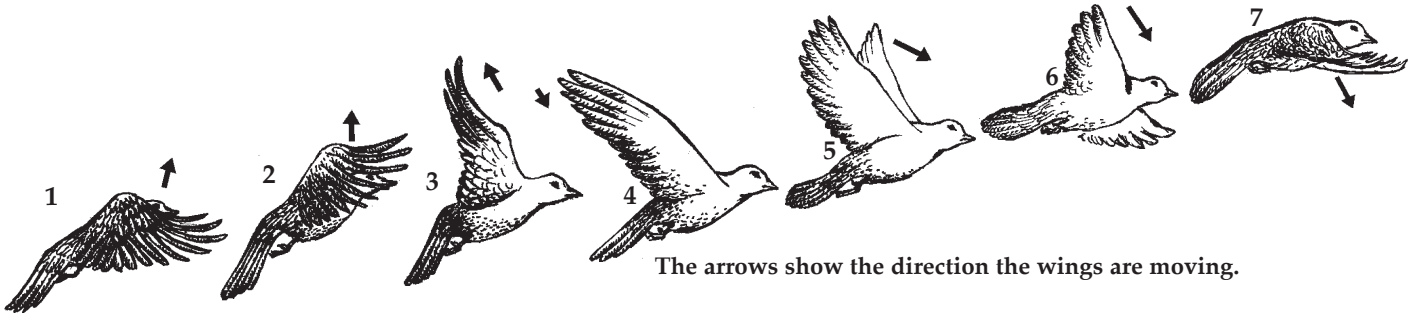


Look carefully at each seed. Do you think it can travel with the wind?

Put the seeds on your palm and try to blow them away.

What are the differences between the seeds that blow away easily and those that do not? (WorkBook pages 51-52)

b. Take a seed that does not travel very well with the wind. What could you stick to your seed to make it blow away with the wind? Try some of your ideas.



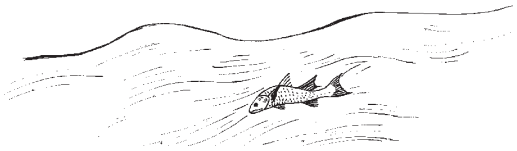
The arrows show the direction the wings are moving.

c. Watch the shape of a bird's body as it flies. Now watch how the wings are turned when the bird slows down to land.

an owl landing

a gull diving

If a bird swoops or dives very fast to catch something, you will see how the wings are folded close to the body.



d. Play this game. Each of you take a sheet of paper of the same size. Fold your paper, crumple it, or roll it into any shape, without cutting or tearing the paper. Now stand in a line with some friends and throw your paper shape. Guess how far your shape will travel. Try it several times. Measure the farthest distance each shape goes (WorkBook page 52).

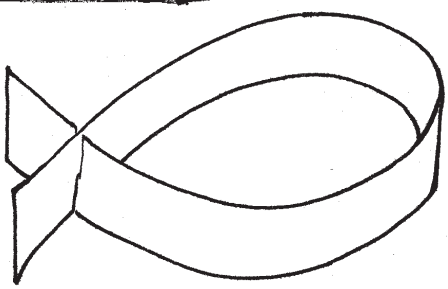
e. Make a spinning fish.

Take a strip of paper, 12 cm x 1 cm.

Cut two small slits on opposite sides, about 2 cm from each end.

Bend the paper strip and lock the slits into each other.

Throw the fish in the air.

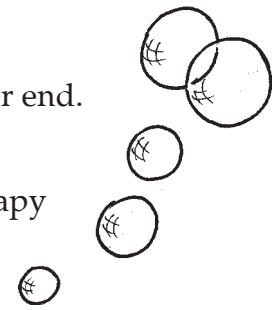


Think! Think!

What happens if the seeds of plants do not blow far away, but fall to the ground close to the plant?

Are there any similarities between the shapes of birds, fish and aeroplanes?

5. Air makes bubbles



a. Dip one end of a drinking straw in a bowl of water. Blow into the other end. Put some soap in the water and blow again.

What is the difference between the bubbles in plain water and those in soapy water? Try different kinds of soap, like bath soap, washing powder, or shampoo. Try to make bubbles that are bigger and that last for a longer time (WorkBook page 53).

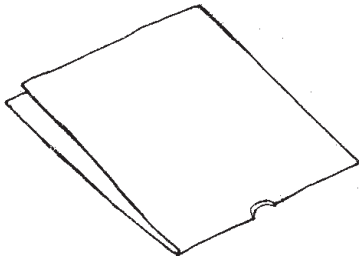
Guess what is inside all these bubbles!

6. Air makes sound

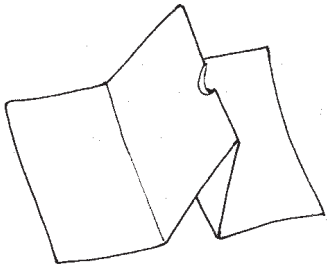
a. Find different ways of making sound using different parts of your body. Make soft as well as loud sounds (WorkBook page 54).

b. Make a paper whistle.

Take a piece of paper, 10 cm x 5 cm.



Fold it in half and tear out a hole in the centre.



Fold out the two sides.

Hold the whistle between two fingers and blow hard.

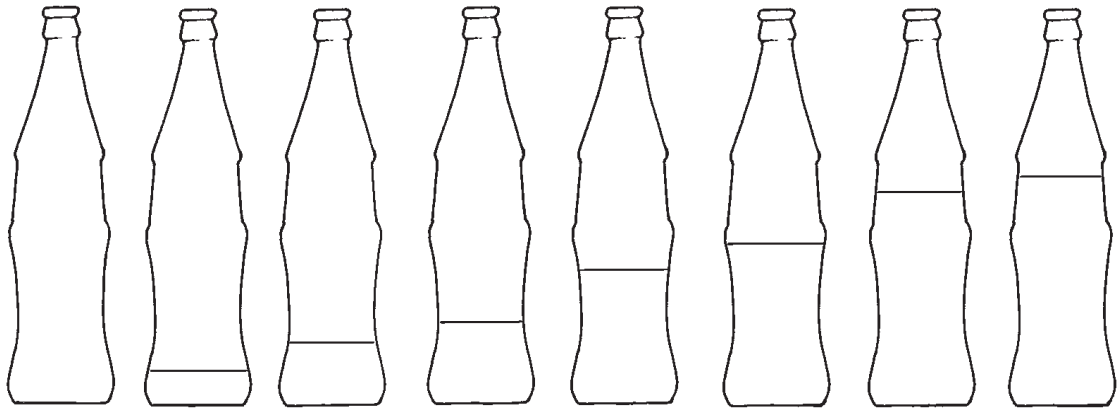
7. Air makes music

a. A musical sound can be loud or soft. It can also be high pitched or low pitched. Sing loud, sing soft, sing high pitched, sing low pitched. Now sing loud and low pitched.

b. Blow across the mouth of an empty bottle, or strike it with a spoon. Add some water and blow or strike again. Hear how the sound changes.

Which sound is higher in pitch?

c. Collect eight empty bottles of the same size and shape. Fill them with water up to different levels. Arrange the bottles in order of water level. Blow across the top of each bottle or tap them with a spoon. Adjust the levels of water until you get a musical scale.

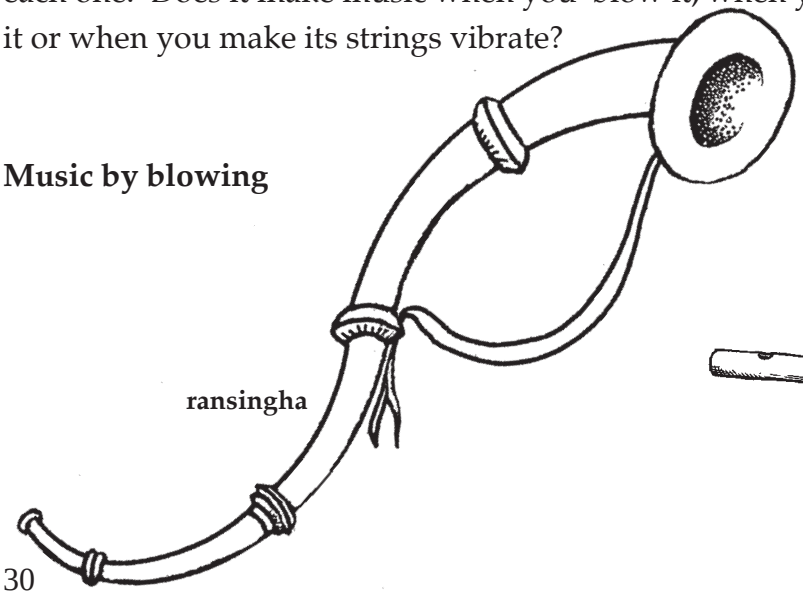


d. Stretch a large torn balloon over the mouth of an empty glass. Fix it in place with a rubber band. Tap, rub, or pluck it to make different sounds.

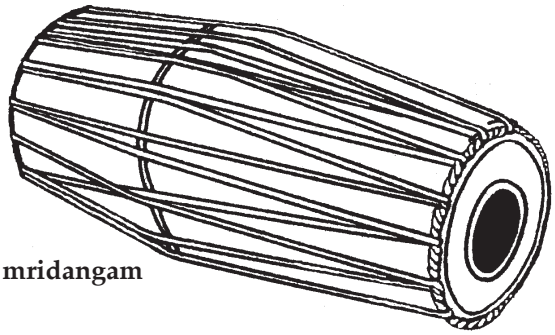
e. Pluck a stretched rubber band to make it vibrate. Then stretch the rubber band around an empty box and pluck it again. Which of the sounds is louder?

f. Bring some musical instruments to class. Look carefully at each one. Does it make music when you blow it, when you beat it or when you make its strings vibrate?

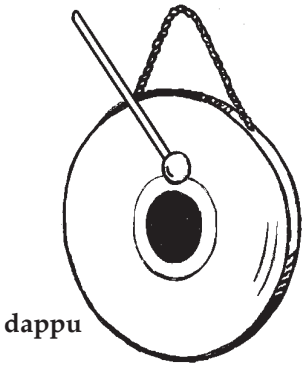
Music by blowing



Music by beating

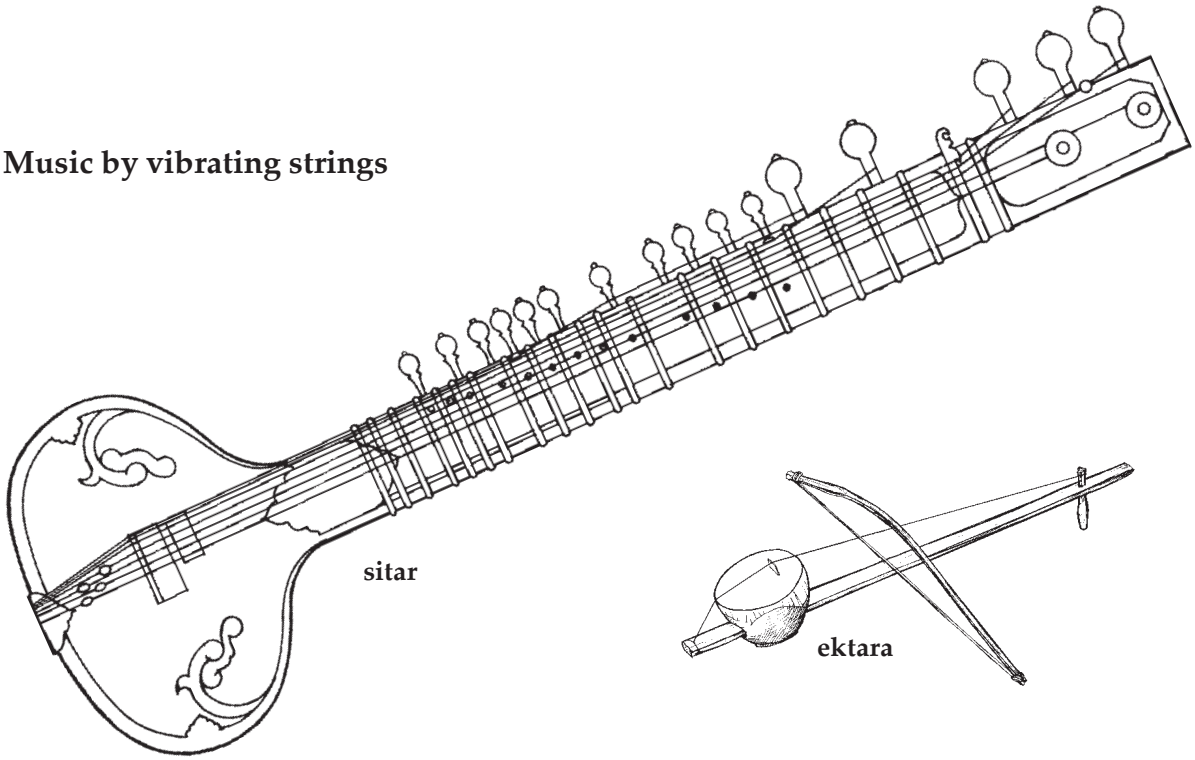


mridangam



dappu

Music by vibrating strings



sitar

ektara

Try to identify the musical instruments that are shown on pages 56-57 in your WorkBook. Sort them into the three groups: blowing, beating and vibrating strings.

Which musical instruments have air inside them? Guess which parts contain air.

g. Design and make your own musical instrument (Workbook page 55).

Know these words

vibrate vibration

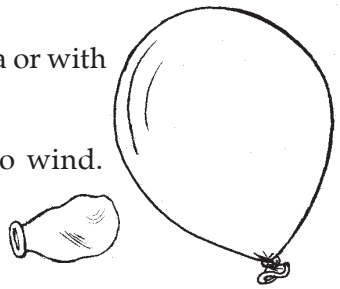
EXERCISES

Name and draw

1. Something moving in the air: draw it so that people will know it's moving.
2. Imagine a musical instrument that will play when the wind blows on it.

Interesting questions

1. When you pour water on dry soil, do you see bubbles? Why?
2. Name some places where you have seen bubbles.
3. On a calm day, is it easier to run with an open umbrella or with a closed umbrella?
4. Suppose you throw these two balloons. There is no wind. Which balloon will travel further?



5. You have two sheets of paper: one unfolded, the other crumpled into a ball. If a wind blows, which sheet will travel further?
6. Name some seeds that are carried by the wind.

Classroom discussion

1. In which of these places is there air: in a closed cupboard, in the soil, in water, inside your body, inside a brick?
2. Is there any place that is empty? Which does not even have air? Make your own guesses.
3. Suppose you close the mouth of a pichkari that is filled with water and push the piston. Will the piston move? Is this different from what happened with air? Why?

What's the same? What's different?

1. Give two similarities and two differences between:
   a. Air and water
   b. Air and mud
2. Look at these sets of things:
   a. balloon, bubble, football, cricket ball

   Why is the cricket ball different from the rest?
   b. vulture, frog, butterfly, aeroplane

   Why is the frog different from the rest?

Play with words

1. These action words describe what air can do and what you can do to air: move, push, press, squeeze, blow, bubble, sing ... Write all these words in the crossword on page 61 in your WorkBook. What else can air do? See how many more words you can add to the crossword.
2. Finish this poem about air using as many of the crossword words as you can.

   Talk to me, air!
   Knock on the blue door
   Tumble inside, air!
   Lift my papers gently
   Tickle my soft nose, air!
   . . . .
3. Here are some 'sound words.' Think of some more. Try to make these sounds.

   bang! trrnng hum squeak plop sshroooookh

Figure it out

1. With some instruments you make music by blowing air from **inside** your body. In others you use air that is **outside** the body. Sort the following instruments into these two types using the pictures in your Work Book:

   flute tabla shehnai guitar
   veena harmonium sarangi whistle

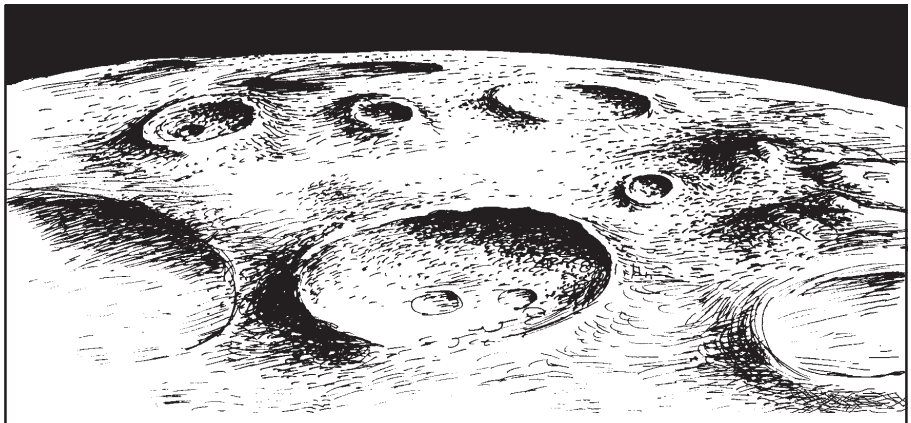
Ask a question

1. Ask questions about air. Think of how you will try to find the answers.

DID YOU KNOW?

Air is everywhere around the earth. But if you climb up a very high mountain, there will be less air. If you go on a rocket into outer space, you will come to a place without any air.

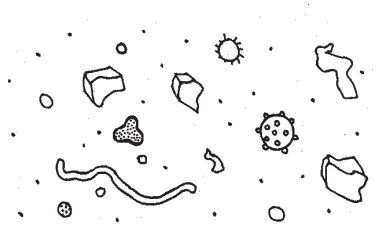
There is no air on the moon.



A close-up picture of the moon

CHAPTER 4

WHAT'S IN THE AIR?



Something in the air

Apu and Mini were playing in the big ground with trees around it. They loved to run, jump and play in the clean fresh air.

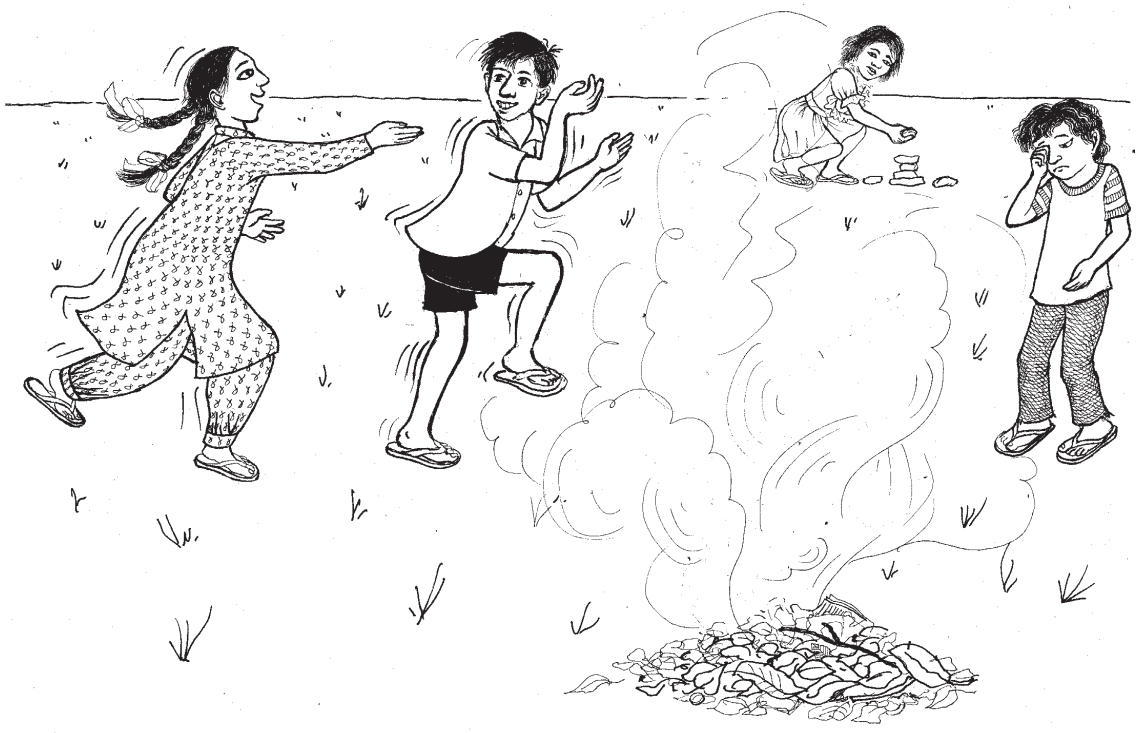
There's something in the air
That lets me live
It lets me breathe
Makes me feel so good!

But today some people came to the ground to burn dry leaves and garbage. The playground was full of smoke. Mini and Apu soon decided to go home.

There's something in the air
That chokes me up
That smells so bad
Makes me sputter and cough!

As they walked home they wondered, "Does it have to be like this?"

What can we do to have clean, fresh air always?



What is air?

1. Air is made of different kinds of gases.

a. The four main gases in air are called **nitrogen**, **oxygen**, **carbon dioxide**, and **water vapour**.

These four gases have no colour, no smell, no taste.

Each gas is made of very tiny particles called molecules. Molecules are so small that we cannot see them with an ordinary microscope.

This is an imaginary picture of air:

The rectangles show molecules of nitrogen.

The black ovals show molecules of oxygen.

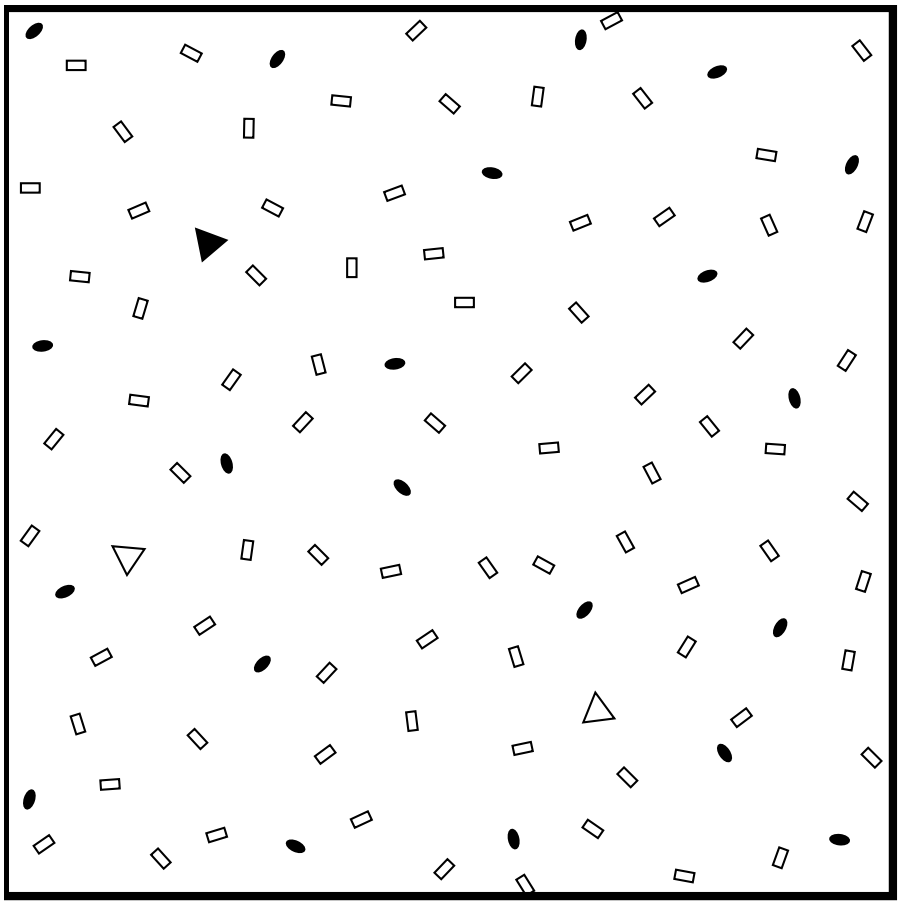
The black triangles show molecules of carbon dioxide

The white triangles show water molecules.

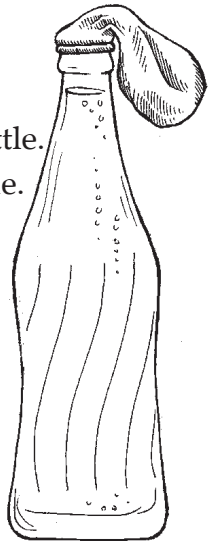
Look at the picture to answer these questions:

Air consists mainly of which kind of gas?

What is the second most abundant gas in air?



An imaginary box of air

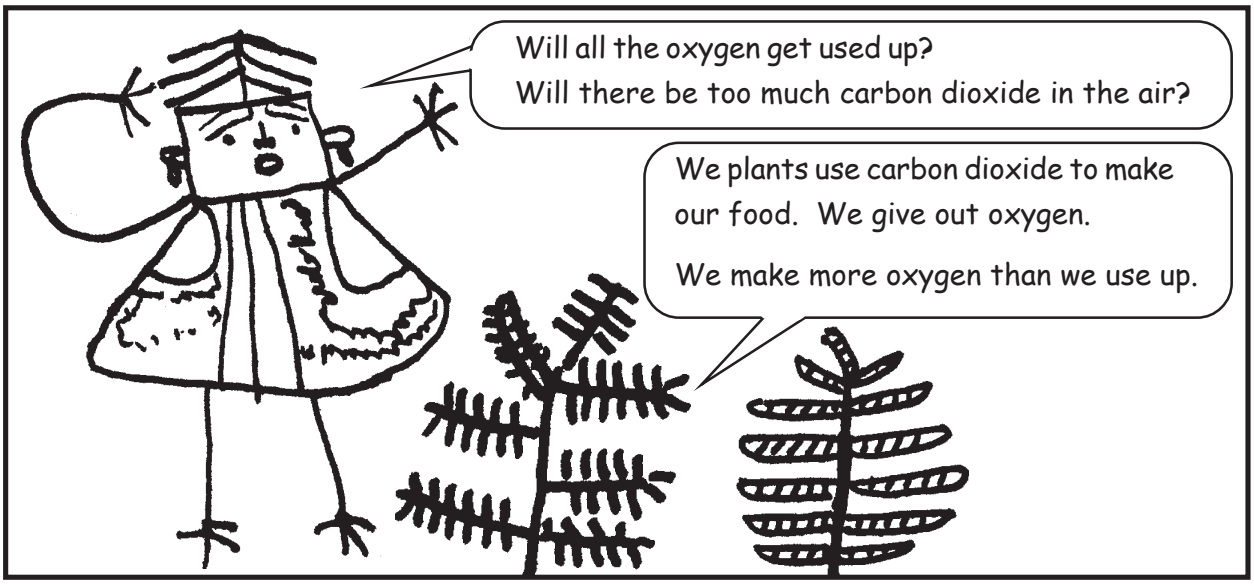


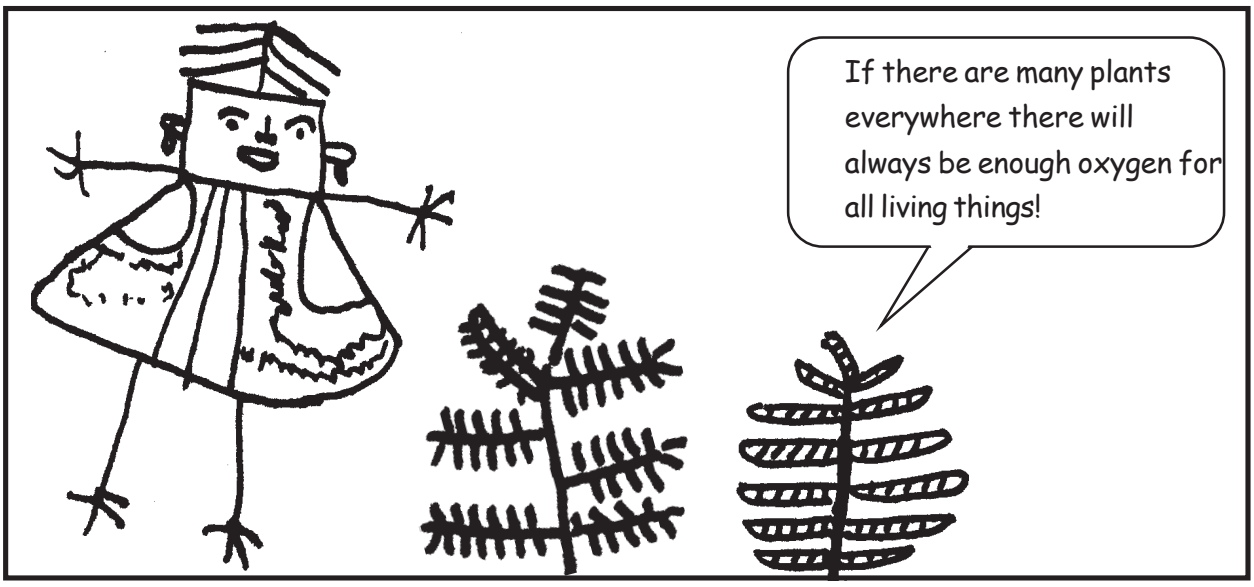
b. Fill a balloon with carbon dioxide: get a bottle of soda or some other aerated drink. Open it and quickly put a balloon over the mouth of the bottle. Shake the bottle. Watch the bubbles rise up. They are full of carbon dioxide. (WorkBook page 64)

2. Living things use gases

a. All living things need to breathe air. Without air they would die.

All animals and plants use up oxygen from the air and give out carbon dioxide.





b. We need to breathe! Close your mouth and hold your nose shut.

Count in your mind, "tick tick one, tick tick two ..." For how many seconds can you keep your nose and mouth shut? (WorkBook page 65)

Think! Think!

All animals need oxygen. How do fish get oxygen?

3. Air inside our bodies

a. Blow on your palm. Where is this air coming from? For how many seconds can you keep blowing out? (WorkBook page 65)

b. Blow air into a balloon. Hold the balloon and release its mouth.

What do you feel? What do you hear? Where did the air in the balloon go?

Think! Think!

You blew air into a balloon. Where was this air before it went into the balloon? Do you think it was somewhere inside your body?

How many balloons can you blow up one after another? Where will all that air come from?

4. Where do different gases come from?

a. Living plants make oxygen. Animals make carbon dioxide.

b. In Chapter 10 you will find out how things decompose (rot). When plants and animals die they decompose. Decomposing things give off gases as waste. One of these gases is carbon dioxide.

Decomposing things give off other gases too. You can smell some of them.

Name some decomposing things that give off gases.

c. Go to different places in your home, school or outdoors. You could go to a kitchen, a bathroom, a garden, or a garbage dump. Close your eyes and sniff. Which of these places can you recognise by their smell? How do the smells get inside your nose?

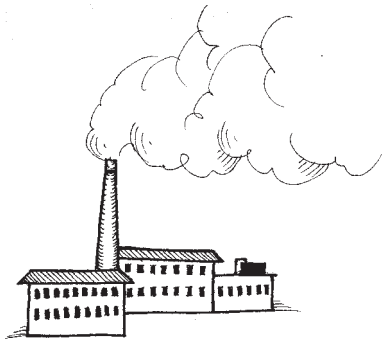
d. Burning things use up oxygen. They produce carbon dioxide and other gases. You cannot see these gases. Many of them are poisonous.

Can you smell the stove or fire in your kitchen?

Stand around the teacher in two circles. The teacher will light a match. When you hear the sound of striking the match, start counting seconds, "tick-tick one, tick-tick two ...". As soon as you smell something, raise your hand and note the number of seconds the smell took to reach you.

e. Factories make different kinds of gases. They also give off gases as waste.

Here are some ways poisonous gases get into the air:



Look for ways that poisonous gases might be getting into your air.

Take care!

Some poisonous gases have a smell, but others do not. Sometimes people can die from breathing too much of a poisonous gas that they cannot see or smell.

When tobacco burns it makes smoke that you can see as well as gases that you cannot see. The smoke and the gases are poisonous.

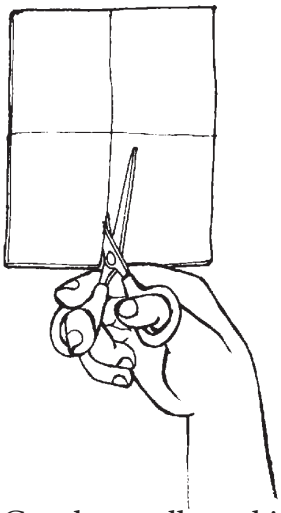
Breathing these gases may make you sick right away, or years later. Do not use tobacco or breathe tobacco smoke!

5. Air carries dust and smoke

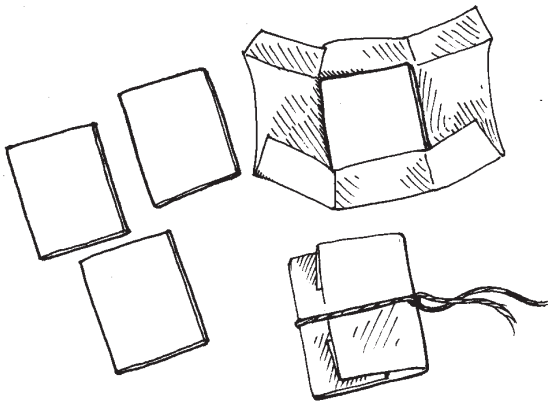
a. Watch a beam of sunlight, or shine a bright light, in a darkened room. Describe what you see (Workbook page 67).

b. Sweep the floor of a room and collect the dust. Where did all this dust come from? Name some places and things that get very dirty or dusty. Think of how the dust came to these places.

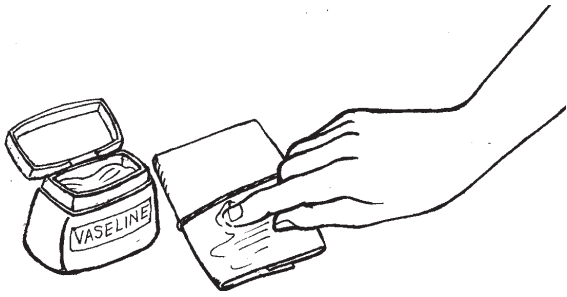
c. Find out how dusty the air is. You will need: cardboard cover from an old notebook, white cotton cloth or paper, string or clips, vaseline or grease.



Cut the cardboard into four pieces.



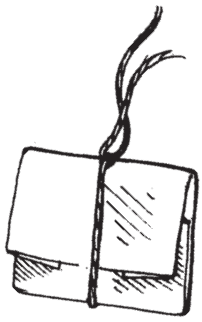
Cover each piece with white cotton cloth or paper.



Rub vaseline on the cloth or paper.

Hang these cards in four different places:

- a place that you think has very clean air,
- a place that you think has very dirty air
- any two other places.



Compare the cards after a few days. Describe what you see on them. Guess why the cards look the way they do (WorkBook page 67).

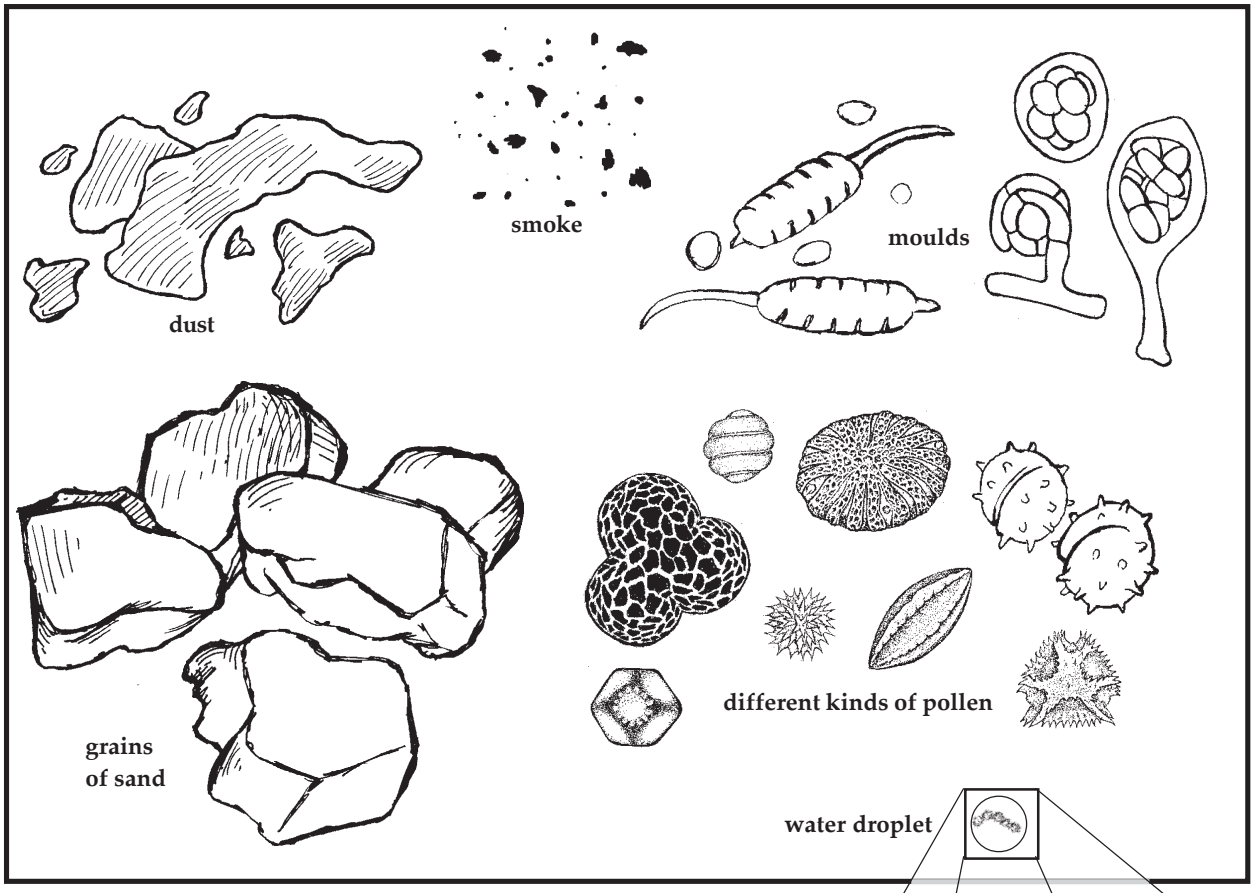
Can you use such cards to check how dirty the air is? Would this method work every time?

A hand lens makes things look bigger. Look at the dust and sand on your cards through a hand lens. Can you see any particles with the hand lens that you cannot see without it?

6. Air carries things that you cannot see

A microscope has many lenses in it. With a microscope you can see tiny things that you cannot see with a hand lens.

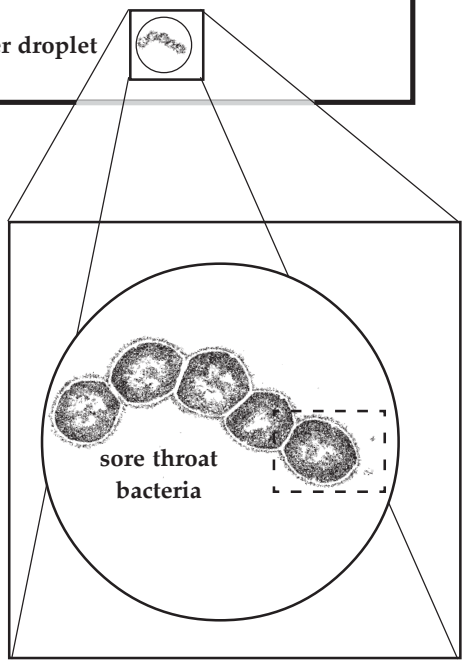
Some of the things floating in the air look like this through a microscope:



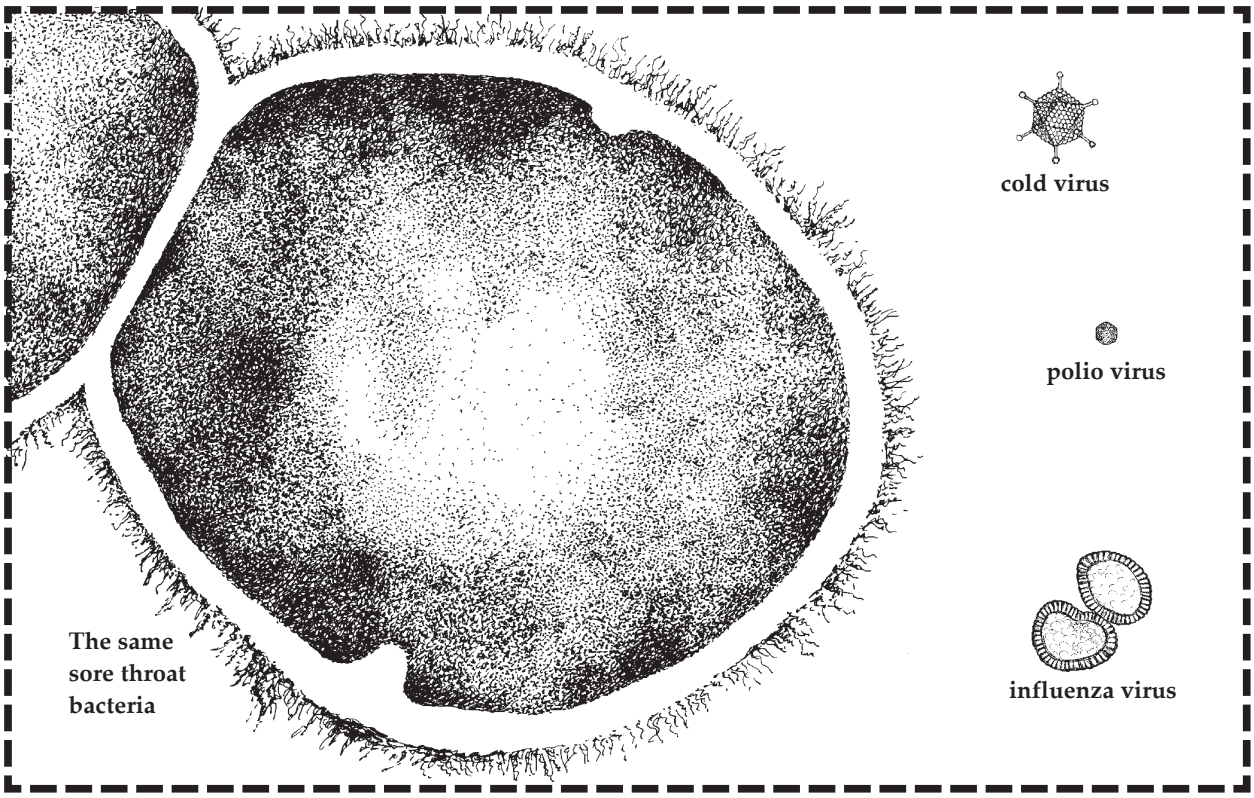
Which of these might be living things, or parts of living things? Check your guess with your teacher.

Tiny living things that you can see only through a microscope are called **microbes**.

The water droplet in this picture is much smaller than a raindrop. When you cough or sneeze you send thousands of water droplets into the air. You cannot see the smallest droplets except under a microscope.



This close-up view of the water droplet shows it contains a chain of bacteria that can give you a sore throat. Can you see anything else in the dashed rectangle drawn in the droplet?



Here is a close-up view of that dashed rectangle. Now you see the sore throat bacteria and some viruses too.

Take care!

One sneeze or cough sends out tiny water droplets containing millions of microbes. Someone who breathes in these microbes might become sick. Cover your mouth and nose when you sneeze or cough!

There are many different kinds of moulds, bacteria, and viruses. Most of them are not harmful to people.

Know these words

gas	water vapour	microscope	bacterium
nitrogen	poisonous gases	microbes	bacteria
oxygen	air pollution	mould	virus
carbon dioxide	decompose	pollen	viruses

Air that contains too much poisonous gas, smoke, dust or too many microbes is called **polluted air**.

EXERCISES

Name and draw

1. Some things that smell bad
2. Some things that smell good

Interesting questions

1. You can blow out continuously for only a few seconds at a time. Why?
2. For which of these actions do you need to take deep breaths?
   running
   walking
   swimming
   eating
   shouting
   writing
   whistling
   singing
3. If you do not wipe things they get covered with dust. Why?
4. Name some ways that dust gets into the air.
5. Name some ways that smoke and poisonous gases get into the air.
6. Is there water in the air? How do you know?
7. Which of these gases can you smell?
   oxygen
   carbon dioxide
   water vapour
   kerosene vapour
8. From the pictures on pages 40-41 in the TextBook, guess which diseases spread through air.
9. Arrange these microbes from largest to smallest:
   sore throat bacterium
   cold virus
   polio virus
   mould
   influenza virus

What's the same? What's different?

1. What polluting things (for example, poisonous gases, dust, smoke or microbes) get into the air when the following things happen:
    a. a bullock cart goes down a dusty road
    b. a truck goes down a dusty road
    c. a person spits
    d. a tree grows
2. Find the odd one out:
    a. air, water, food, sweets
    b. oxygen, carbon dioxide, water, water vapour
    c. gases, dust, smoke, rabbits, tiny living things

Talk and write

1. The air I breathe (Think of the air you breathe every day. Is it clean or dirty? Why do you think so? What things make your air either dirty or clean? What can you do to get clean air?)

Play with words

1. Find out what these smell words mean. Then match the smell words on the left with the things on the right.

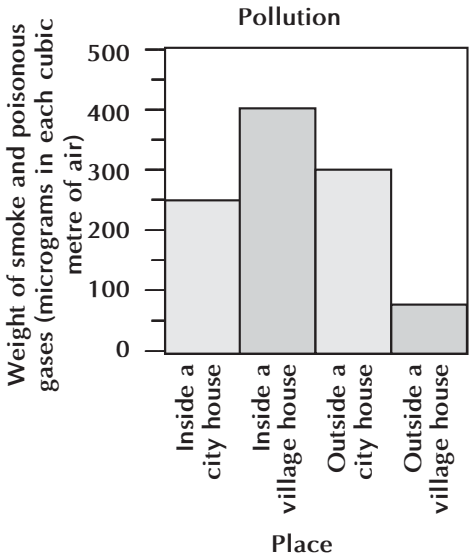
	cooked cauliflower left for two days
sweet	roasting chillies
rotten	mango
rancid	a rose
pungent	old cooking oil
fruity	perfume
	onion

Ask and find out

1. Have you seen waste materials being burnt? Why is waste burnt? Does burning waste cause any harm?
2. Find out some other ways that poisonous gases get into the air.
3. Have you heard of people getting sick from gases and smoke?

Figure it out

1. Apu met a scientist who was measuring pollution. She showed him this graph of the amounts of pollution she had found in one city and in a village some distance away.

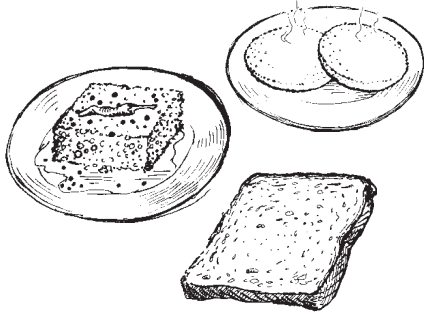


   a. What could be the reasons for pollution in each of these four places?
   b. Which places had the cleanest air? Can you explain why?
   c. Which was more polluted, the village home or the city home? Can you explain why?

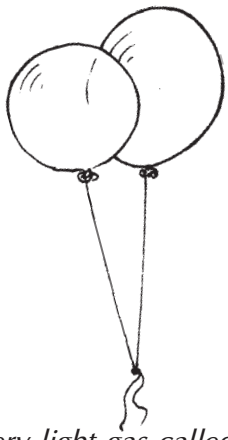
Ask a question

1. Ask questions about different gases in the air. Think of how you will try to find the answers.

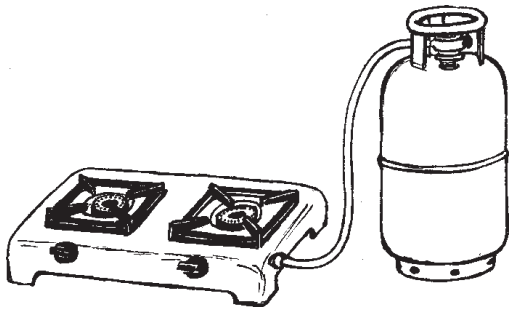
DID YOU KNOW?



Holes in idli, dhokla, batura, bread and cake are made by carbon dioxide produced inside these foods.



A very light gas called hydrogen is filled in the kind of balloons that rise high up in the air.



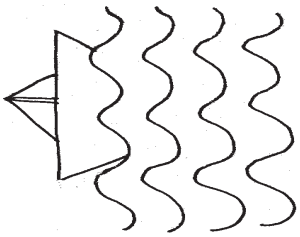
Cooking gas cylinders contain a liquid called LPG (Liquified Petroleum Gas). When it comes out it is a gas. LPG is got from deep under the ground.

UNIT 3

WATER

Cool, refreshing, washing, splashing, water!
Without water there would be no life.
Without water we would not exist!

Find out about this wonderful liquid called water.
Learn to measure it, to use it with care.
Every year the rains bring us fresh clean water.
Learn how to save it, so that every one of us gets enough water to live.



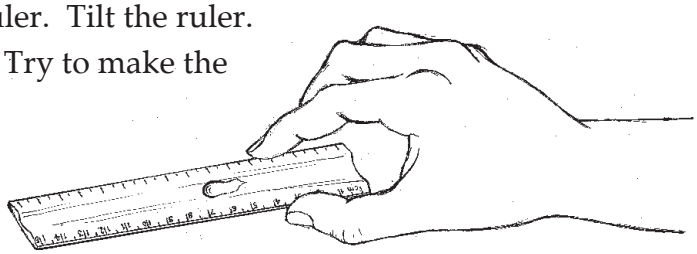
CHAPTER 5

FUN WITH WATER!

What water does

1. Water flows down

a. Put a few drops of water on one end of a ruler. Tilt the ruler. Watch the water flow. Do this several times. Try to make the water flow slower or faster.



b. Watch streams of water in a nullah or a river, near a public tap, a pump or a well. If it rains heavily, you see many streams.

Look at broad and narrow streams, slow and fast streams. Draw a stream of water showing the direction of flow (WorkBook page 75).

Think! Think!

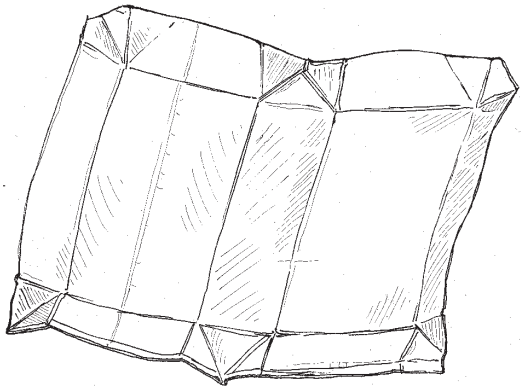
Could you make a river flow in the opposite direction?

2. Water moves things

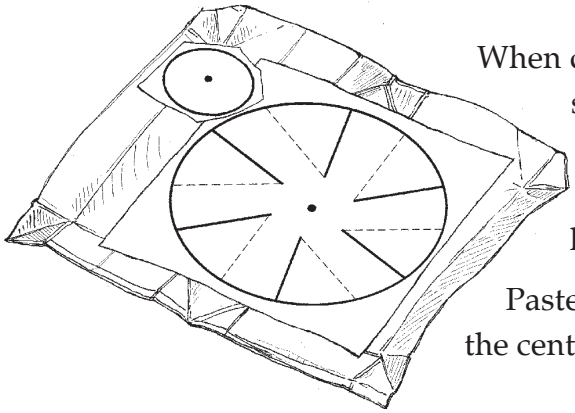
a. Drop a leaf in a stream of water. Watch it flow down with the stream.

b. Make a water wheel:

Cooking oil, milk and fruit drinks are sometimes sold in 'tetrapacks'. Open out one of these empty packets and wash it.

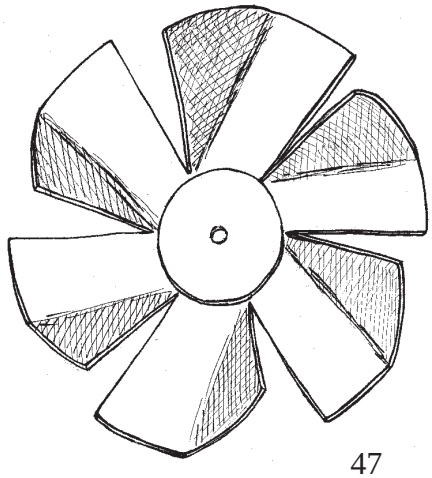


Paste the water wheel design on page 77 of your WorkBook to the flattened card.



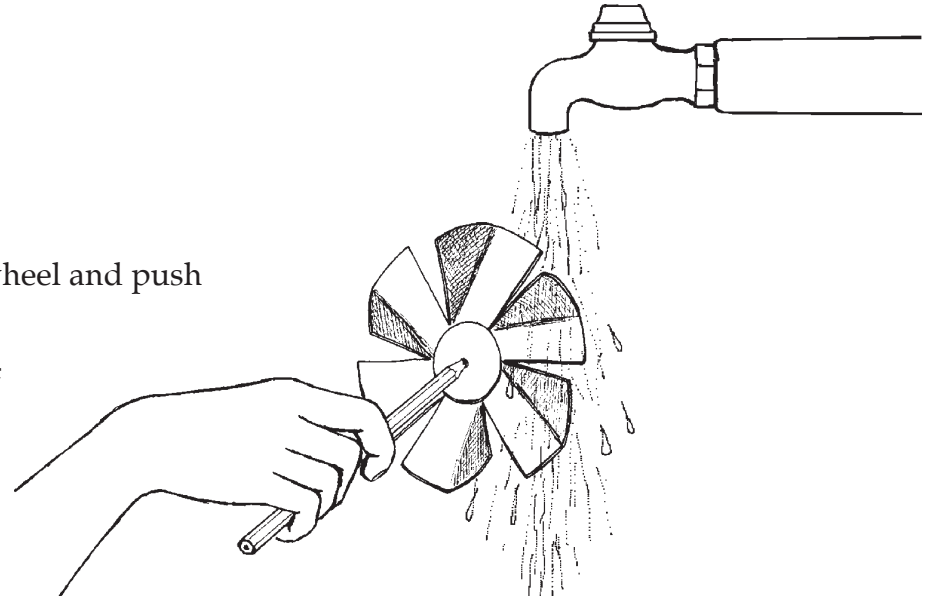
When dry, cut along all the solid lines. Fold along all the dashed lines, as shown here.

Paste the small circle in the centre.



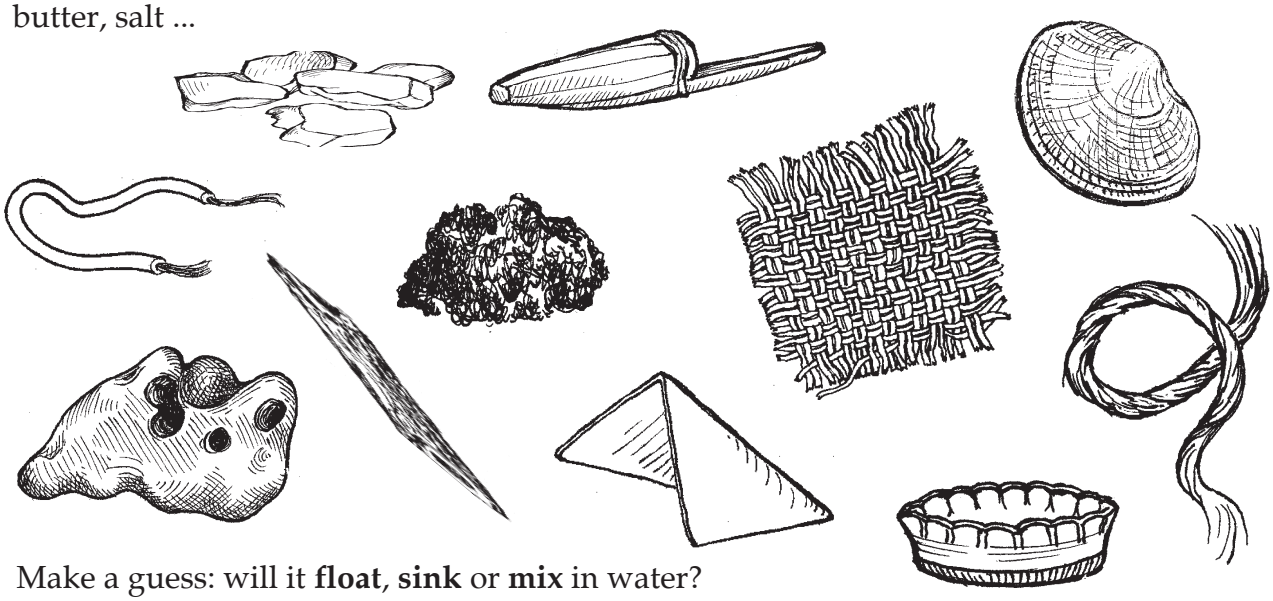
Make a hole at the centre of the wheel and push the point of a pencil through it.

Hold the wheel under a stream of water from a tap.



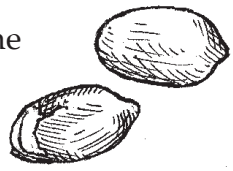
3. Float, sink or mix?

a. Take some water in several containers. Find different small solids like, pieces of wood, cork, wax, metal, plastic, stones, leaves, seeds, lump of mud, sand, jaggery, butter, salt ...



Make a guess: will it **float**, **sink** or **mix** in water?

One by one, put the things in the water. Stir the mixture and wait for some time. Find out if your guesses (**float**, **sink** or **mix**) were right.



Did some things first float and then sink? Why?

Watch the floating things carefully. How much of the thing is above and how much below the surface of water? Is it lying straight or tilted? Draw a picture of how it looks in the WorkBook, page 76.

b. Now add these different liquids to the water: cooking oil, kerosene, milk, machine oil, water paint, oil paint, liquid soap, honey, etc.

First guess whether the liquids will float, sink or mix in water. Then try it out.

Keep aside the solids and liquids that mixed in water. You need them for the next activity.

Think! Think!

Could you make a stone float on water? How?

Could you make an air-balloon sink in water? How?

4. Water dissolves things

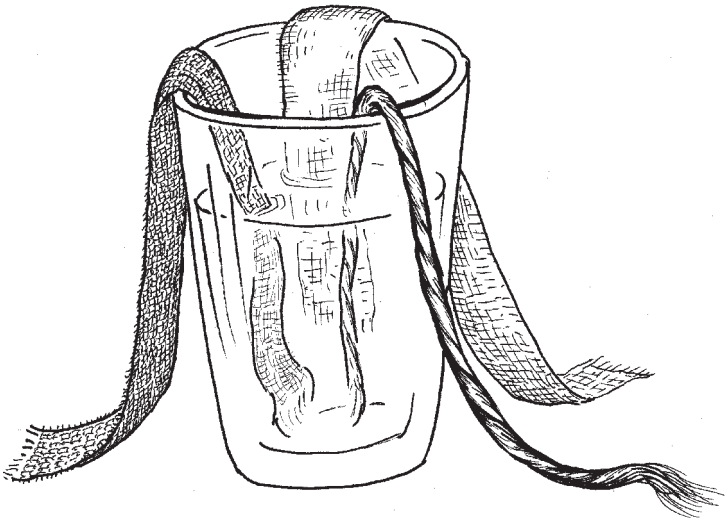
You have found that some things mix in water. Stir these mixtures. Observe what happens (WorkBook page 80).

When you stopped stirring, did the solid or liquid remain mixed in the water? Or did it get separated from the water?

Is the mixture clear or turbid? If the mixture is clear, the solid or liquid has **dissolved** in water. The clear mixture is called a **solution**.

Pour some of the solutions into small plates. Keep the plates in the sun till they dry.

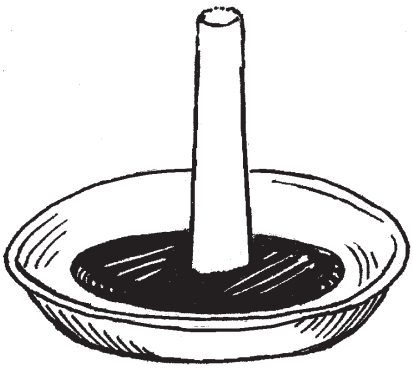
Is anything left in the plates?



5. Water climbs

a. Take water in a glass. Dip one end of a coloured cotton string, or the corner of a coloured handkerchief, in the water. Watch after about half an hour.

Touch the part of the string or handkerchief that is outside the water. Is it wet? How did it get wet? Make your guess.



b. Pour some ink in a plate. Keep a stick of chalk standing in the plate (WorkBook page 81).

Do you think that the ink will climb the chalk? Guess how long it will take for the ink to climb 1, 2, 3 or 4 cm up the stick of chalk. Do it and see.

c. In a glass pour some water up to a height of 2-3 cm. Add dry soil to fill the glass. Watch the water climb up through the mud. In this way water deep in the soil can reach the roots of plants.

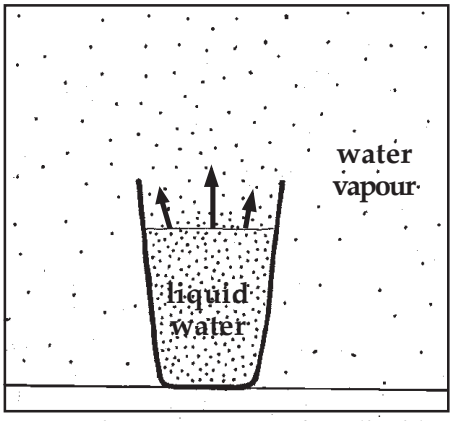
6. Liquid water turns into water vapour

Watch water **evaporate**.

a. Wipe a blackboard or a slate with a wet cloth. When a part of the board is dry, spread out the remaining water with your finger. Describe how the water evaporated. Where did it go?

b. Fill two identical glasses with water up to 60 mm (6 cm). Stick a strip of paper on the outside of both glasses. Mark the level of water on the two strips.

Keep one glass covered and the other open. Every day mark the level of water on the two strips. Note the measurement in the Table in your WorkBook on page 81. Draw a graph.



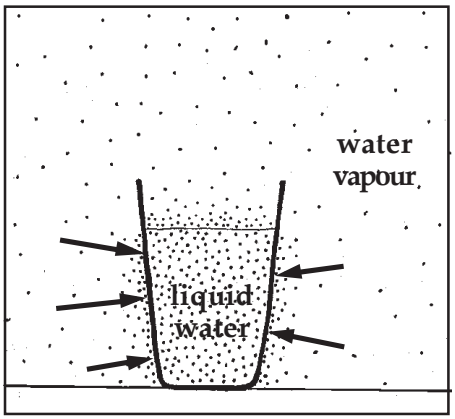
Evaporation: Water goes from liguid into water vapour

7. Water vapour turns into liquid water

Watch water vapour **condense**.

a. Touch a bottle of ice-cold drink. Check if it is wet on the outside. Wipe the bottle and, after a few seconds, touch it again.

Is the bottle wet again? Is this water coloured or sweet like the cold drink? Where did the water come from? Why do you think so?



Condensation: Water goes from vapour into liquid

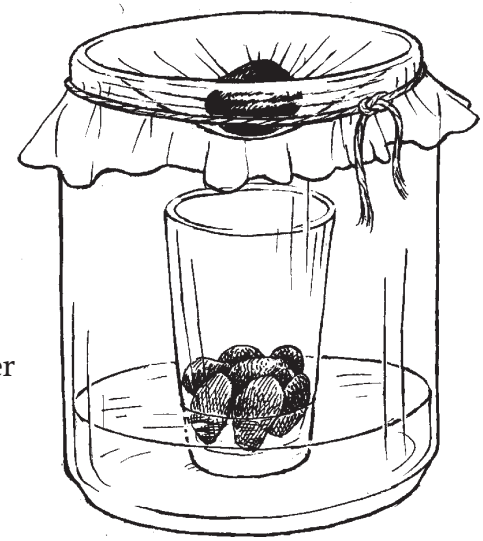
b. Take two glasses. Tightly wrap a thick dry cloth around one glass. Pour ice-cold water into both glasses. Guess: will both the glasses be wet? After a minute touch the glasses from outside.

Are both glasses wet? Is the cloth wet? Now do you think the water came from inside the glass or from outside? Why do you think so? (WorkBook page 82)

8. Water to vapour (and back to water)!

a. Take two containers, one a little smaller than the other.

Pour some water in the large container. In the smaller container put only a few dry stones. Keep the small container inside the larger one.



Tie a dry plastic sheet over the mouth of the larger container. A stone at the centre of the sheet should make it slope into the smaller container.

Keep the containers out in the sun. Open them at the end of the day.

Is the plastic sheet still dry? Are the stones in the inner container still dry? Guess why this might have happened (WorkBook page 83).

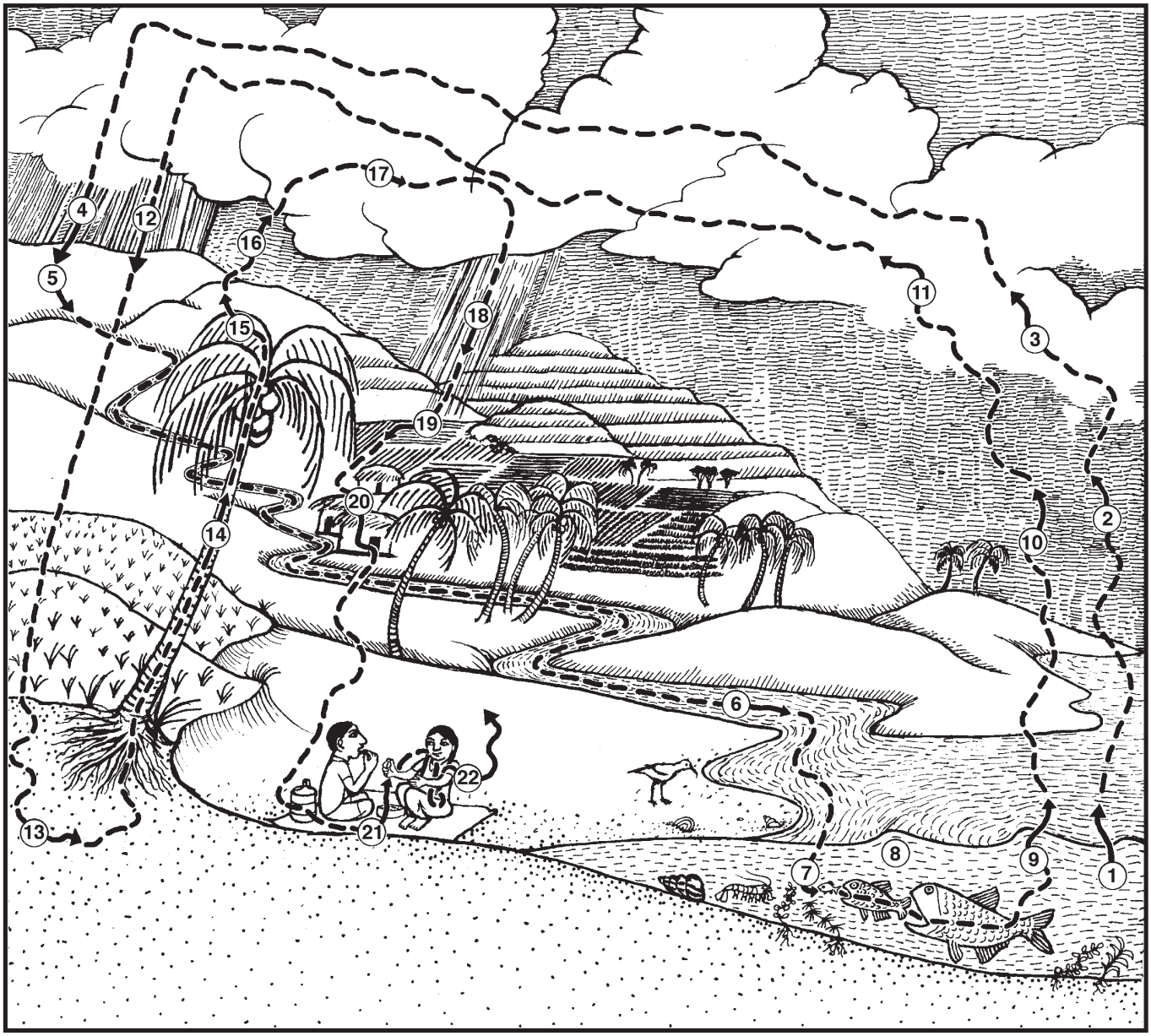
b. Boil water with the help of an older person. Hold a cold lid above the boiling water. Where did the water on the lid come from?

Is there now more, less or the same amount of water in the vessel? (WorkBook page 83)

Think! Think!

When water turns into vapour, where does it go?

When a huge ocean is heated by the sun, about 10,000,000,000,000,000 of litres of water turns into vapour. What would happen if this vapour became cold and turned back into water?



The water cycle

Describe the journey of the water molecule in the above picture (Workbook page 84).

Write a story about what happens to this water molecule after number 22, shown in the picture.

In which places was the water molecule a part of vapour?

In which places was the water molecule a part of liquid?

Know these words

flow float sink mix dissolve filter

Water is a **liquid**. Liquids are things that flow.

Liquid turning into vapour is called **evaporation**.

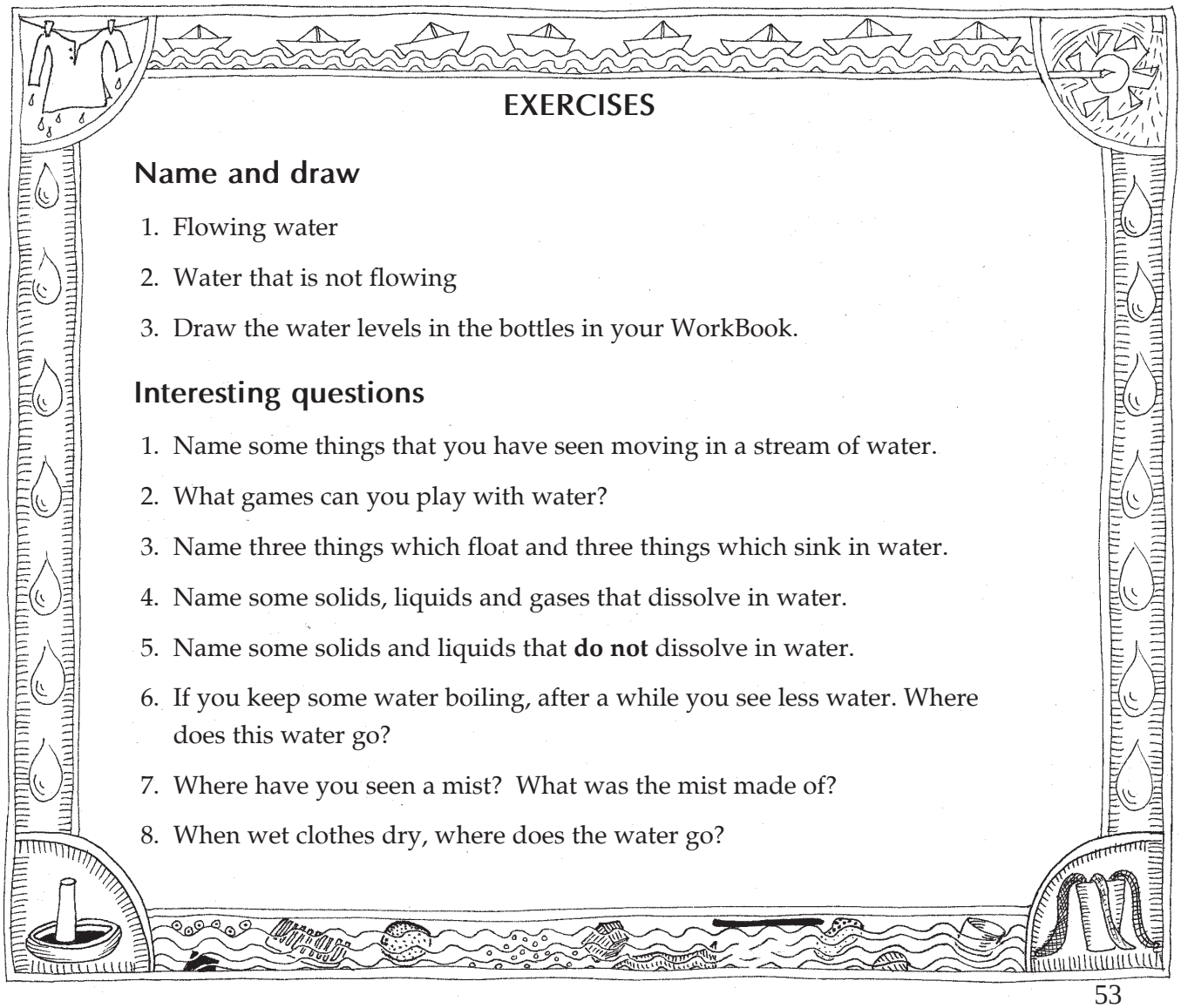
When you heat water it **evaporates faster**.

Water vapour is a **gas**. It mixes with other gases in the air.

When you cool water vapour it **condenses**.

Vapour turning into liquid is called **condensation**.

When you make water very cold, it turns into ice. Ice is a **solid**. Solids do not flow.



EXERCISES

Name and draw

1. Flowing water
2. Water that is not flowing
3. Draw the water levels in the bottles in your WorkBook.

Interesting questions

1. Name some things that you have seen moving in a stream of water.
2. What games can you play with water?
3. Name three things which float and three things which sink in water.
4. Name some solids, liquids and gases that dissolve in water.
5. Name some solids and liquids that **do not** dissolve in water.
6. If you keep some water boiling, after a while you see less water. Where does this water go?
7. Where have you seen a mist? What was the mist made of?
8. When wet clothes dry, where does the water go?

9. Suppose you keep three wet shirts out in the sun. One shirt is folded, the second is spread out and the third is kept inside a plastic bag. Which shirt will dry first, second and third?

10. Guess which will evaporate faster:
    a. hot water or cold water?
    b. water in a cup, or water poured into a plate?
    c. water in a covered plate or in an open plate?
    d. water in a windy place or in a calm place?

11. Would you see drops of water on a warm soda bottle or on a cold one?

12. Name some other liquids.

Classroom discussion

1. Does water sometimes move from lower to higher level? Is this water moving from a higher to a lower level, or from lower to higher:
   waterfall, river, evaporation, rain, fountain, a tap,
   water pumped out from a well, water pumped into a high tank.
   What about the water in these pictures:

2. If there were no wind, would there be rain?

3. We use water for cleaning and washing things. Could we use any other liquids for cleaning? Why or why not?

What's the same? What's different?

1. Give two similarities and two differences between:
    a. Water and water vapour
    b. Ice and water

2. Find the odd one out:
    a. water, salt, diesel, honey
    b. stone, glass, plastic, sugar
    c. wood, iron, butter, oil

Talk and write

1. I played in water on a rainy day

Play with words

1. Here are some action words. Do they describe water, air, or both air and water?
   splash blow flow drip run fall
2. Make sentences using the action words below. Do your sentences describe things moving on land, water or air?
   roll slide float glide sail fly dive

Ask and find out

1. What are **water sports**? Have you played or watched any water sports? Find out about some water sports played in different parts of India.
2. Find out about any festival celebrations in which water is used.

Figure it out

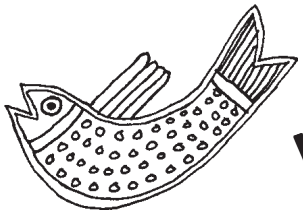
1. The amount of a liquid is called its **volume**. We measure the volume of water, milk, kerosene and diesel in **litres**. Find a container that holds about one litre of any liquid.
2. Find out the weight of one litre of water in kilograms.
3. Mini mixed some mud with water, stirred it and kept the mixture aside. After a few minutes most of the mud settled to the bottom, while dried bits of grass floated on the top. Mini wondered, "Did some part of the mud dissolve in the water?" How would she try to find out?

Show and tell

1. Find some water in your classroom. Imagine and tell a story about how this water might be part of a water cycle. (Where might this water have come from? Where could it go?)

Ask a question

1. Ask questions about water. Think of how you will try to find the answers.



CHAPTER 6

WATER AND LIFE

The Fish Tank

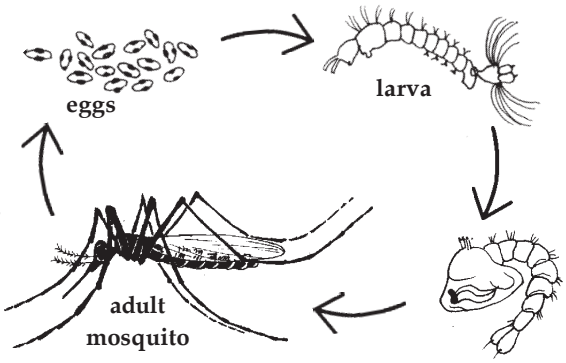
Mini and Apu were very sad when their two pet fish died. They buried the fish in the garden, but the tank remained on their window sill. A month later, they were surprised to see fine green threads growing in the water. They also found some insects wriggling inside the water.

"Where did these water plants and these insects come from?" Mini asked.

"The plants might have been in the tank before. They were so small that you could not see them." Amma said. "Fish eat these plants even when they are very small. Now that the fish are not there, the plants have grown!"

"And the insects?" Apu wondered.

"Mosquitoes might have laid their eggs in the tank. Out of a mosquito egg comes a larva, which changes into a little pupa that finally turns into a mosquito. The little insects you see in that water are larvas and pupas."



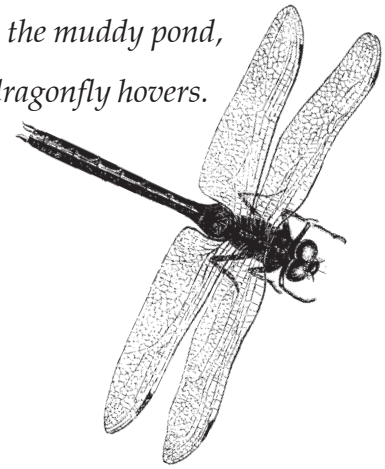
"The fish might be eating them. That is why, when the fish were there, there were no little mosquitoes!" Mini exclaimed.

"Less mosquitoes to bite us and spread diseases," Apu said. "The fish are really useful."

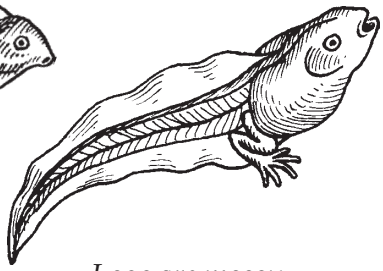
Suddenly Mini remembered something. "Amma, you told us that where there is water, there is always life of some kind."

"Yes, we found so many living things in the rainy season!" Apu said.

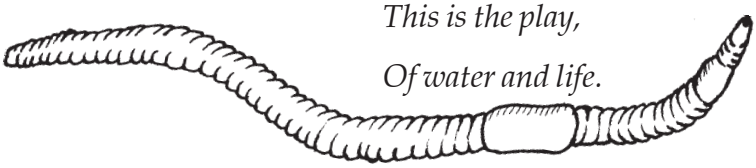
Grey clouds,
Wet showers,
On the muddy pond,
A dragonfly hovers.



New green plants,
And pesky flies,
Tadpoles swim,
The first frog cries.



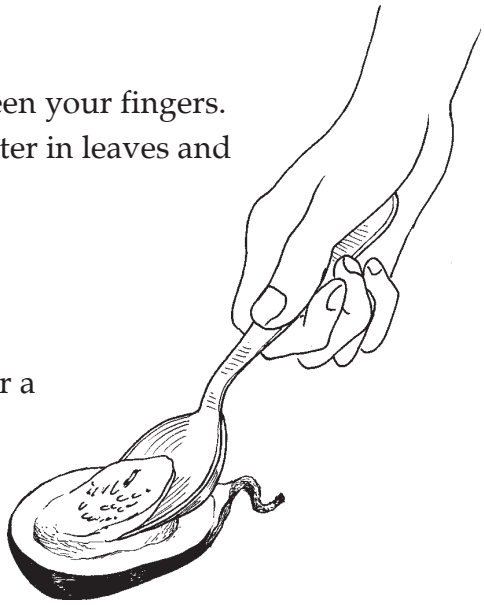
Logs are mossy,
Earthworms thrive,
This is the play,
Of water and life.



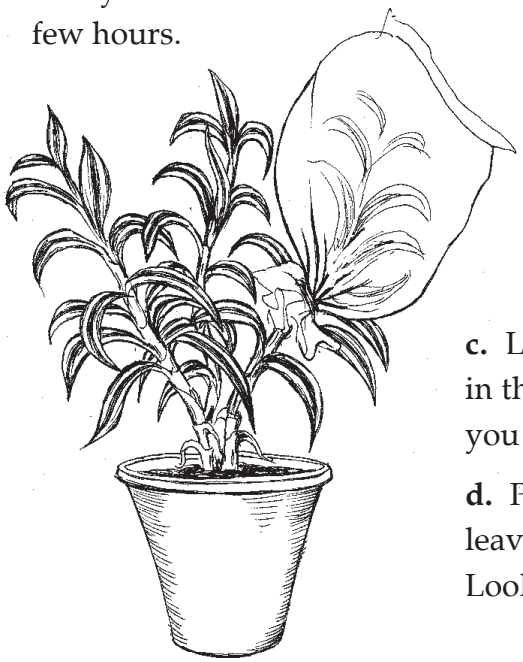
Water for living

1. Water in living things

a. Pluck a leaf or a petal of a flower. Crush it between your fingers. What do you see and feel? Do you think there is water in leaves and petals? (WorkBook page 93)

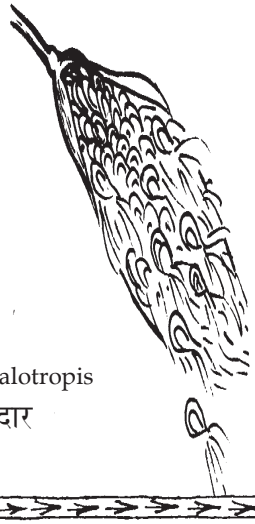


b. Scoop a piece out of a cucumber or a brinjal to make a cavity. Rub a big pinch of salt inside the cavity. Watch for about 10 minutes. Look again after a few hours.



c. Leave a freshly plucked flower and some leaves out in the sun for a few hours. How do they look? Why do you think they look different now?

d. Put a large clear plastic bag around some of the leaves of a plant. Tie the mouth of the bag with a thread. Look at it after a few hours.



Calotropis
मदार

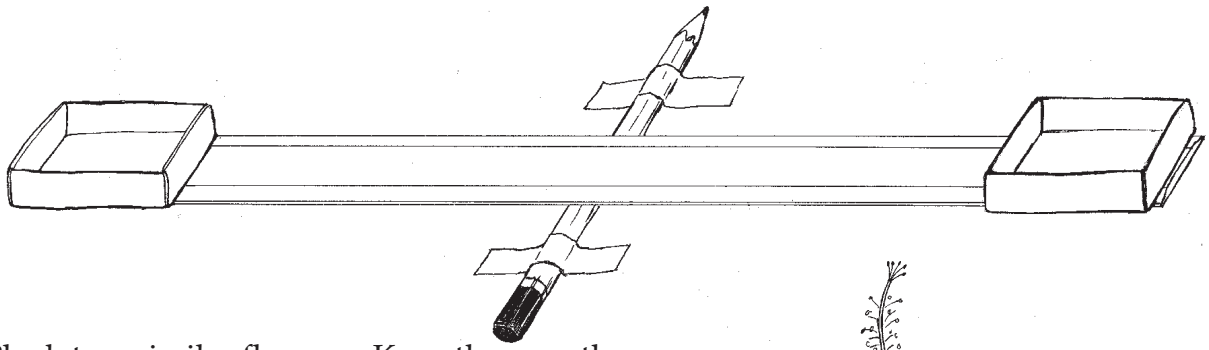
Take Care!

When you pluck a leaf or a flower, make sure there are many of the same kind remaining. Do not spoil a garden or kill a plant.

Do not crush unfamiliar wild leaves or flowers. Some of them might harm you. The juice of the ***Calotropis*** *plant is poisonous.* ***Cowitch*** *gives you a very bad itch.*

Cowitch
किवच

e. Make a balance like the one you made last year.

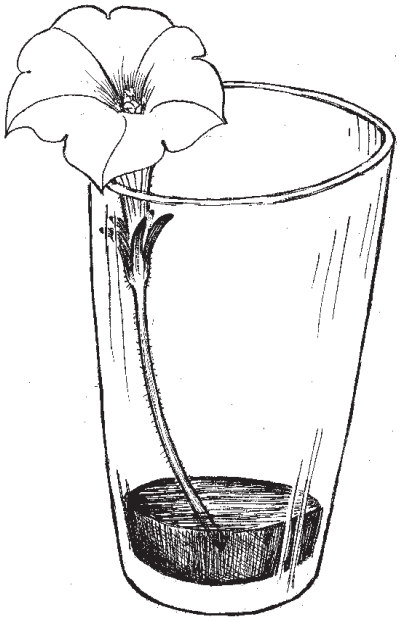


Pluck two similar flowers. Keep them on the two pans of the balance. If one of the flowers is heavier, cut off a little of the stem until they balance.

Now keep one flower with the stem in water. Leave the other flower outside the water.

On the next day wipe the stem of the flower which was kept in water. Put the two flowers in the two pans of the balance. Now do they weigh the same? Why is there a difference?

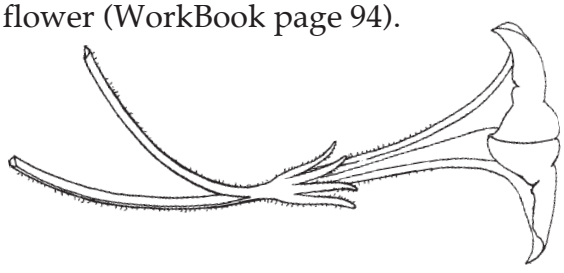
Carefully add water with a dropper to the lighter side till the pans balance again. How many drops of water did you add? Can you guess how much water the flower lost in one day? (WorkBook page 94)



f. Put a few spoons of writing ink in a glass. Add an equal quantity of water.

Take a white or light-coloured flower with a stem. Keep the stem in the mixture of ink and water. Look at it after about an hour.

Cut the stem of the flower. See how the ink went up the stem to the flower (WorkBook page 94).



g. Do you think animals have water in their bodies? Remember some experiences to support your ideas (WorkBook page 94).

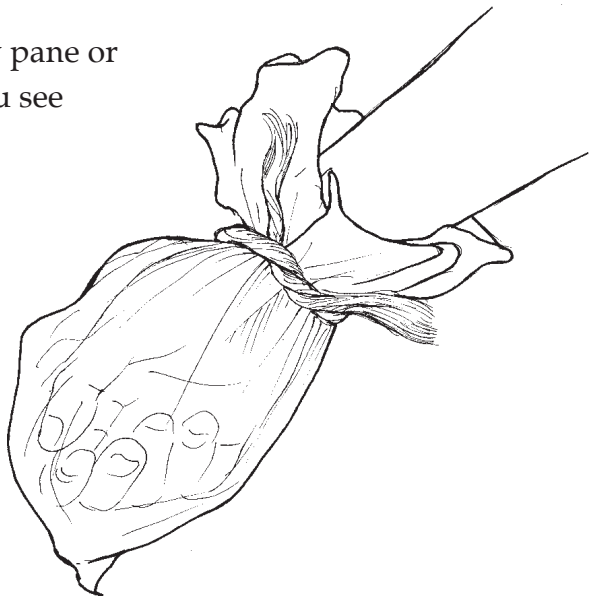
2. Water inside our body

a. Hold your mouth close to a mirror, a window pane or a piece of glass. Breathe out gently. What do you see on the glass?

In cold weather you might see near your mouth a cloud of tiny water droplets.

Where did this water come from?

b. Loosely tie a dry plastic bag around one hand. Remove it after 10 minutes. What do you see inside the bag? (WorkBook page 95)



Think! Think!

All living things have water in their bodies. They need water to live. But all of them do not drink water! Ants do not drink water, nor do the little grubs that live in grain. Where do you think they get water from?

3. Living things in water

a. Write the names of some animals that live in water.

b. Look for plants growing in water. Try to find a plant that is completely under water, and a plant that is partly underwater and partly out of the water.

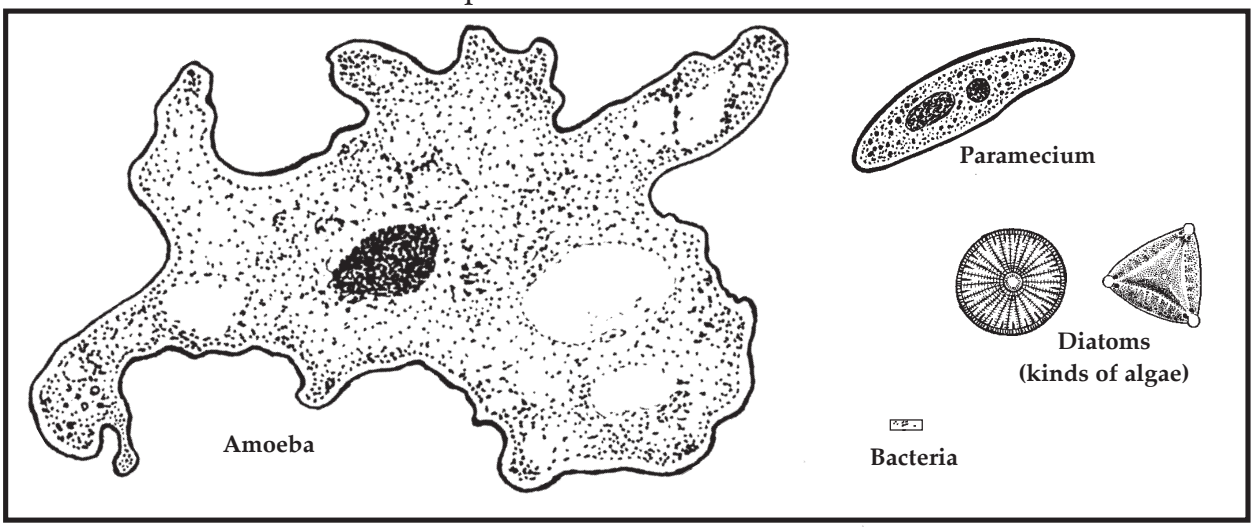
Describe and draw pictures of each plant you find. Try to find out the names of these plants (WorkBook pages 95-96).

c. Look for small living things in water. Fill a glass jar with water, plants and other living things from a pond, tank, puddle or stream. Observe the living things, describe them and draw what you see in your WorkBook on page 96. Use a hand lens if you have one. Wash your hands well after handling dirty water.

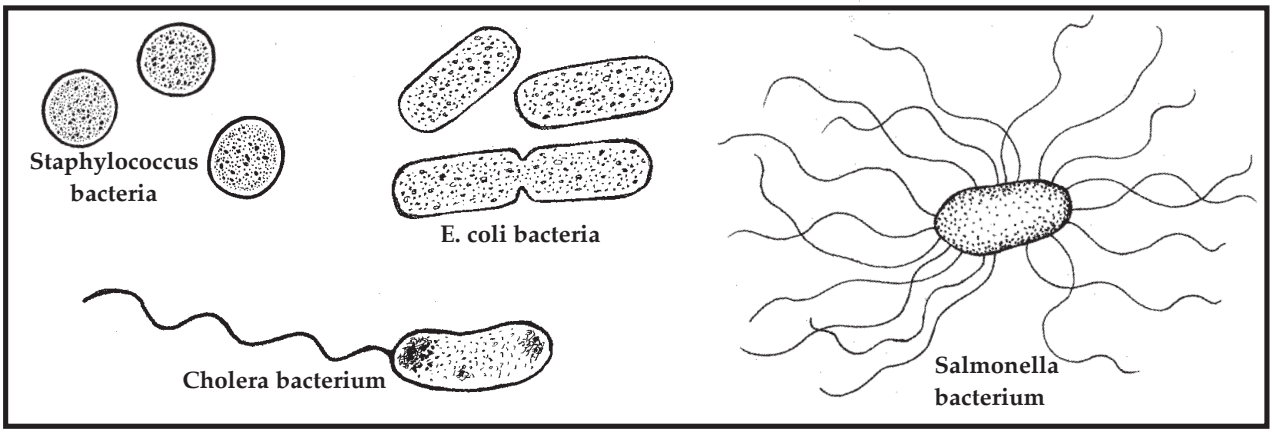
Take water containing living things from different places, and compare it.

Keep the water for a week. Observe it every day and note any changes (WorkBook page 97).

d. If you look at pond water through a microscope you find even smaller living things called **microbes**. Here are some pictures of microbes.



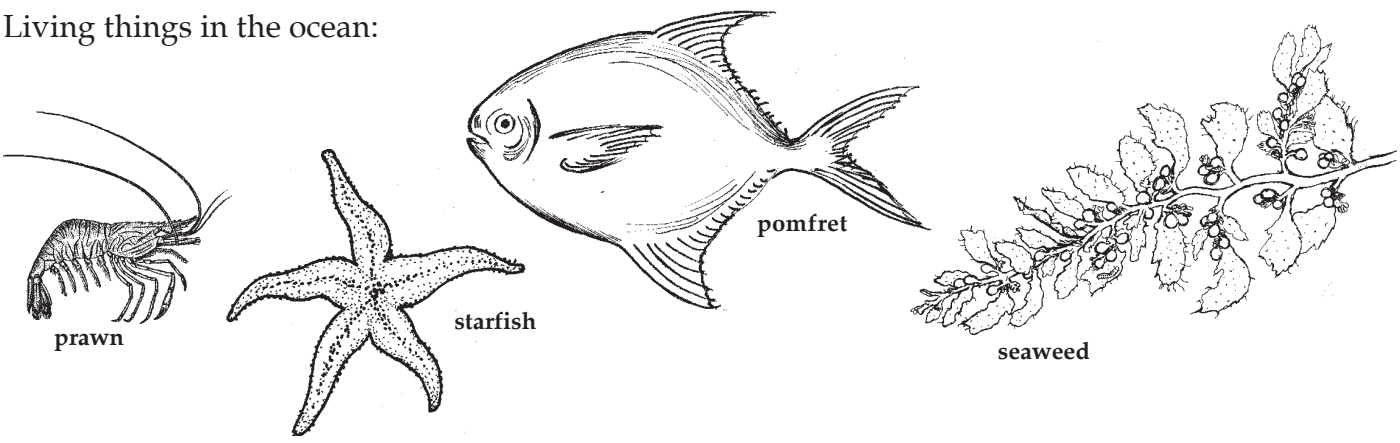
Here is a more close up view of the bacteria in the box in the above picture:



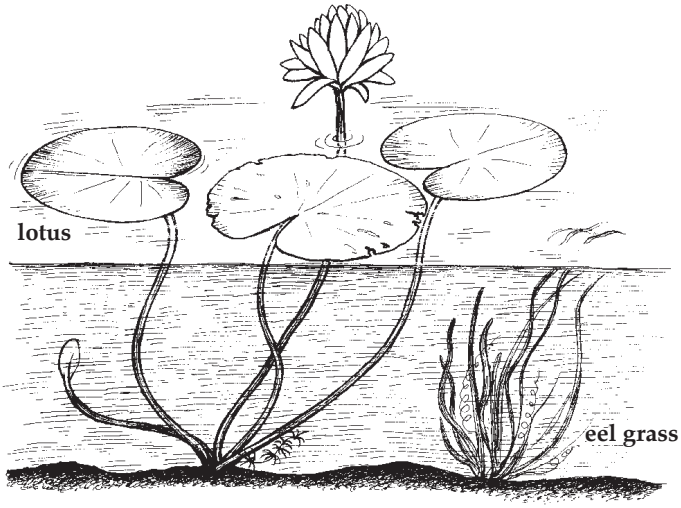
Microbes need water to live. Dry places have fewer microbes. Drying things in the sun kills microbes.

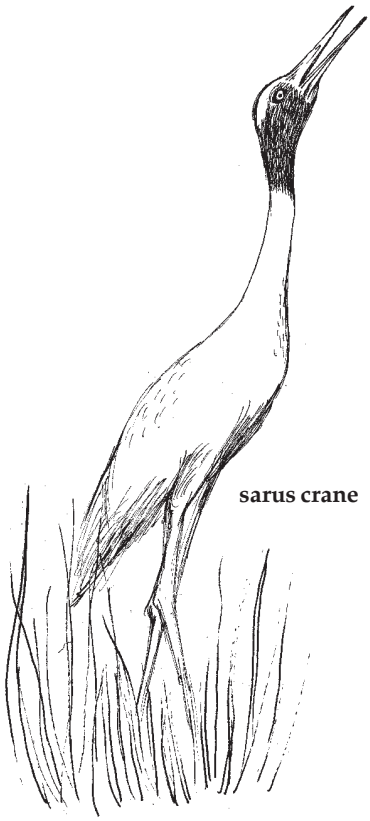
4. Some need more water, some need less

Living things in the ocean:

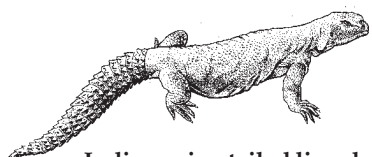


Living things in or near fresh water tanks and ponds:





Living things in the desert:



All living things need water to live

All living things contain water. They need water to live and grow.

Our skin, muscles, blood, bones and even teeth have water in them!

Know these words

aquatic plants

aquatic animals

marsh

EXERCISES

Name and draw

1. Juicy fruits and vegetables
2. A plant that has been given
   a. no water
   b. just enough water
   c. too much water

Interesting questions

1. Suppose you put water on the ground around a plant. Does this water reach parts of the plant above ground?
2. Does the water go out of the plant? How do you know?
3. Which of these different parts of a plant have water in them? Why do you think so?
   root stem leaf flower fruit seed trunk
4. Which of these things have water in them? Why do you think so?
   orange juice a banana a groundnut a roti your body
5. Will a bundle of grass weigh more when it is freshly cut or when it has dried up? Guess why.

6. A sack full of wheat got wet in the rain. What might happen to it in a few days?
7. Name some animals that can swim in water but stay alive even out of water.
8. Name some animals that live in water and die if they come out of water.

Classroom discussion

1. Could a rose plant grow in water like a lotus plant? Could it grow in a desert? What would happen to it?

Talk and write

1. One day when I got very thirsty

Figure it out

1. A farmer kept 50 kg of cut grass in the sun for several days. The dried grass weighed 15 kg. Then he kept this grass in a warm oven for a few hours. Now it weighed 7 kg. Why did the weight change? How much water did the fresh grass have?
2. Find out your own weight. About two-thirds of the weight of your body is due to the water in it. Now estimate the weight of the water in your body.

Show and tell

1. Bring something that is not living but needs water to work properly. Show it to the class and tell about it.

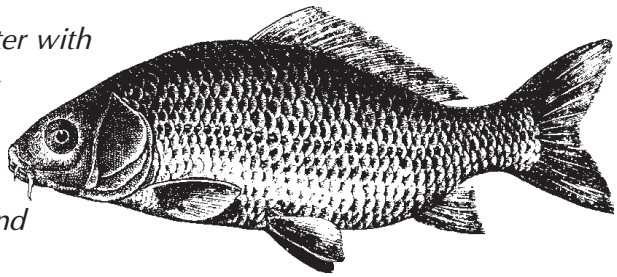
Ask a question

1. Ask questions related to water and living things. Think of how you will try to find out the answers.

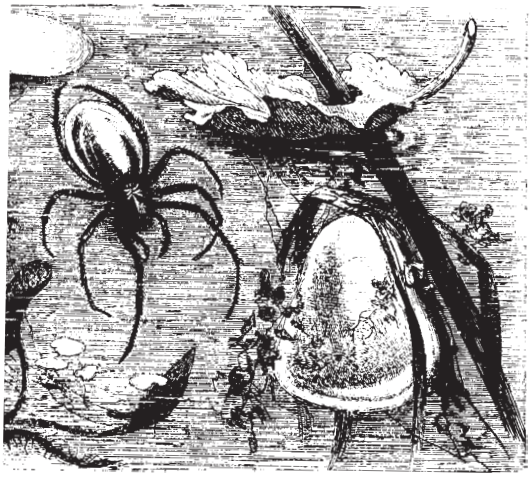
DID YOU KNOW?

Frogs and ducks take a deep breath before they dive down into the water for food.

Fish use oxygen dissolved in water. Water with oxygen enters their mouth and comes out over the gills. Oxygen passes through the gills of the fish into its blood. Carbon dioxide comes out of the blood and dissolves in the surrounding water.



All parts of a plant, including the roots, need to breathe. Mangroves are trees that grow in wetlands. Their roots come up above the water to breathe.



The water spider lives in ponds. It spins a cobweb like a sheet of silk at the bottom of the pond. Then it swims up to the surface and flips its hind legs to make an air bubble. It carries the bubble down and releases it below the cobweb. It keeps diving up and down, each time bringing a little air to fill its house. It goes out of the house only to catch its food.

CHAPTER 7

WATER AND US

Water is precious!

1. Where did this water come from?

a. List the places where you have seen water. For every place you listed ask yourself, "Where did this water come from?". When you do not know the answer, ask someone else (WorkBook page 102).

b. Water falls as rain. It travels a long way to come to your home. Your teacher will explain this. Describe how the rain water comes to your home, so that you can drink it (WorkBook page 102). Draw a picture to show this on page 108 in your WorkBook.

2. How we use water

Answer these questions for yourself. Then ask your parents, grandparents or other older people, how they did these things when they were as young as you are (WorkBook pages 103-104):

How did you clean your teeth? (*datun*, toothpaste and brush ...)

Where did you bathe? (at the river, tank, home ...)

With what did you clean your body? (*besan*, soap ...)

How did you wash your hair? (*shikakai*, shampoo ...)

Your source of water (river, common well, house well, common tap, tap at home ...)

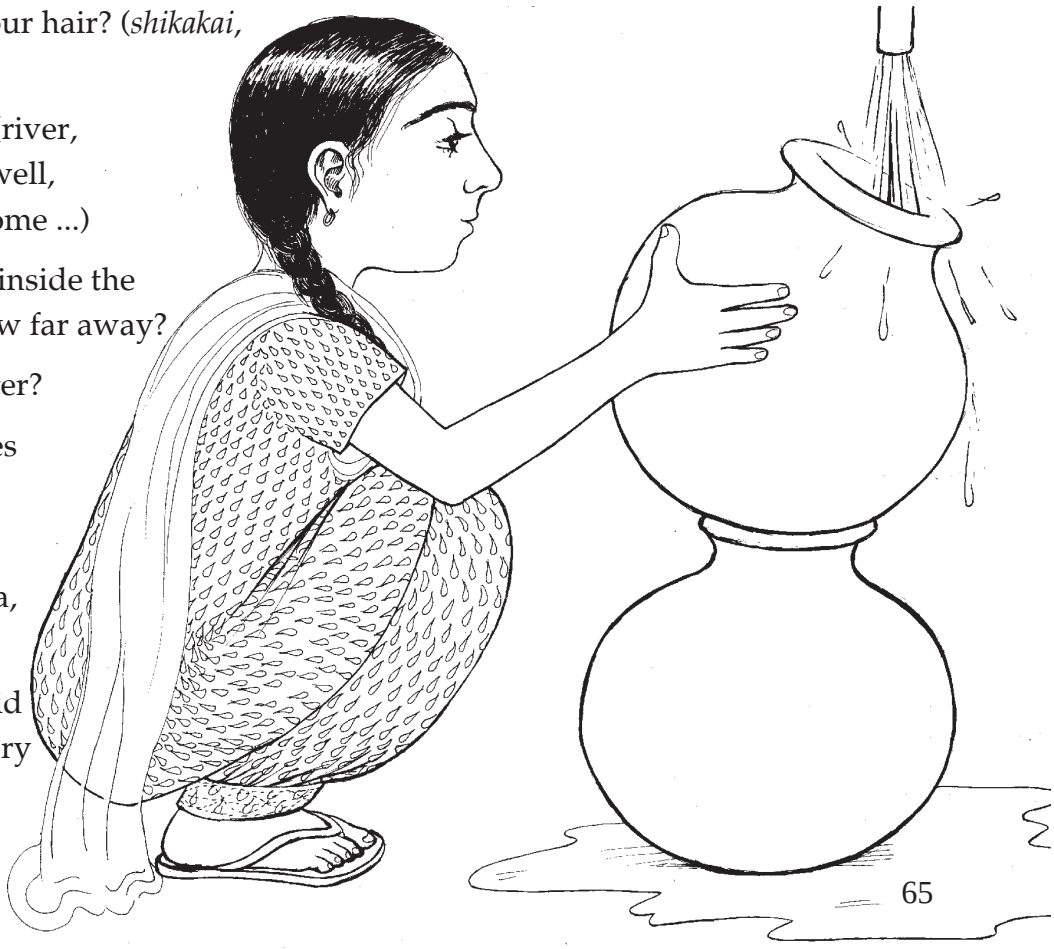
Was the water source inside the house or outside? How far away?

Who collected the water?

Where were the clothes washed?

With what were the clothes washed? (soda, bar soap, detergent ...)

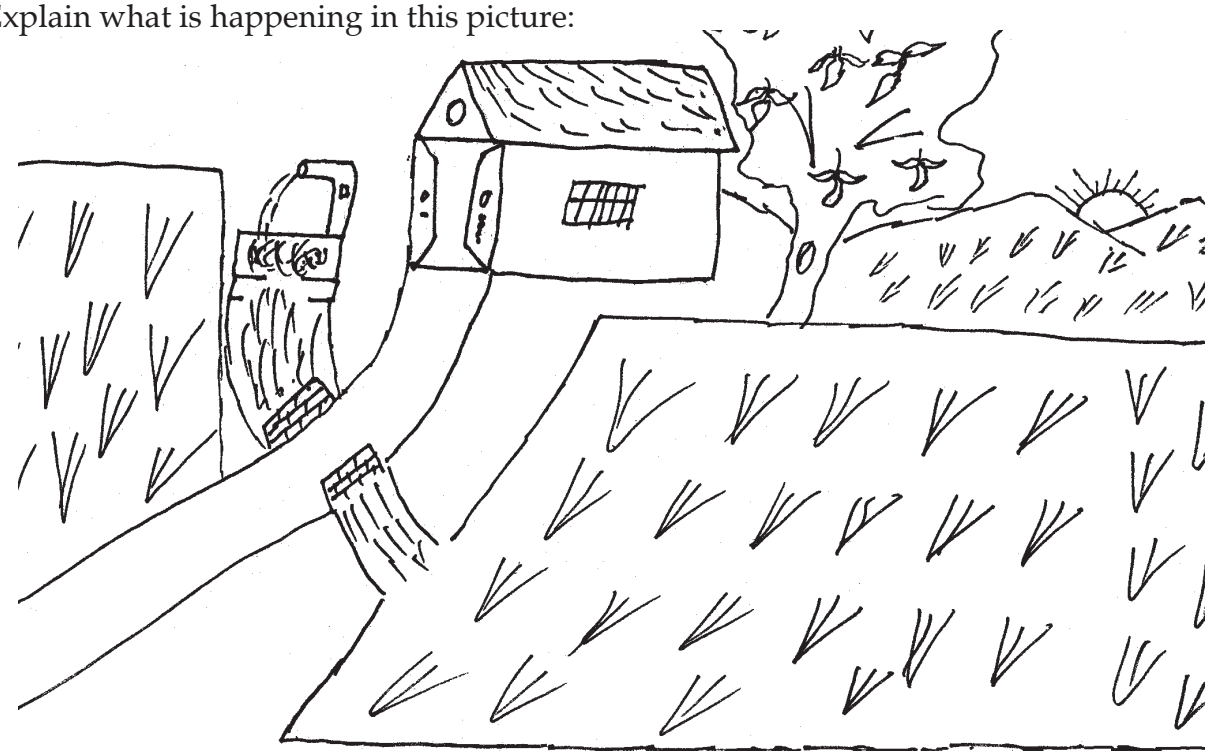
What kind of toilets did you use? (outdoors, dry latrine, flush toilet ...)



3. Water for crops

Find out how crops are watered in the area where you live. Is rain water sufficient? Is water brought to the fields in other ways? How? Which crops can do with less water and which need more? (WorkBook page 104)

Explain what is happening in this picture:



4. Measuring water

a. Look for jars, bottles, packets, cans or tanks that show how much liquid is stored in them. The amount of a liquid is called its **volume**.

We measure volume in litres (l) and millilitres (ml).

1000 ml = 1 l

b. Find a container that can hold a little more than 1 litre. Your teacher will pour exactly 1 litre of water in your container. Stick a piece of cellotape to show the level of water (WorkBook page 105).

5. How much water do we need?

a. Guess how much water is needed to grow 1 kilogram of rice. Check your guess with your teacher. Does all this water remain in the rice plant? Where do you think it goes?

b. Guess how much water you need to take a bath. Check your guess using your marked container (WorkBook page 105).

c. List the ways in which your family uses water every day. Estimate how much water your family uses for these different things. In your Workbook on page 105 write your guess in litres (l) and millilitres (ml).

6. How clean is the water?

Collect a glass of water from at least two different places near your home or school.

What is the colour of the water? Is the water clear or turbid? Are there any things floating in it? Does the water have a smell? If yes, describe the smell.

Let the water stand in a glass. Does anything settle to the bottom?

Filter the water through a piece of cloth. Does anything remain on the cloth?

Add soap powder to the water. Stir it briskly. Is there any lather?

Pour some of the water in a dish. See what is left after it evaporates (WorkBook p. 106).

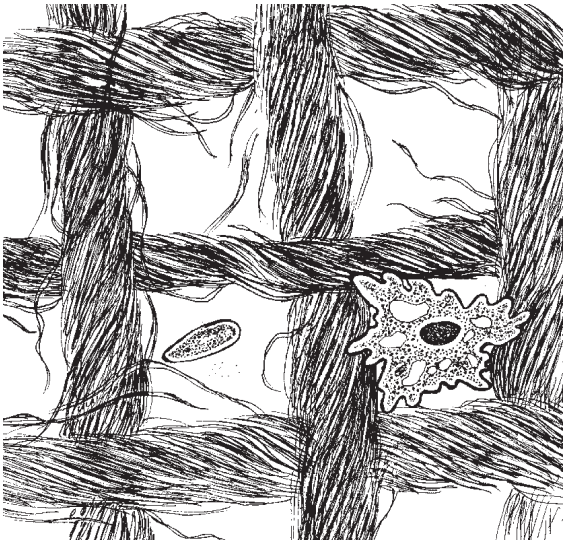
7. How to get clean water

a. Keep some dirty water in a glass. Check if any dirt settles down. Carefully pour out the water from the top. This way of cleaning water is called **decantation**.

Is the decanted water clean? In which ways could you use it? (WorkBook page 106)

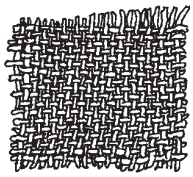
Would you drink this decanted water? Why or why not?

Is there any way that you can make the dirt settle faster? Find out from your parents or teachers.



A close up of the cloth

b. Filter this water through a cotton cloth.



The picture on the left shows what a cloth looks like through a microscope. In this picture there are also some microbes like the ones on page 60.

Do you think water that is filtered through this cloth will be clean? Do you think microbes can pass through the cloth? Would you drink it? Why or why not? (WorkBook page 106). Many dangerous microbes can be removed if water is filtered through six or eight layers of clean cottton cloth.

8. Water for drinking

Sometimes water may look clean but it may have microbes that are too small to see.

Most kinds of microbes are not harmful to you. But just a few dangerous microbes in your water or food, or in the water droplets you breathe, might make you sick. Some dangerous microbes are shown on page 60. Name some illnesses they could give you.

If you boil water and keep it boiling for 20 minutes most of the microbes will be killed.

Store drinking water in a clean, covered container.

Do not let water stay in puddles or open tanks. Mosquitoes and sand flies lay their eggs in stagnant water. These insects spread diseases.

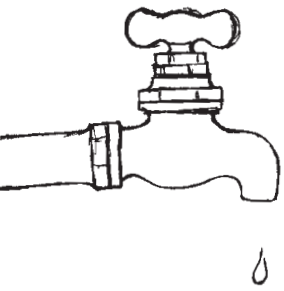
Never do these things near a source of drinking water:

Washing clothes and utensils	Bathing	Defecating
Letting out waste from factories	Washing cattle	

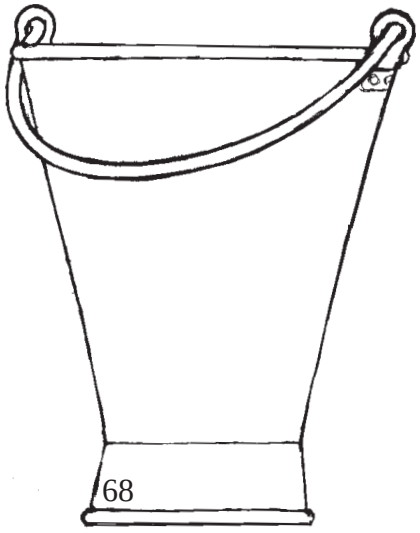
9. Save water!

a. Think of different ways that you could save water in your home, school and neighbourhood (WorkBook page 107).

b. Have you ever seen water being wasted? Find out if there is a leaking tap or pipe nearby. Collect this dripping water. Measure the time and the amount of water collected. Estimate how much water is wasted from the tap in one day. Do something to stop the waste.



Do not keep tap or pump water running needlessly. Turn off the tap while you brush your teeth or bathe.



c. Think of ways to collect and use rain water.

Plant trees. They help to save water.

Know these words

pond	well	dam	marsh
lake	pump	canal	stagnant
spring	tubewell	irrigation	

EXERCISES

Name and draw

1. Containers used to store water at your home or school. Guess the capacity of these containers. Check your guess if possible.
2. Draw and describe how you get water.
3. Make a poster showing in what ways you can save water.

Interesting questions

1. Does the water you drink at home come from a well, river, lake or somewhere else?
2. Write these sources of water from smallest to largest:
   lake ocean dewdrop pond puddle sea
3. Name three different ways of drawing water out from a well.
4. Which of the following needs the cleanest water? For which uses can you have water that is not so clean?
   drinking watering plants bathing washing floor
5. About how many litres of water do you drink every day?
6. About how many millilitres of water do you need to brush your teeth?
7. In what different ways is water used in the kitchen?

Classroom discussion

1. Do you get clean drinking water near your home? Do all the people in your village or locality get water easily? What problems do people have in getting clean water? How can these problems be solved?

2. Do you ever carry water from one place to another? Why do you have to do this?
3. Do one or more persons in your house get water for the whole family? Do they make sure that there is clean drinking water for all? Who does this work and why doesn't someone else do it?
4. Is your drinking water decanted? Is it filtered? Who decants and filters it? Where? What are the different ways of filtering water?

What's the same? What's different?

1. Give two similarities and two differences between:
    a. A tank and a river
    b. A well and a tubewell
2. Find the odd one out:
    a. pipe, canal, well, stream
    b. sea, tank, river, ocean
    c. ocean, creek, lake, sea

Talk and write

1. When we had no water

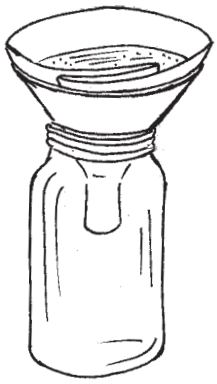
Ask and find out

1. How is rain water stored for use by your village, town or city? Most big cities are situated on the banks of a river, or close to a large lake. Find the names of some cities and the rivers or lakes they are on.
2. Many years ago did your village, town or city use the same water sources that you do now? What were their sources of water?
3. Find old sources of water like wells and tanks in your locality. Find out whether and why these sources are not used any more.
4. Can we prevent floods and droughts? How?

Figure it out

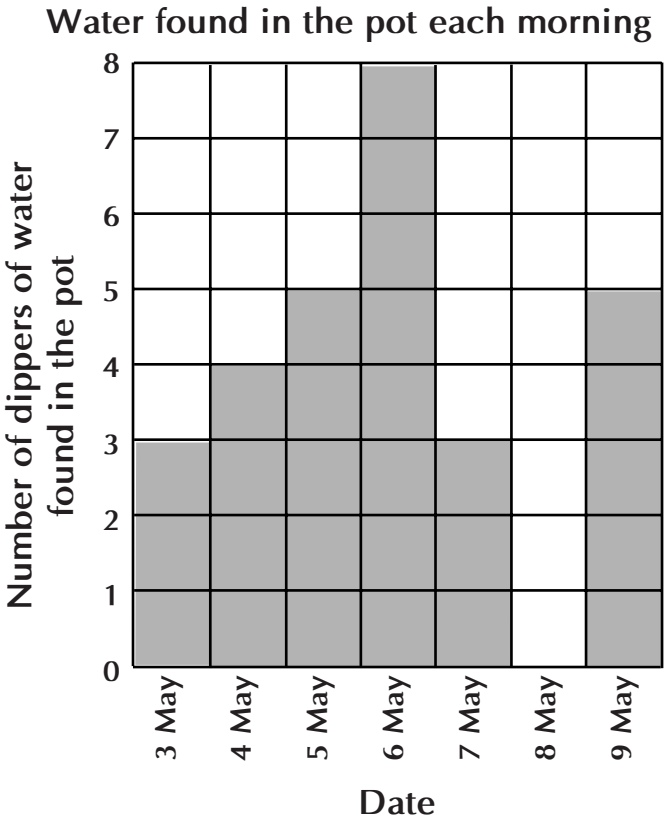
1. Ninety seven percent of the water on the earth is in the seas and oceans. The water you drink might have been in the ocean at some time! At that time there was salt dissolved in it. How did the salt get separated from this water?

2. Water can pass through blotting paper. Sand cannot pass through blotting paper. Mini made a cone of blotting paper, rested it on a funnel and poured sandy water into it. What came out in the jar?



   a. Sand only
   b. Water only
   c. Sand and water
   d. Nothing

3. Every morning Apu filled a pot with clean drinking water. Some mornings he noticed that the family had finished almost all the water in the pot. Other mornings there was more water left. One week he counted the number of dippers of water left in the pot each morning and made a graph.



   a. How many dippers of water did he find on 3 May? On 5 May?
   b. On one of the days they had visitors. Guess which day this was.
   c. On one of the days they were gone all day at the fair. Guess which day this was.

Show and tell

1. Bring a newspaper or magazine article on problems of water supply. Explain it to the class.

Ask a question

1. Ask questions about how we use water. Think of how you will try to find the answers.

DID YOU KNOW?

If we store water, share it and use it carefully there will be enough water for everyone.

Traditionally people in India have found many ways to store, transport and use rain water. In the Indus valley civilisation (3000 - 1500 BC) people built dams and dug wells and canals.

Some parts of the Rajasthan desert get only 10 cm of rain every year. Here people store rain water and use it throughout the year.

But if we do not store water . . . ?

Cherrapunji is a very rainy village in the hills of Meghalaya. Here it rains about 1140 cm every year! Yet Cherrapunji suffers water shortage, because the water runs off the mountain slopes and is not stored for use.

UNIT 4

FOOD

Clean air and clean water: first we need these.
And then comes food!
Fresh, tasty, lip-smacking, mouth-watering food.
Where does it come from?
What happens to it in our body?
It's a long story which does not stop with eating.

Along the way are parts we throw away.
What happens to them?
They might dirty our surroundings and spread diseases,
or they might help us get more and better food.
Let's find out how!

CHAPTER 8

WHERE OUR FOOD COMES FROM

Find out about food

1. Where does food come from?

Yesterday Mini and Apu ate *palak paneer*. Apu wanted to know what it was made from. Amma told them that the **ingredients** of *palak paneer* are: spinach (*palak*), *paneer* (from milk), onion, garlic, ginger, chilli, turmeric (*haldi*), and salt.

List some foods that you and your friends have eaten recently. What ingredients are these foods made from? (WorkBook page 117)

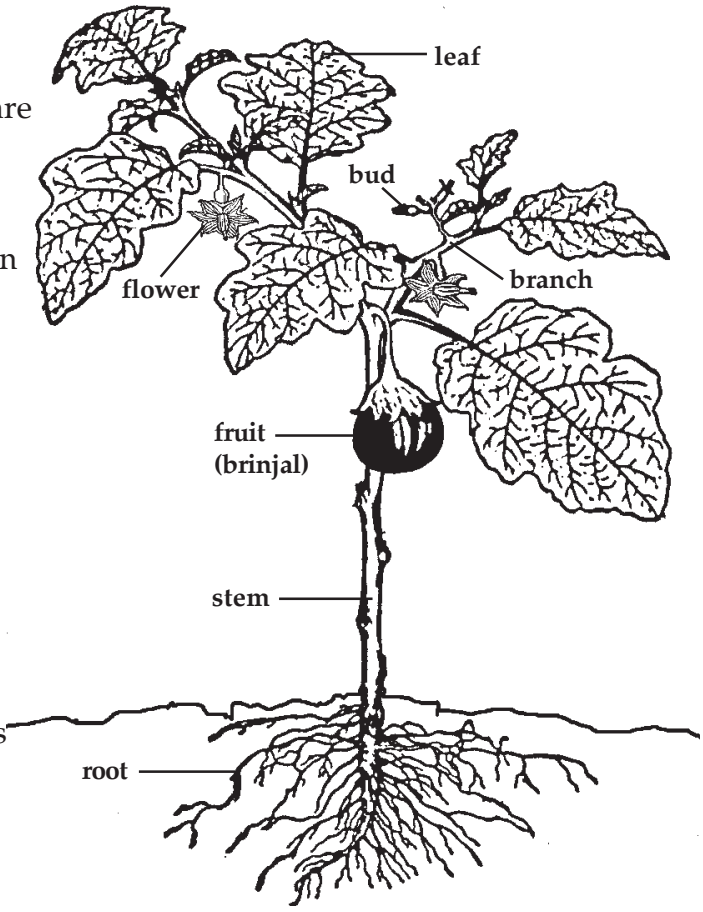
Find out if each ingredient came from a plant or an animal, or from somewhere else. Name the plant or animal (WorkBook page 118).

2. Which parts of plants do we eat?

On pages 119 to 120 in your WorkBook are pictures of many food plants. Match the plants with their names in the list.

Label those parts of the plant that you can recognise: root, trunk, stem, branch, leaf, flower, fruit or seed. Circle the names of the parts that you eat.

In which of the plants are two or more parts edible?



Brinjal (baingan) plant

3. Foods that come from animals

a. Read your list of foods from animals. Write the names of these animals on slips of paper. On the other side of the slip write the name of the food we get from that animal, like, milk, eggs or meat.

Sort the slips into groups in different ways. Write the names of the animals in the correct parts of the circles in your WorkBook on page 122.

b. People get food from a number of animals. Which foods do these animals eat?

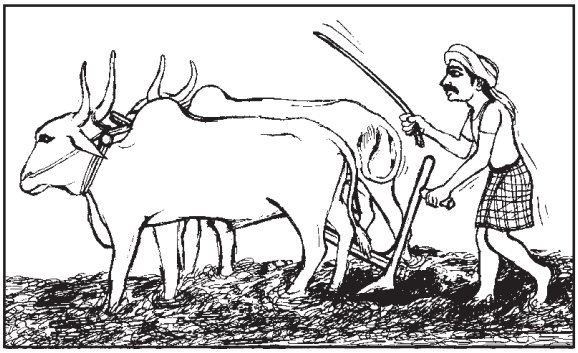
buffalo goat chicken fish

If you do not know what food some animal eats, think of how you can find out.

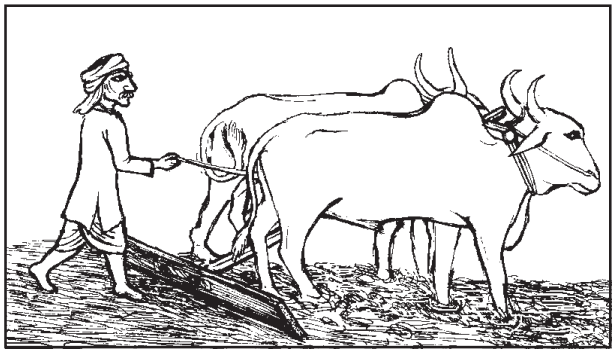
4. How crops are grown

a. Name some food and other crops that are grown in your area. Visit a farm and find out how some of these crops are grown.

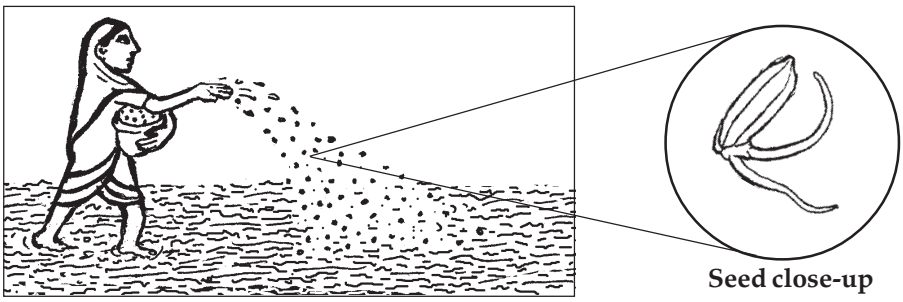
b. These pictures show how rice (or 'paddy') is grown. Find out what is happening in each picture (WorkBook pages 123-126).



(1) Ploughing and applying manure

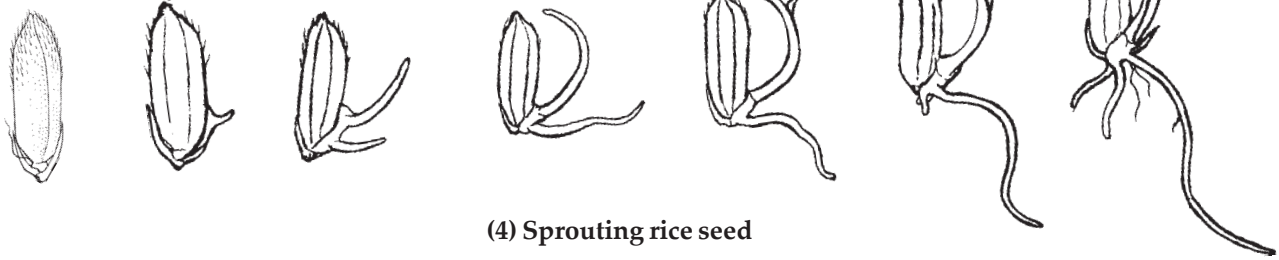


(2) Levelling

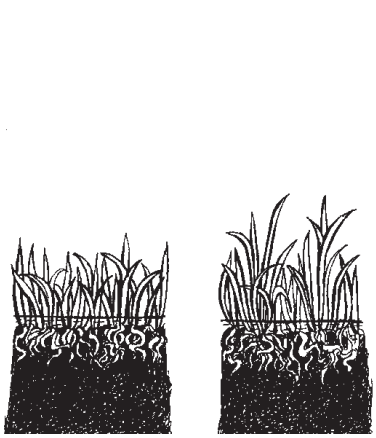


Seed close-up

(3) Sowing by broadcasting sprouting seeds onto wet nursery plot



(4) Sprouting rice seed



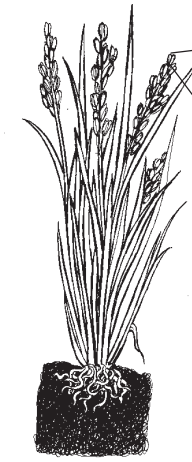
(5) Seedlings grow

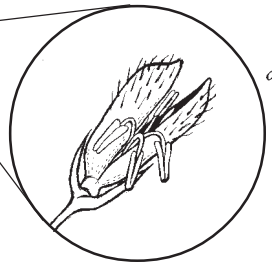
(6) Removing seedlings from nursery plot

(7) Transplanting seedlings into flooded fields

(8) Applying pesticides

(9) Weeding





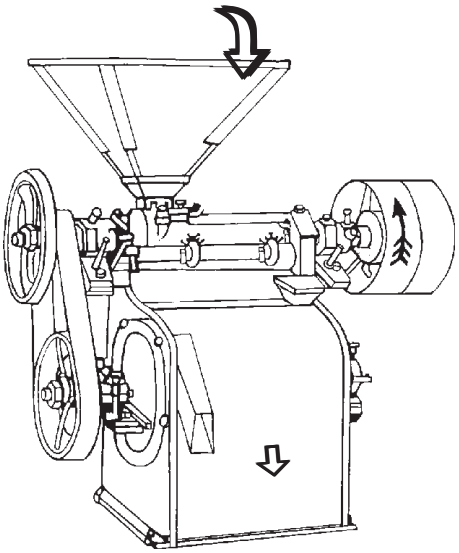
Flower close-up

(10) Flowering

(11) Drying out in drained field

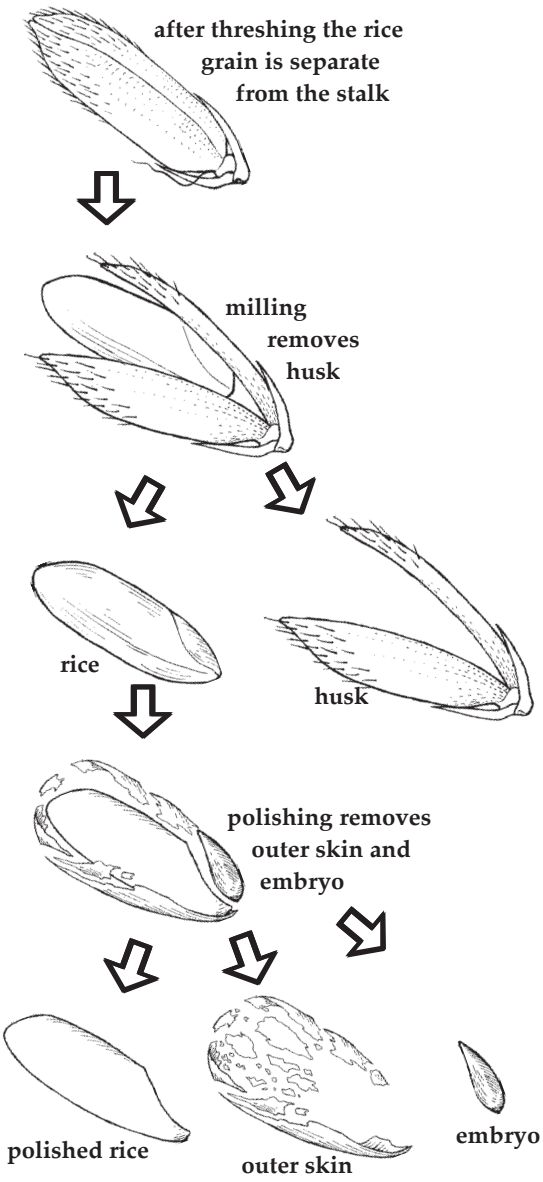
(12) Harvesting

(13) Threshing

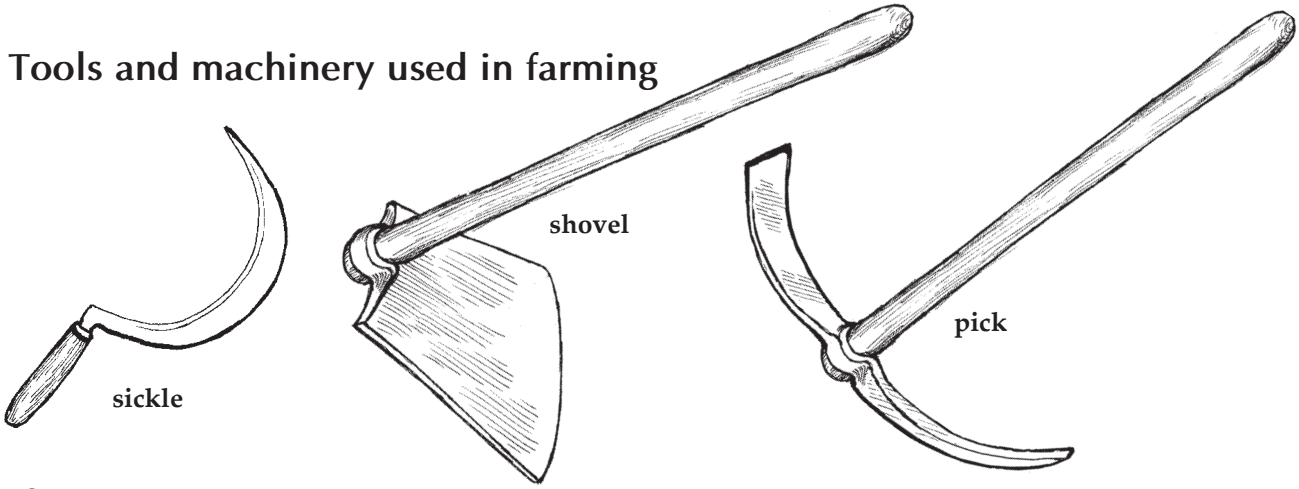


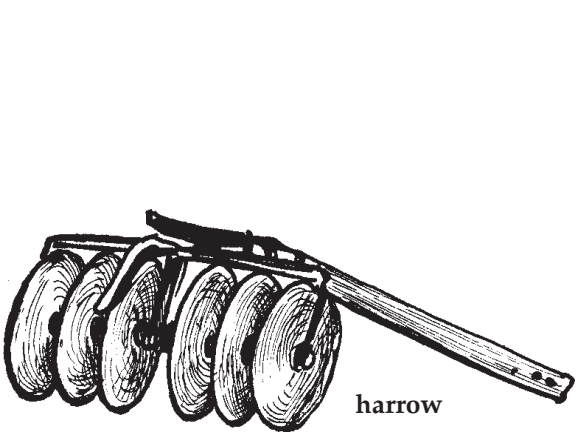
(14) Milling and polishing machine

What happens during milling and polishing:

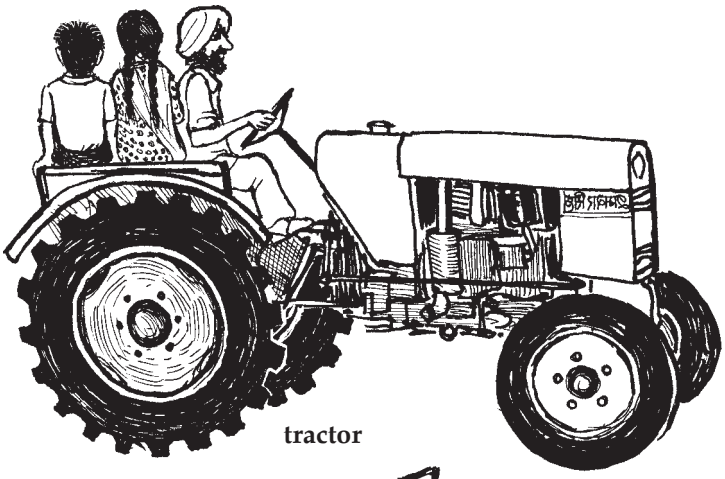


Tools and machinery used in farming

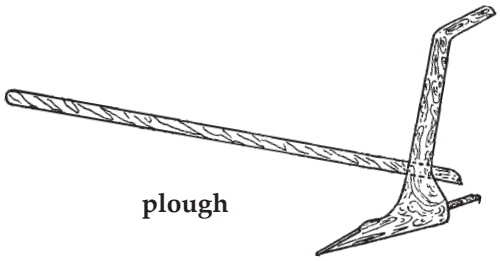




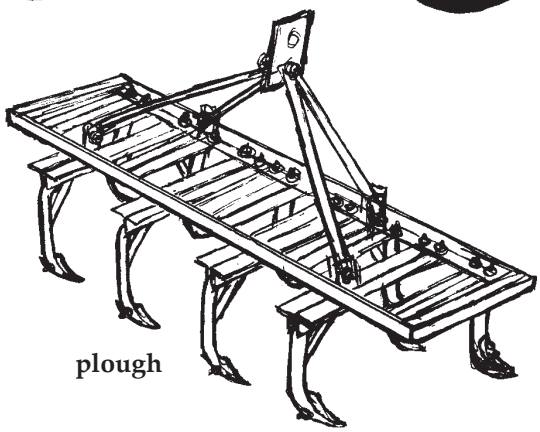
harrow



tractor



plough



plough

Find out how some of these tools are used. What farming or gardening tools are used in your area?

Is rice grown in your area? If not, in which nearby places is rice grown?

Find out how rice is grown in your area or in the closest place. Find answers to the following questions.

When are the seeds sown?

When are rice seedlings transplanted? What do farmers do before they transplant the seedlings? When is paddy harvested?

How long does it take from the time the seeds are planted until the crop is harvested?

What happens after the paddy is harvested?

Who does most of the work in growing and harvesting rice, men or women?

Which part of growing rice do you think is the hardest? Why?

Find out more and use these pictures to help you write a story about how rice is grown.

Are other crops in your area grown in the same way? What are the differences?

Think! Think!

Why do we need to plough the field before sowing seeds?

5. Grow your own food

a. Plan how you would grow a crop (WorkBook pages 126-127):

What crop to sow

In which soil

How to plough your 'field'

How much space between the plants

How often to water

What care to take to prevent any damage

How to make the crop grow better or faster

When to harvest the crop

Whether you need to separate the food from other parts of the plant

Whether you have to dry it, peel or shell it, wash it or cook it

Which parts of the plant to throw away

What will happen to these parts

b. Follow your plan and grow some food on a small patch of land or inside a tray.

OR

Plant the seeds of a ripe tomato, cucumber, chilli or any other food plant.

Take care of the plants till they bear fruit.

6. Make your own flour

Take a cereal like, rice, wheat or corn, or a pulse like chana or urad. Measure out a little of this grain. Grind the grain between two clean stones to get flour. What shape of stones will you use? (WorkBook pages 127-128)

one bottle-cap of grain

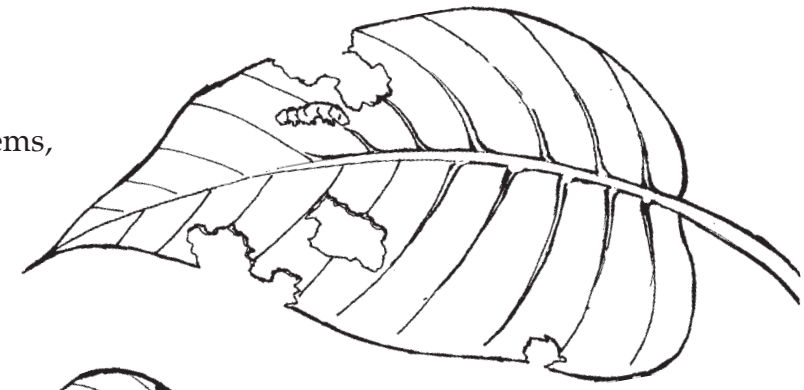
Will the flour fill the same number of measures as the grain, or more or less? Why? Measure it and see.

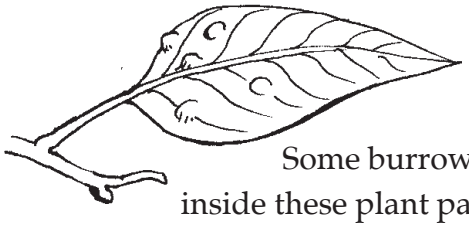
Mix the flour with water and shape it into a ball. Flatten the ball to make a roti. Is your roti clean? Would you eat it?

Are some grains easy to shape? Which ones? Is it easier to make a roti out of coarse flour or fine flour?

7. Pests and pesticides

Many kinds of insects eat the roots, stems, leaves, flowers and fruits of plants.





Some burrow inside these plant parts.

Fungus, a kind of small living thing, grows on plants and damages them.

a. Was your crop eaten or damaged while it was growing?

Look for food crops or other plants that have been damaged. The leaves, bark, flowers or fruit might have been eaten, the leaves might be curled or have swellings or markings. Try to find out how this damage was caused (WorkBook page 128).

b. Look for caterpillars and other insects in vegetables and fruits. You might find insects inside peas, beans, cauliflower, cabbage, spinach, mango, apple, etc.

c. Look for insects living in grain, spices or other foods stored in the kitchen.

d. Pesticides are poisons that are put on crops to kill harmful insects and other small living things. Find out the names of some pesticides used on crops or garden plants.

Do you use any pesticides in your house? Do you put any pesticides in food grains?

Could pesticides be harmful to us? Why do you think so?

Take care!

Pesticides are poisonous. They can make you sick.

Wash all grains, vegetables, fruit and meat well to remove pesticides and other dirt and germs.

Know these words

ploughing	transplanting	threshing	fertiliser
flooding	weeding	milling	pesticide
broadcasting	harvesting	polishing	

EXERCISES

Name and draw

1. Every week after sowing the seeds draw a picture of your field or plants.
2. Draw any farming or gardening tool used in your area.

Interesting questions

1. Name one ingredient of food that comes from neither plant nor animal.
2. Put in the right order:

   threshing ploughing harvesting sowing milling irrigating
3. Put in the right order:

   bhindi flower cooked bhindi unripe bhindi on the plant

   chopped bhindi ripe bhindi sprouting bhindi plant
4. Write the name of the plant, and the part of the plant, from which we get these foods:

   corn coconut oil sugar peas carrot cauliflower
5. Name some domestic and some wild animals that people eat.
6. Name some water plants and animals that people eat.
7. Name some foods eaten on certain festival days.

Classroom discussion

1. Does everyone around you get enough food to eat? Why do some people not get enough food? What could they do about it?
2. Do you think sometimes people eat too much food, or the wrong kinds of food? Give examples, and tell why you think this happens.
3. What are the advantages and disadvantages of using tractors or animals for ploughing?

What's the same? What's different?

1. What is the difference between a fruit and a vegetable? Can a fruit be a vegetable? Give some examples.

2. Give two similarities and two differences between:
    a. Raw papaya and ripe papaya (or any other fruit)
    b. Raw papaya and cooked papaya (or any other vegetable)
3. People eat only some kinds of plants and animals. Make a list of 5 plants and 5 animals that you think no one eats. For each one, tell why you think people do not eat it.

Talk and write

1. Find out about festivals, songs, and dances celebrating sowing, harvesting or other farming activities.
2. Something I ate today - Imagine and tell a story about where some food came from.
3. Ask your friend to think of some food. Ask questions to help you guess the name of that food. Your friend can only answer "yes" or "no". How many questions did you have to ask before you could guess the answer?

Play with words

1. Play this game with your friends. The first player says the first letter of any food word. The second player says the next letter so that the word can still be completed into a food word. (It does not matter if this word is different from what the first player had in mind.) A player who cannot think of the next letter gets out. One who completes a food word gets a point.

Ask and find out

1. What is a weed? What is meant by weeding?
2. What is manure? How is it made and used? What is a chemical fertiliser? Find out the names of some fertilisers.
3. Can fertilisers and pesticides be harmful to us? In what ways? When fertilisers and pesticides are washed off by rain where will they go?
4. Are there pesticides that are not harmful to us? Find out about safe ways of protecting grains from pests, like using neem leaves.

Figure it out

1. Suppose a family of four cooks 250 grams of rice every day. How much rice will they use in 30 days? (Remember, 1000 grams make 1 kilogram.) Where does your family get rice? How much rice does your household use in one month?
2. A square metre is a piece of land 1 metre long and 1 metre wide. If you can grow 5 kg of rice on each square metre of land, how many square metres will it take to feed your family for one year?

Show and tell

1. Bring some food that you might carry on a long journey. Now tell the names of some foods that you would **not** carry on a long journey. Tell the class why.

Ask a question

1. Ask questions about where our foods come from. Think of how you will try to find the answers.

DID YOU KNOW?

To grow one kilogram of grain we need a few thousand litres of water.

Most of this water is let out into the air by the leaves.

CHAPTER 9

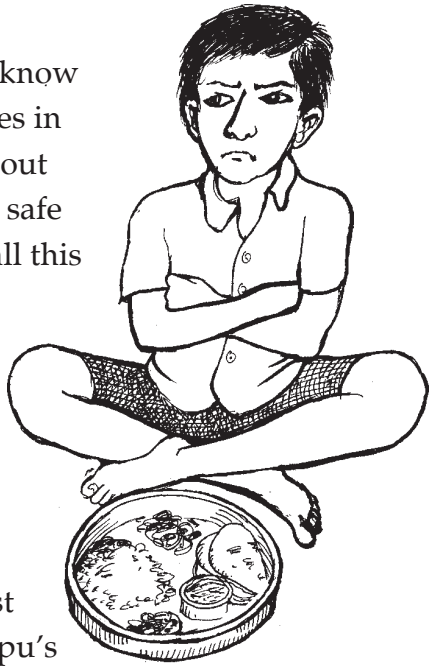
FOOD IN OUR BODIES

Eat your lunch

"Amma, I don't like doodhi!" Apu complained, "I don't want lunch today."

"Let him go and play Amma," Mini said, "Does it matter if he does not eat, just for today?

"It matters, Mini." Amma replied. "You know Apu, your body is like a factory. It takes in food to make energy, repair the worn-out parts, to help you grow and keep you safe from illness. Remember, you learnt all this last year!"



"So what if he misses just one meal?" Mini wanted to know. "He had breakfast early in the morning. That should give him energy and everything else."

"Ah, Mini, that energy does not last very long. Now put your ear close to Apu's tummy and listen! Do you hear a rumble? That's his tummy saying it is empty and wants more food."

Mini listened and had so many question to ask, "What is this rumbling sound? Where did his breakfast go in just four hours? What happened to that food inside his body?"

"I know what happened," said Apu, smiling impishly. "It turned into shi shi, you know, the stools that we pass out every morning!"

Now Mini was really curious, "But Amma, how did the food give energy?

And our stools look and smell so different from the food we eat!

Something must be happening inside our body."

"You'll find out," said Amma, "So many things happen inside our body all the time. Let's find out what happens to our food."

The Digestive Path

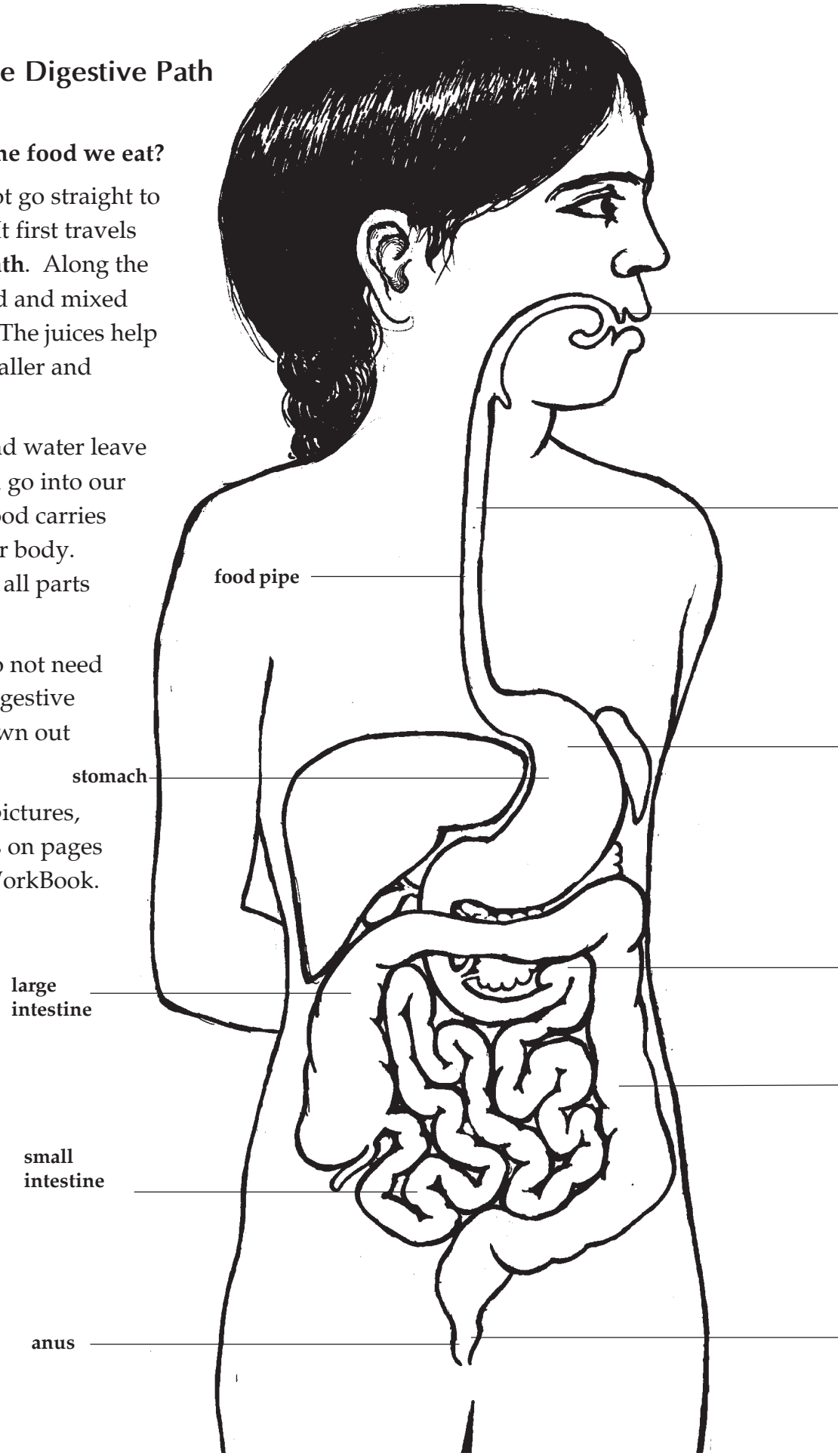
1. What happens to the food we eat?

The food we eat cannot go straight to all parts of our body. It first travels along the **digestive path**. Along the way food gets churned and mixed with digestive juices. The juices help break it down into smaller and smaller pieces.

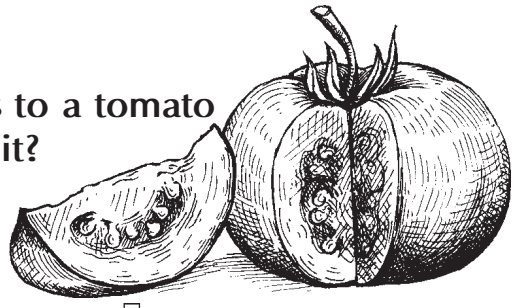
These tiny particles and water leave the digestive path and go into our blood stream. The blood carries them to all parts of our body. They are used to keep all parts living and growing.

Waste food that we do not need continues along the digestive path. It is finally thrown out through the anus.

After studying these pictures, complete the exercises on pages 137 and 143 in your WorkBook.



What happens to a tomato when you eat it?



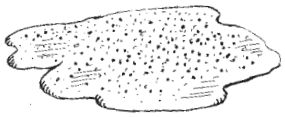
Food is torn, chopped, ground, and mixed with saliva in the **mouth.**

The **food pipe** carries food to the stomach.

Food is churned, mixed with digestive juices, and broken into smaller and smaller pieces in the **stomach**.

In the **small intestine** food is broken into particles so small they pass into the blood stream.

Undigested food and water goes into the **large intestine.** Liquids pass out of the large intestine into the blood stream.



Broken down food particles are carried to all parts of the body by the blood stream.

Waste liquids are finally thrown out as urine

Solid food waste is thrown out through the **anus.**

2. Digestive juices break down food

In your mouth food is torn into pieces and ground up by your teeth. Your tongue helps mix up food and move it around. Food is also mixed with **saliva** (spit) in the mouth. Saliva is a **digestive juice** that helps to break down food into smaller pieces.

a. Chew a piece of bread, roti or cooked potato for 2-3 minutes. Describe the change in taste (WorkBook page 137).

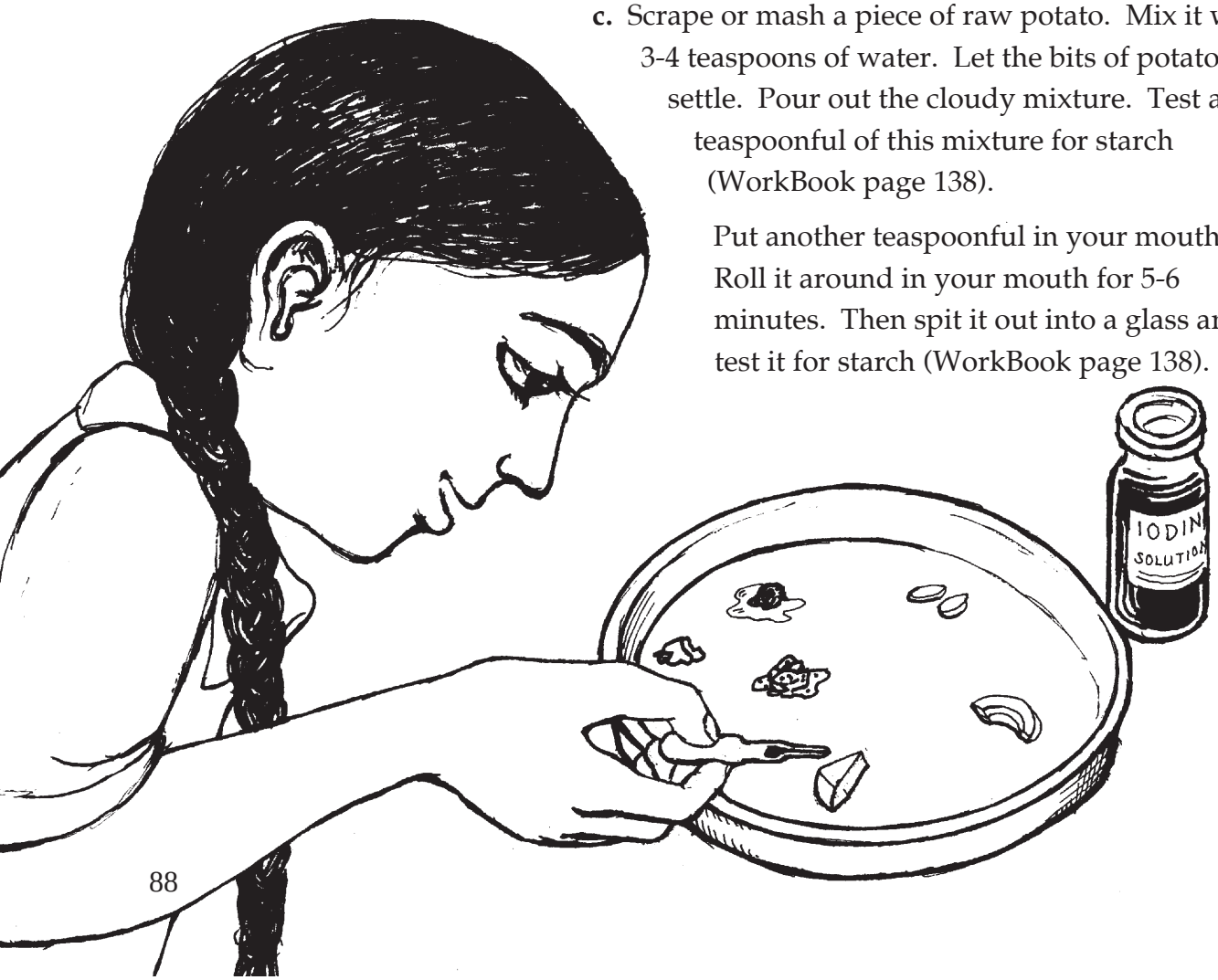
Flour and potato contain a lot of starch. Saliva changes starch into something else. Can you guess what it is?

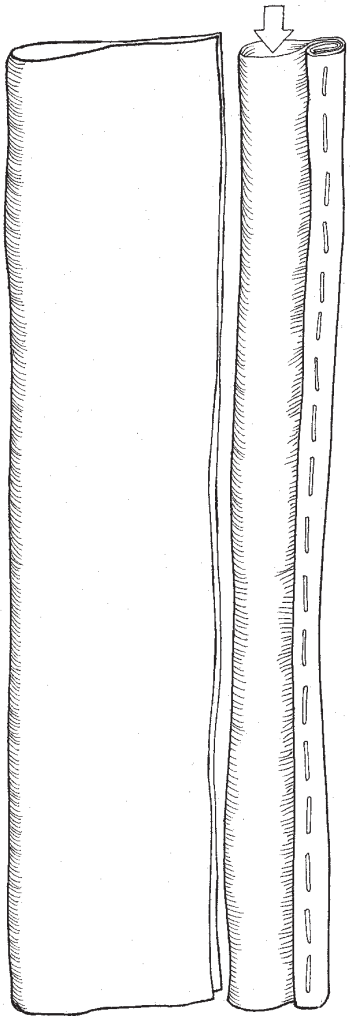
If you chew your food well, the saliva will digest it well!

b. Iodine turns starch blue or black. Take small quantities of banana and other fruits, flour, groundnuts, roti, milk, cooked rice, potato, butter, bread, cabbage, different grains, cooked egg, tomato, biscuit, etc. Test if these foods contain starch by putting a drop of iodine solution on them (WorkBook page 138).

c. Scrape or mash a piece of raw potato. Mix it with 3-4 teaspoons of water. Let the bits of potato settle. Pour out the cloudy mixture. Test a teaspoonful of this mixture for starch (WorkBook page 138).

Put another teaspoonful in your mouth. Roll it around in your mouth for 5-6 minutes. Then spit it out into a glass and test it for starch (WorkBook page 138).

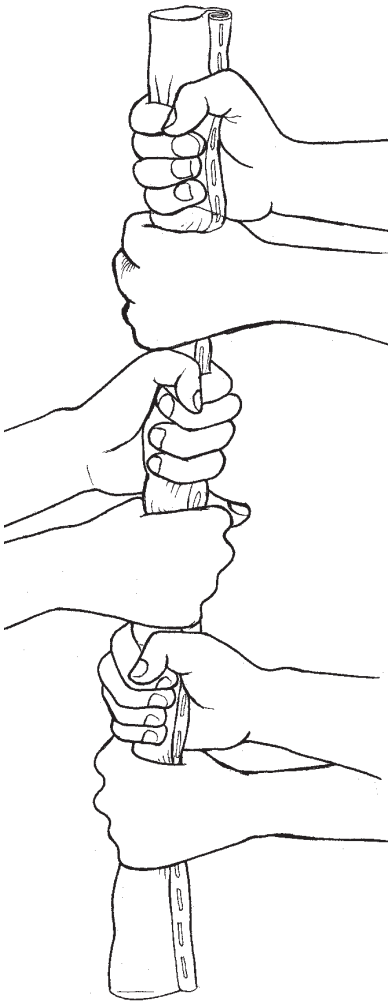




3. How food goes through the digestive path

a. When you swallow, food goes down your food pipe.

Make a model of your **food pipe**: Cut out a long piece from a plastic bag (about 20 cm wide and 40 cm long). Fold it in half lengthwise, roll up the edge and sew or staple it to make a long tube.

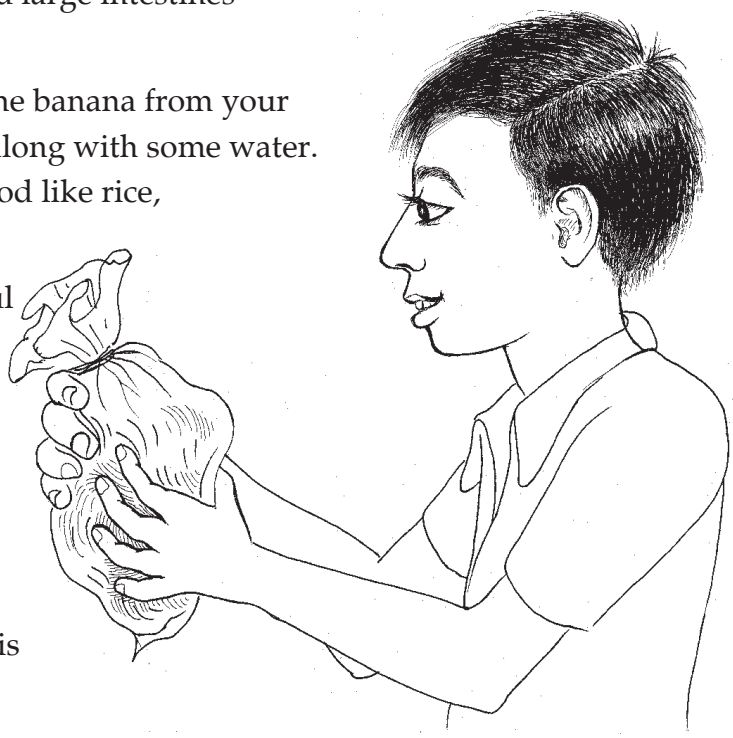


Put a squashed banana into one end of the tube. Three of you hold the tube with your fists. Do not leave gaps between the fists. Pretend your hands are the muscles of the food pipe.

By clenching and opening your fists, try to move the lump of banana from the top of the tube to the bottom.

This is how food moves through the food pipe, and also through the small and large intestines (WorkBook pages 139-140).

b. Make a model of your **stomach**: Put the banana from your model food pipe into a clear plastic bag along with some water. If you like, add a little leftover cooked food like rice, dal, sambhar or soft subji.

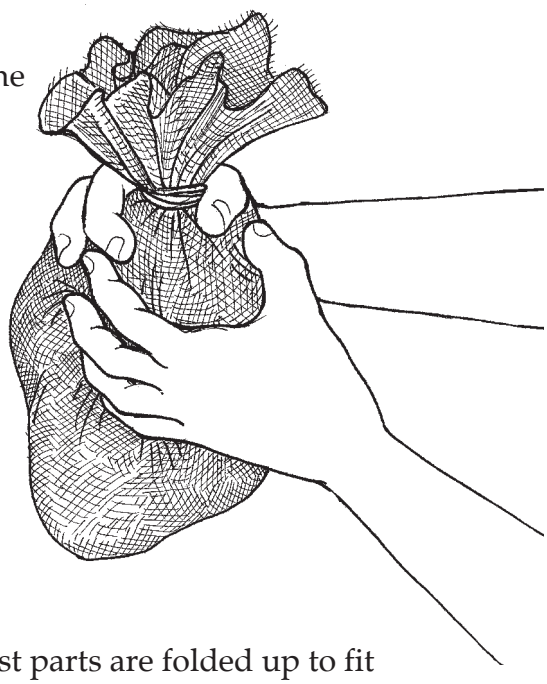


Tie up the mouth of the bag, being careful not to leave much air in the bag. Now pretend your hands are the stomach muscles.

Try to mix the food with your hands in the same way it might be churned by the stomach muscles.

What happens in your real stomach that is not happening in your model stomach?

c. Make a model of your **intestines**: Put the wet food from the stomach model into a piece of cloth. Tie up the cloth and gently squeeze it.



What comes out and what remains inside?

How is this similar to what happens in the small and the large intestines? How is it different?

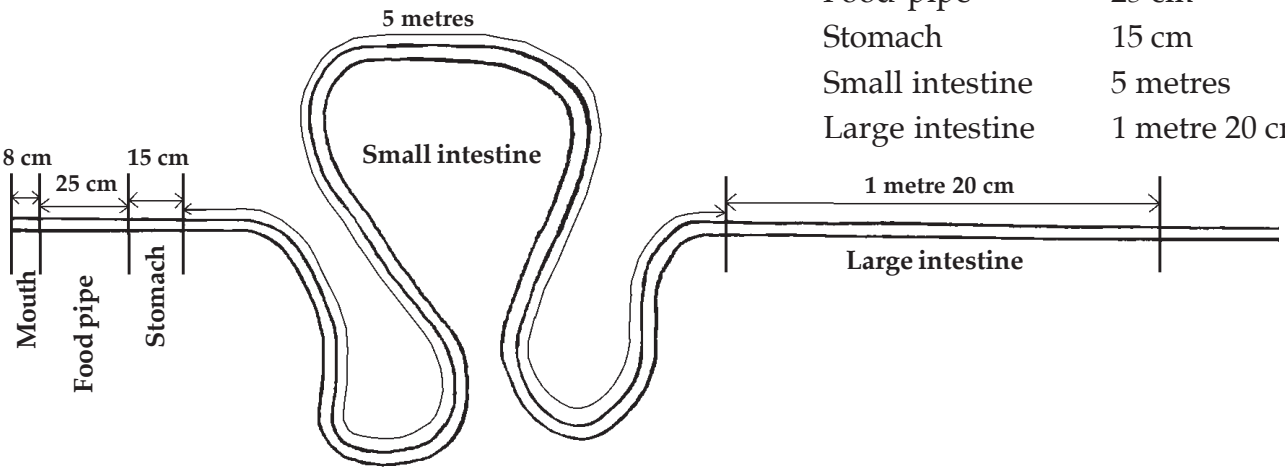
d. Listen to the sounds in your digestive path: Put your ear on your partner's belly and listen carefully for two minutes. What do you hear? Try this before and after a meal. Imagine what might be making these sounds.

4. How long is the digestive path?

The digestive path is much longer than our body. The longest parts are folded up to fit inside our body.

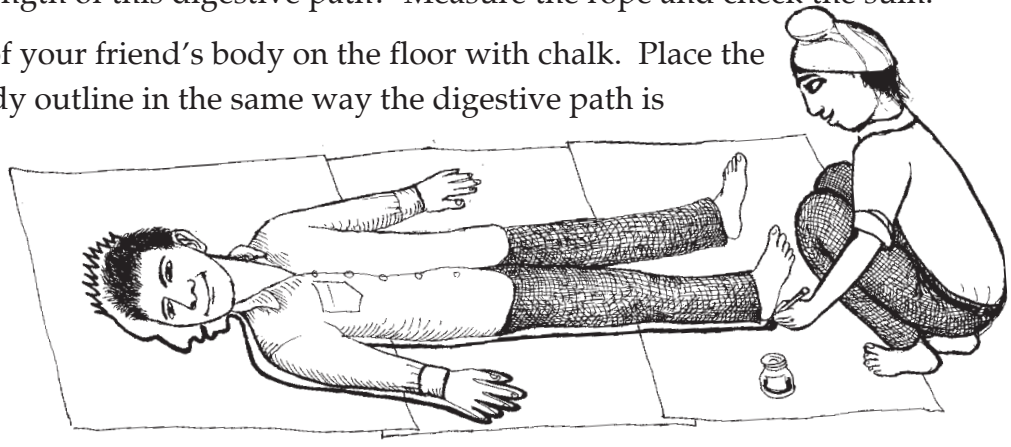
Take a rope about 7 m long. Imagine that it is your digestive path. Mark out these lengths along the rope:

Mouth	8 cm
Food pipe	25 cm
Stomach	15 cm
Small intestine	5 metres
Large intestine	1 metre 20 cm



What is the total length of this digestive path? Measure the rope and check the sum.

Draw the outline of your friend's body on the floor with chalk. Place the rope inside the body outline in the same way the digestive path is folded up in your body (WorkBook page 140).



Think! Think!

Every organ in the digestive path has a different shape. The food pipe is a short tube, the stomach is bag-shaped, while the intestines are long, coiled tubes. What would happen:

a. If the food pipe was coiled?

b. If the stomach was a straight tube?

c. If the intestines were short and straight?

5. How food changes inside the body

You have seen how food changes inside the mouth. Do you know how food looks in the stomach and intestines? (WorkBook page 167)

a. Some time when you were sick you might have vomited food. This partly digested food comes from your stomach, and sometimes also from your small intestines. Describe how it looked and what kind of taste it left in your mouth.

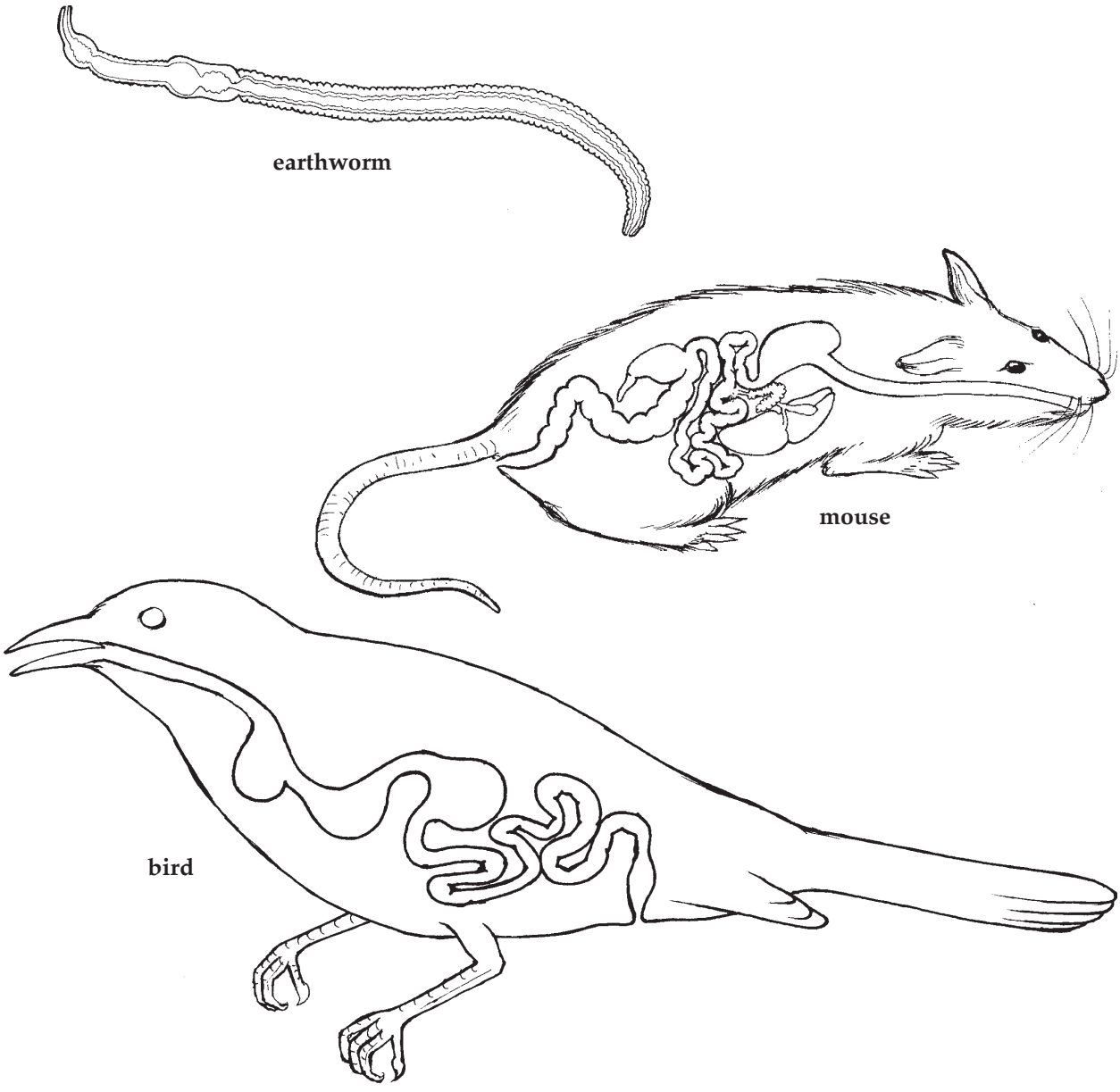
b. What is the colour of your stools? Does this colour change from day to day? Notice the colour on the day after you have eaten green leafy vegetables, beetroot or a lot of tomato.

Think! Think!

People sometimes say that if you swallow a seed, "a tree will grow in your stomach and its branches will come out of your ears!" Is this possible? Why or why not?

6. Other animals have to digest food too!

These are pictures of digestive paths of some other animals.



On pages 141-142 in your WorkBook draw arrows to show the path of food.

Which of these animals have a mouth and an anus?

Which of them have a stomach?

The food canal of which animal looks most like our own?

Know these words

fermentation, digestion

digestive path

mouth, food pipe, stomach, small intestine, large intestine

saliva, digestive juices

EXERCISES

Act it out

1. Act out digestion. One student each could play the role of an organ like, the mouth, teeth, food pipe, stomach, small intestine, large intestine and anus. A round piece of paper could be the roti. Pass the roti along this 'digestive path'. Act out what happens to it.

Interesting question

1. In the picture on page 143 in your WorkBook fill in the missing parts and add the missing labels.

Classroom discussion

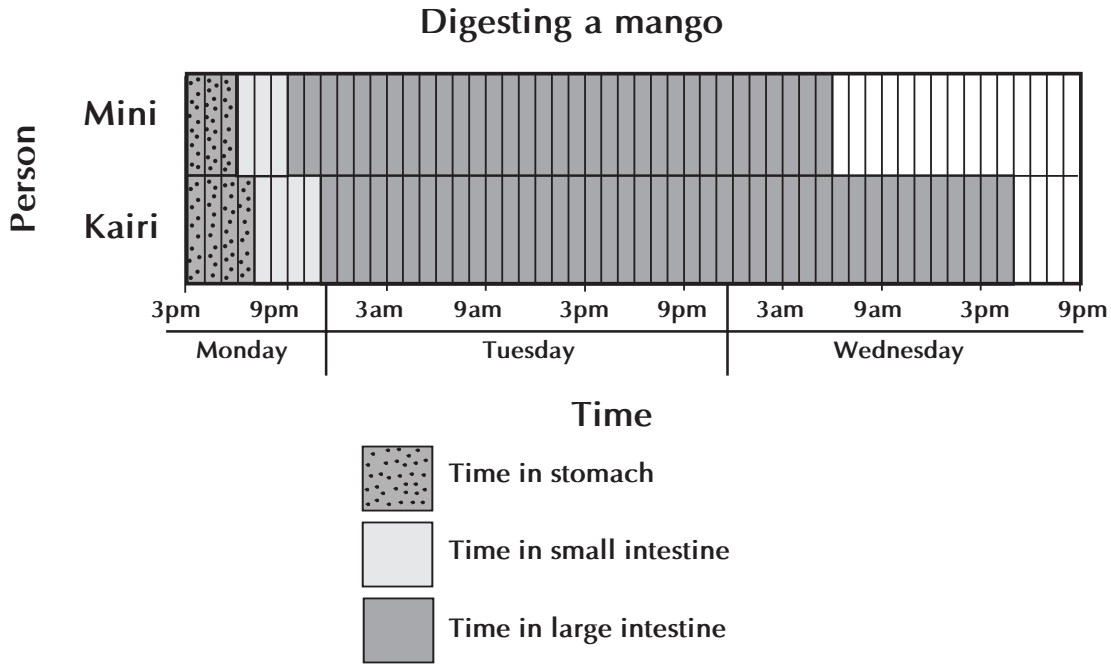
1. In what ways does food change inside our body? Suppose food remained as it was. Could it be used by the body? Why or why not?
2. Suppose you put some mashed up food in a bowl, added some of the digestive juices produced inside our body and mixed it well. Would the food in the bowl get digested? Why or why not?
3. Does digestion occur while we are asleep? Why do you think so?
4. What will happen if we eat more food than we need? Will we get extra energy or become very strong?
5. Have you had indigestion? What might have gone wrong with your digestion then? Have you ever noticed any gas coming from your stomach or intestines? How could gas get into the digestive path?

What's the same? What's different?

1. Is our digestive system similar to a kitchen grinder? How? How is it different? What things happen to the food in the digestive system but not in the grinder?

Figure it out

1. Mini and her friend Kairi ate a delicious mango at 3 pm on Monday. This graph shows how long it took them to digest the mango.



Look at the graph and answer these questions:

a. Where was the mango at 4 pm on Monday in Mini's digestive path?
b. Where was the mango at 4 pm on Monday in Kairi's digestive path?
c. Where was the mango at 10 pm on Monday in Mini's digestive path?
d. Where was the mango at 10 pm on Monday in Kairi's digestive path?
e. Did Mini and Kairi both take the same amount of time to digest the mango?
f. How many hours did it take each of the girls to digest the mango?

Play with words

1. Mini wants to give Apu a crossword puzzle to complete. She found the crossword puzzle shown on page 146 of the WorkBook in an old newspaper. Someone had already completed it, but some of the clues were missing. Help Mini write clues for the crossword puzzle.

Ask a question

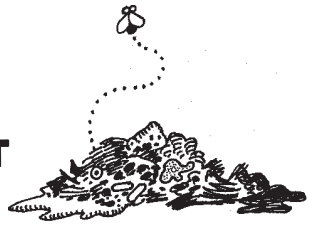
1. Ask questions about digestion of food. Think of how you will try to find the answers.

DID YOU KNOW?

Many seeds are dispersed by birds who swallow them and pass them out through their faeces. Cows and goats also eat and pass out undigested seeds which grow into new plants.

CHAPTER 10

WHAT IS THROWN OUT



Where our food goes

1. The parts we throw away

a. Look again at the pictures of food plants on pages 119-121 in your WorkBook.

Which parts of each plant do we **not** eat? Why do we not eat these parts?

b. The pictures on pages 76-78 of this TextBook show harvesting, threshing, milling and polishing of rice. Which parts of the rice plant are thrown out at these stages? Find out if these parts are useful (WorkBook page 149).

c. List some animals whose flesh we eat. Which parts of the animal do we **not** eat? Why do we not eat these parts?

d. Find out how much garbage is produced in your kitchen in one day. Where does all this garbage go?

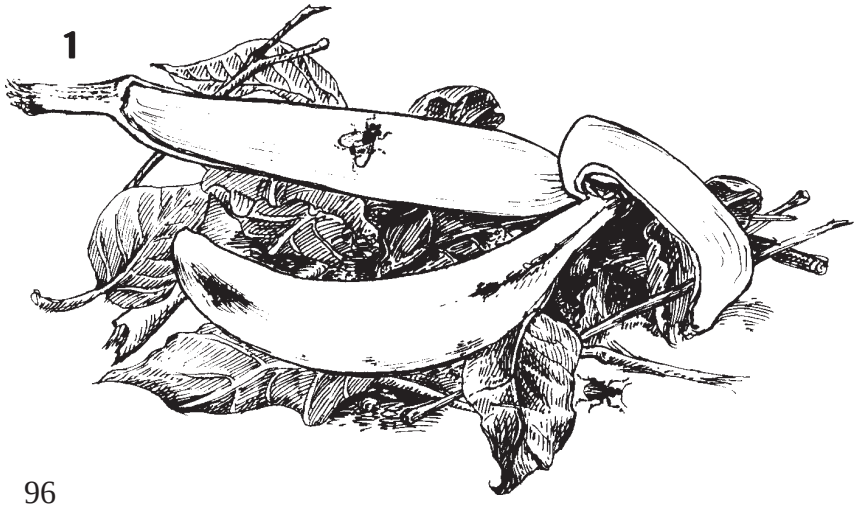
Think! Think!

In preparing food from plants and animals, we throw large parts into the garbage. Could these parts be useful in any way? Make your own guesses.

2. Who eats our wasted food?

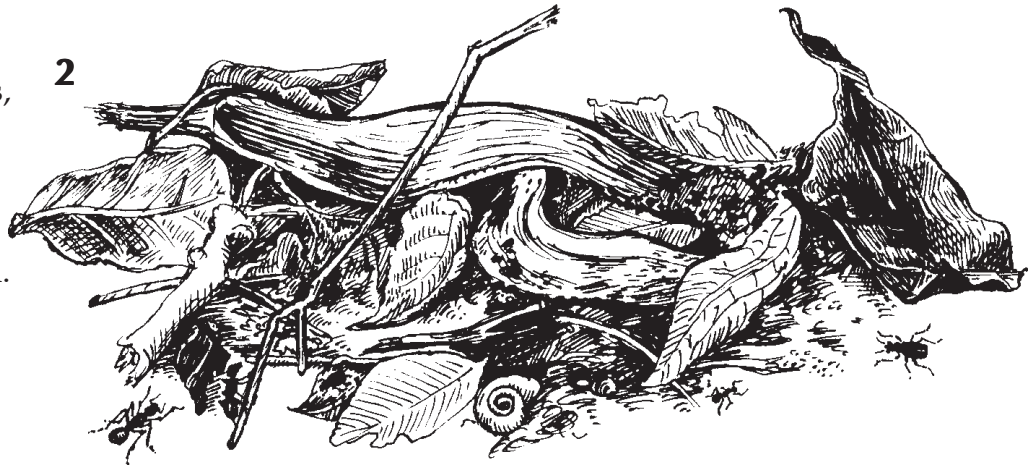
Name some animals who eat the food that we throw away.

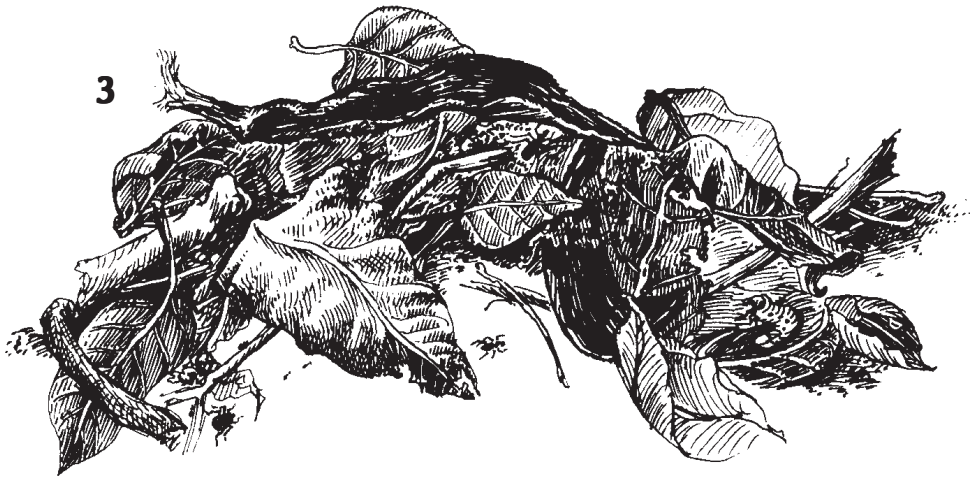
At the school picnic Mini and her friend ate bananas. They dropped the banana peels near some bushes. A goat passed by and ate one.



The other peel started to decompose.

Flies, beetles, ants, snails, millipedes, and earthworms ate parts of the decomposing peel.





A few weeks later: the peel had decomposed further.

Some months later the peel was almost completely broken down. Its parts had mixed into the soil and the air!

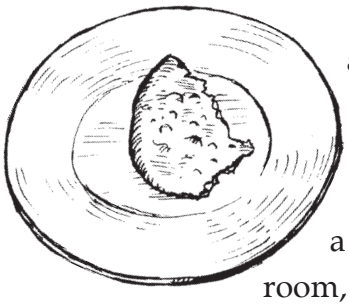
How did this happen? (WorkBook page 150)

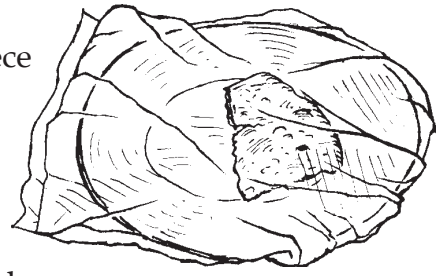
3. How microbes decompose food

Microbes like moulds and bacteria are all around us. Any food has some microbes in it. Microbes from the surrounding air, water and soil get into it. Animals which come to eat the food bring some more microbes.

The microbes give out juices that break down the food. They use this food to live and grow. Very soon these microbes 'multiply' into more microbes. The wastes and gases given off by the microbes make the food look and smell rotten.

Weeks or months later the food has broken down completely. Where has it gone?





a. Take two plates, each containing a piece of roti or any other cooked food. Keep one plate covered and the other open. Each group should keep their plates in a different place: out in the sun, inside a room, or in a refrigerator. Observe over a few days.

Did any animals eat the food? Did the pieces of food change in any way? Is there any difference between the covered and uncovered foods?

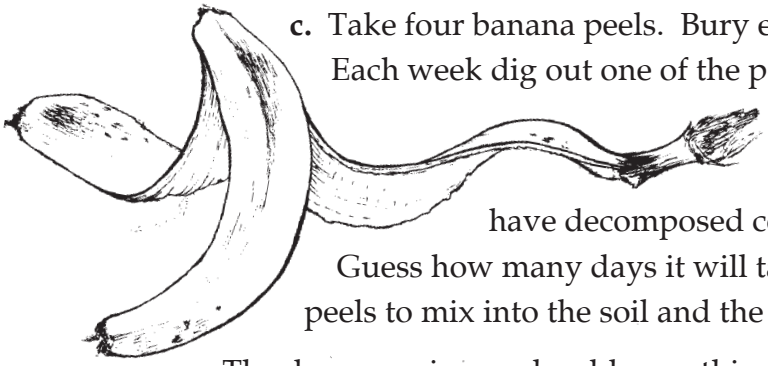
Did you see anything growing on the food? You might see grey, black, green or yellow spots on it. This is a kind of mould. The mould is slowly breaking down and eating the food! Look at the mould with a hand lens. Smell it from a distance.

On this food there are also bacteria and other microbes that you cannot see.

Should you eat this food? Why or why not? Guess how this food might look after several months (WorkBook pages 150-151).

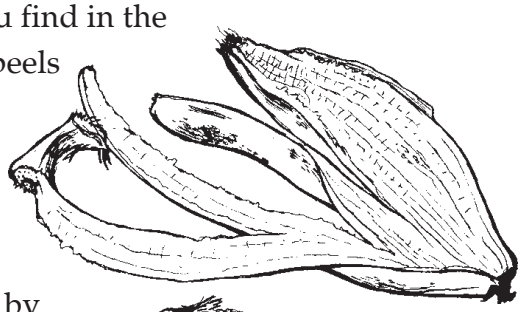
b. Describe the smell of a garbage bin. Did the garbage smell like this before you put it into the bin? What makes it smell now?

If you do not brush your teeth, does your mouth smell? Guess why.

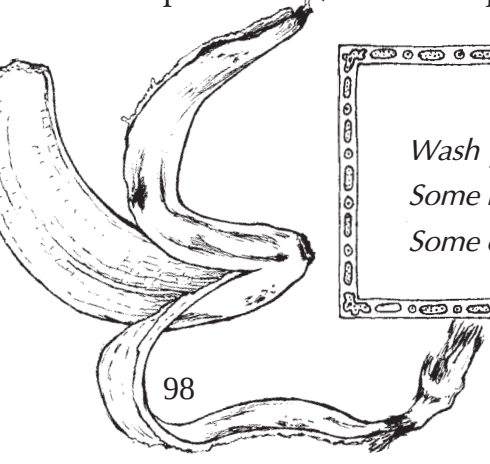


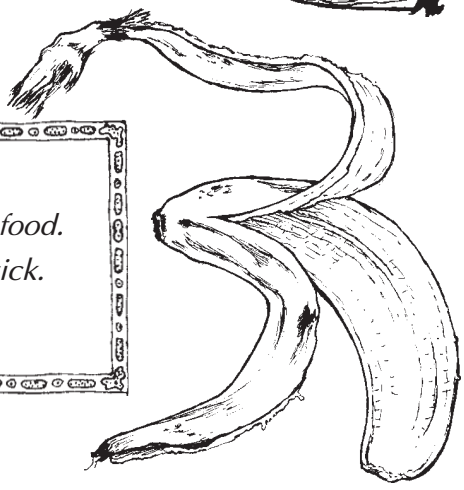
c. Take four banana peels. Bury each peel on a marked spot in wet soil. Each week dig out one of the peels and observe it.

What will you find in the soil when the peels have decomposed completely? Guess how many days it will take for the peels to mix into the soil and the air.



The decomposing peels add something useful to the soil! They get broken down into nutrients that can be used by plants (WorkBook pages 150-151).





Take care!

Wash your hands well after handling decomposing food.
Some microbes growing on the food can make you sick.
Some of them make poisons that can make you sick.

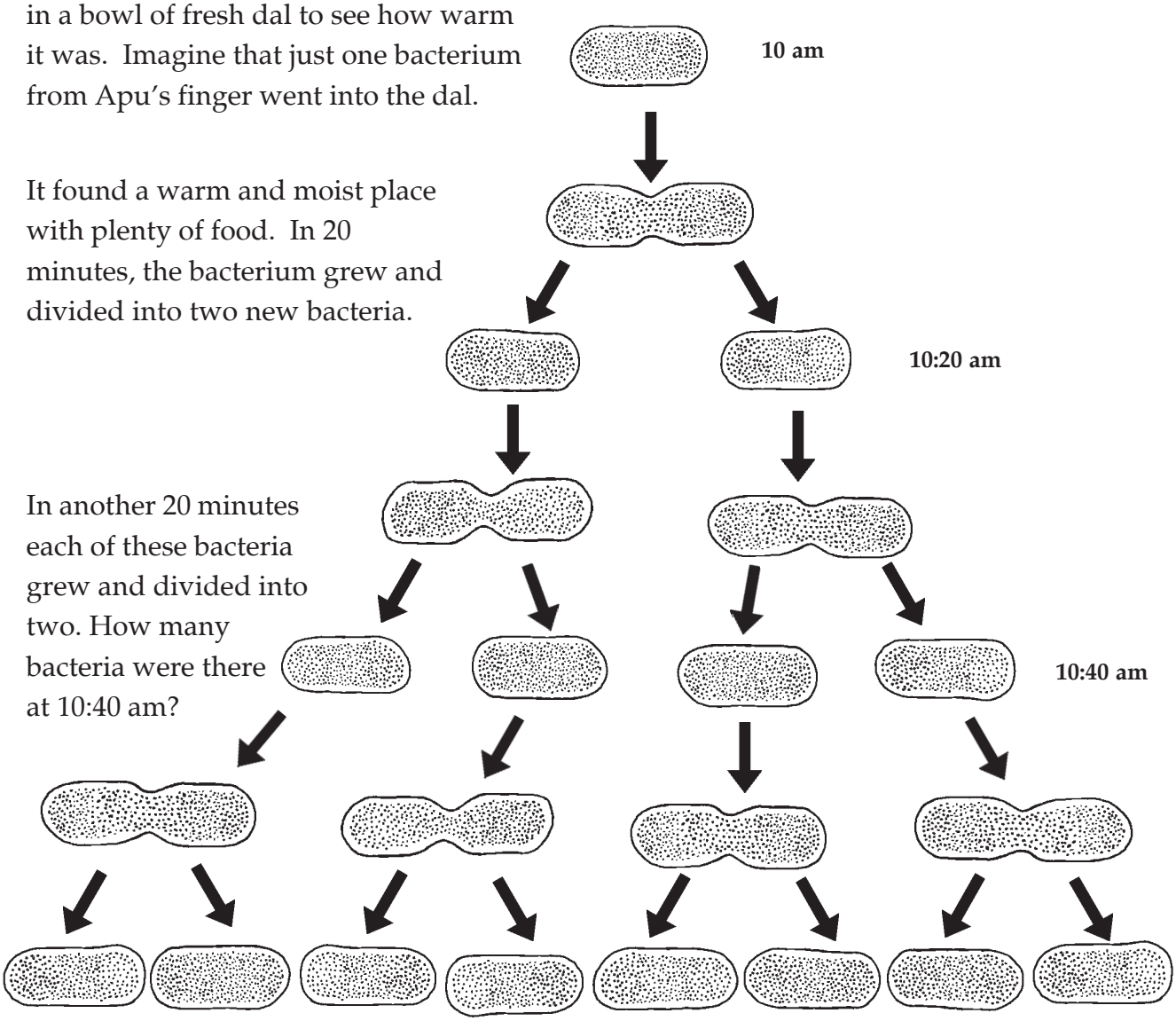
4. How quickly microbes multiply!

Look what happened to this bowl of dal:

One day Apu forgot to wash his hands after playing in mud. At 10 am he put his finger in a bowl of fresh dal to see how warm it was. Imagine that just one bacterium from Apu's finger went into the dal.

It found a warm and moist place with plenty of food. In 20 minutes, the bacterium grew and divided into two new bacteria.

In another 20 minutes each of these bacteria grew and divided into two. How many bacteria were there at 10:40 am?



How many bacteria were there at 11 am?

Fill in the Table on page 152 in your WorkBook to show how many bacteria there will be if they continue to multiply so fast.

At 2 pm Mini found little bubbles in the dal. Where did the bubbles come from? What might happen if Mini ate the dal?

What should Apu have done first after he came back from playing? Was there a better way of checking whether the dal was warm or cold?

Think! Think!

"I don't like microbes!" Apu said. "They are dirty and smelly! They make us sick."

"Microbes are not dirty!" Mini replied. "They make everything clean. They eat garbage and break it down into smaller and smaller pieces that go back into the soil and help plants to grow!"

What do you think?

Microbes need time to do their work. If many people dump their food garbage in one place every day, all this food will take a long time to decompose completely. Flies, cockroaches and rats will eat the food and multiply. They will spread disease microbes everywhere.

What could we do with all this food garbage? (WorkBook page 153)

5. Microbes in our faeces

You have learned to wash your hands well after you go to the toilet. You know that faeces should never come into contact with food or drinking water. Why do you need to be careful about all these things?

Why are faeces considered to be dirty? (WorkBook pages 153-154)

If you are a normal, healthy person, you may have as many as 100,000,000,000,000 microbes in your body! Most of the microbes are in your intestines and are harmless or even helpful. But there are also some kinds that could make you sick if there were too many of them.

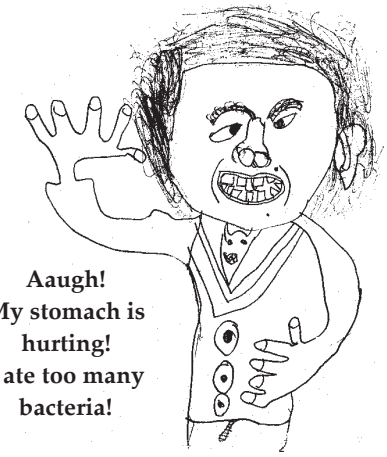
Think! Think!

Have you ever noticed gas in your intestines? Where could this gas have come from?

Take care!

Our faeces contain large numbers of microbes. Microbes can multiply very quickly in faeces. Faeces also attract flies that carry the microbes to our food. If we eat this food we might fall sick.

We must find safe ways to get rid of our wastes.



6. Where does our waste go?

a. Think about the place where you defecate. Do the faeces and urine stay where they are? Do you use a flush or pour water? Where do you think your wastes go?

b. Which of the following pictures best shows the kind of latrine that you use? For each picture think about these questions:

What happens to the urine and the faeces? Is any part of the waste carried away from the place of defecation?

How much water is needed to clean the latrine after each use?

Would you expect to find flies and a dirty smell near this latrine? (WorkBook page 154)

i. Outdoor defecation

A lonely place in a field or jungle would be all right for outdoor defecation.

Take care!

Do not defecate near a pond, stream or well! (Why not?)

Do not defecate close to where people live! (Why not?)

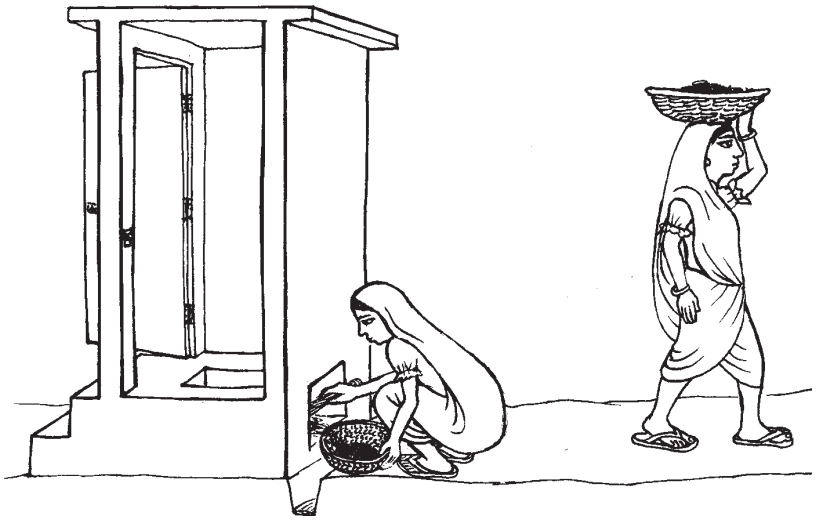
If you defecate outdoors, cover the faeces with soil. This way, flies will stay away and microbes in the faeces will not spread. Under the soil, microbes will slowly decompose the faeces.

The decomposed faeces add something useful to the soil! They get broken down into nutrients which can be used by plants.

Think! Think!

If only a few people defecate outdoors, there is no need to carry away the waste. What would happen if many people defecate outdoors every day around the same place?

ii. Service latrine



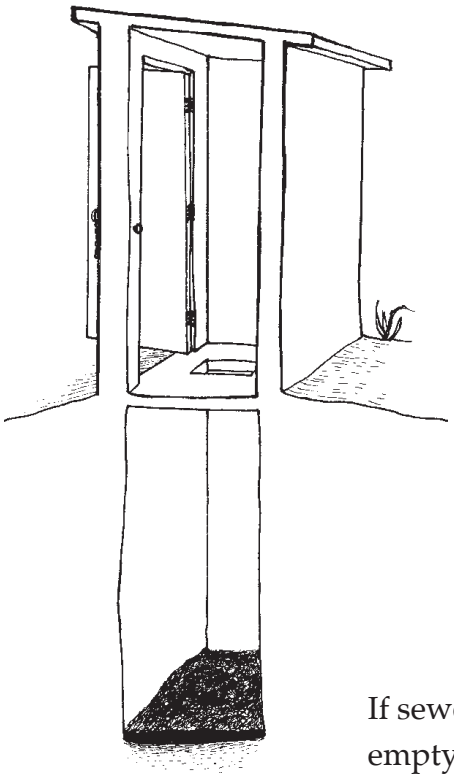
Who carries away the faeces from a service latrine? Where do you think they take it? What could be done with it?

Is this work dangerous? Why? Who would like to do this work?

The government has said that service latrines are unhygienic. The people who carry the faeces have to do inhuman work, and such latrines should not be allowed. What do you think?

iii. Pit latrine

What happens to waste in the pit latrine?



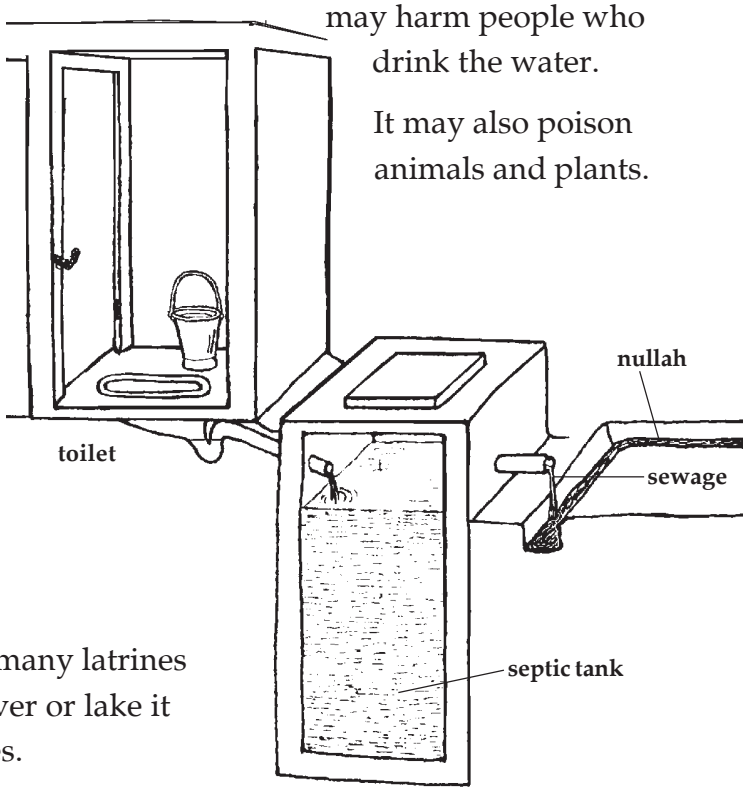
If sewers from many latrines empty into a river or lake it spreads diseases.

iv. Latrine with septic tank

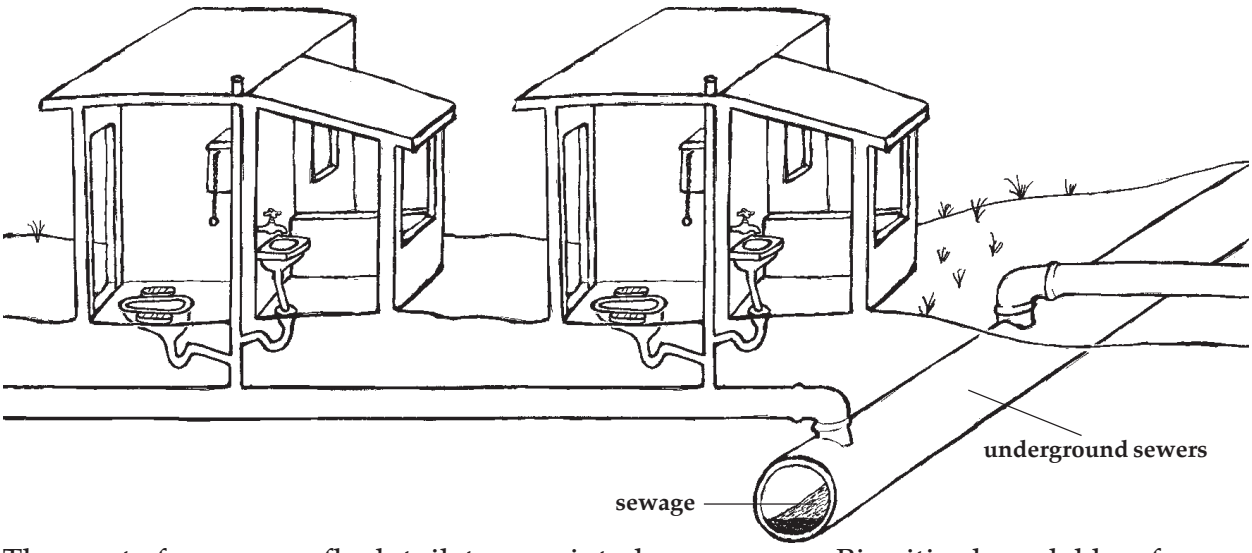
How is the waste carried away from the septic tank? Where do you think it goes?

If sewage gets into rivers and ponds it may harm people who drink the water.

It may also poison animals and plants.



v. Flush toilets with sewers



The waste from many flush toilets goes into large sewers. Big cities have lakhs of people staying in them. What could we do with all their waste? (WorkBook page 156)

7. Microbes help to decompose our waste!

Just as microbes decompose our food garbage, they decompose faeces too. They break down the faeces into parts that go back into the soil where plants can reuse them. We have to give faeces space and time to decompose. But we also have to keep the microbes in faeces from spreading around, getting into drinking water and food, and making people sick.

Wastes produced by several tens of thousands of people can be treated in a large **sewage treatment plant**. Find out if you have a sewage treatment plant nearby. Try to visit it.

Find out if faeces and sewage pose any danger to humans and other living things in your locality (WorkBook page 156).

Think! Think!

What would happen if your faeces did not decompose?

Know these words

Waste water that contains faeces and urine is called **sewage**.

Ditches and pipes that carry sewage are called **sewers**.

Decompose means to break down into very small parts.

EXERCISES

Name and draw

1. A fresh leaf
2. A decomposing leaf

Interesting questions

1. If some liquid food like a curry is left around it starts smelling bad, and you might see bubbles in it. Remember what you know about microbes to explain this.
2. Name some foods that spoil (decompose) quickly and some others that last for a longer time.
3. If you keep flour open it spoils. If it is covered in a box it lasts for a longer time without spoiling. Why?
4. If you keep milk very cold it lasts for a longer time without spoiling. Why?
5. If you dry some foods in the sun, they keep for months or years without spoiling. Why?
6. Name some ways of making food last for a longer time without spoiling. Find examples of cereals, pulses, fruits, vegetables, fish and meat that are preserved in different ways.
7. Which do you think will decompose faster:
   a. bread or wood?
   b. dry bread or moist bread?
   c. bread in a warm place or in a cold place?
   d. a banana peel thrown away during the monsoon, or during a hot, dry season?

Classroom discussion

1. Apart from food wastes, what other things are thrown out in your garbage? Are there things in your garbage that microbes might not decompose? What could we do with these things?
2. Why is it dangerous to keep garbage lying around? What could be done with garbage produced by several households?

Ask and find out

1. How can earthworms help to make manure from garbage?
2. Find the population of your village, town or city. Estimate the amount of garbage produced by so many people in one day. What is done with this garbage?
3. What is done with the sewage in your village, town or city?
4. Wastes produced by some places, like hospitals, small industries and factories, might be especially dangerous. Find out if there are any such places in your locality and what is done with their wastes.

Show and tell

1. Look around your locality and tell the class about any places you find with garbage or sewage disposal problems.

Ask a question

1. Ask questions relating to the wastes that we produce and what we could do with them.

Did you know

There are many more microbes on earth than all the other living things put together!

Some kinds of microbes are used to prepare fermented foods like dahi, idli, dhokla, batura and bread. The microbes break down sugar in these foods and give off gases, mainly carbon dioxide.

OUTLINE OF THE HOMI BHABHA CURRICULUM
(Primary Science)

CLASS I and II

Unit 1: Me and My Family
Unit 2: Plants and Animals
Unit 3: Our Food
Unit 4: People and Places
Unit 5: Time
Unit 6: Things around us

CLASS III

Unit 1: The Living World
- Chapter 1. So many living things!
- Chapter 2. Looking at plants
- Chapter 3. Grow your own plant
- Chapter 4. Looking at animals

Unit 2: Our Body, Our Food
- Chapter 5. Our Body
- Chapter 6. Our Food
- Chapter 7. Our Teeth
- Chapter 8. Taking care of our body

Unit 3: Measurement
- Chapter 9. How many, how much?
- Chapter 10. How long, how high, how far?

Unit 4: Making Houses
- Chapter 11. Houses of all kinds
- Chapter 12. Make your own house

CLASS IV

Unit 1: Sky and Weather
- Chapter 1. Sun, wind, clouds and rain
- Chapter 2. Day sky, night sky

Unit 2: Air

Chapter 3. Fun with air!

Chapter 4. What's in the air?

Unit 3: Water

Chapter 5. Fun with water!

Chapter 6. Water and life

Chapter 7. Water and us

Unit 4: Food

Chapter 8. Where our food comes from

Chapter 9. Food in our bodies

Chapter 10. What is thrown out

CLASS V

Unit 1: The Web of Life

Chapter 1. Living together

Chapter 2. Soil

Unit 2: Moving Things

Chapter 3. How things move

Chapter 4. Making a cart

Unit 3: Earth and its Neighbours

Chapter 5. Our earth

Chapter 6. Day and night

Chapter 7. Earth's neighbours

Unit 4: Our Bodies

Chapter 8. What is in our bodies

Chapter 9. Staying healthy

Unit 5: Materials

Chapter 10. The things we use

Note: The topics in Class I and II cover environmental studies. Classes III - V are primarily concerned with science, though keeping in view social and cultural perspectives. The topics begin with everyday experiences and immediate surroundings in Classes I - III, moving gradually outwards. Classes IV and V make increasing use of measurement concepts.