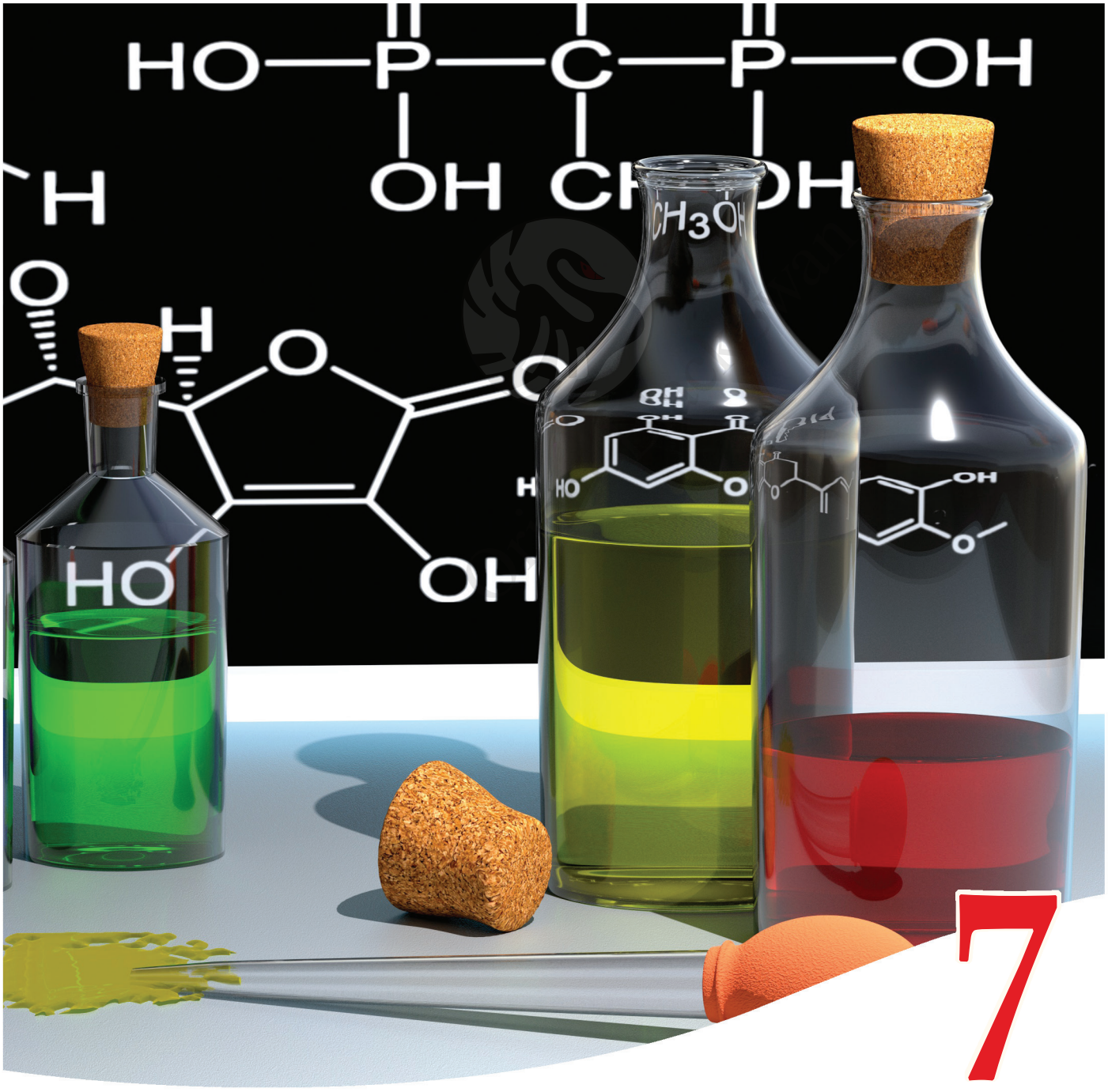
NEP Compliant inside

# NEW SCIENCE AHEAD




7

New

# ScienceAhead

*has been developed in accordance with*

- the CBSE's educational initiatives for effective teaching and learning
- the guidelines laid down in the National Curriculum Framework
- tried and tested methodology in the teaching of science
- the needs of the teacher and the student

## Students' Book

- complete syllabus coverage
- experiments and activities
- carefully graded text
- appealing images and layout

## Teachers' Resource Pack

- For each lesson:
  - **lesson plan**
  - **question bank** with answers
  - **worksheet** with answers
  - **answers for exercises** in the students' book
  - **activities for assessment**
- **Tests*** and **examination papers** with answers

** for classes 3–8*

## In the Students' Book

### Concept Development

#### Learning Objectives

- encourage students to evaluate their progress and take responsibility for their learning

#### Lesson Text

- carefully graded
- enables understanding
- visually appealing

#### In-lesson Activities

- help students develop a scientific temperament

NEW!

#### Case Studies

- in-depth coverage of important topics

#### Assess Yourself

- summarises the lesson
- enables easy revision

### Quick Access

#### Bloom's Taxonomy*

a write-up summarising Bloom's taxonomy of educational objectives, with a handy table of question cues and learning outcomes

** in the preliminary pages*

### Reference

#### Science Tidbit

- nuggets of interesting information

NEW!

#### Be Inspired! Scientists and Values

- information on people who have expanded the world of science or made the world a better place

OUR HERITAGE

NEW!

- an exploration of India's rich heritage in science

#### Internet Links

- enable students to use IT to explore topics in greater depth

NEW!

#### Glossary

- definitions of technical terms

## Smart Book for Teachers

NEW!

informative, interactive and exciting, with:

- animations
- picture galleries
- videos
- interactive tasks
- presentations
- teachers' resources

*including*

- extra questions
- worksheets
- concept maps
- question-paper generator

## Students' App

NEW!

questions that help students review lessons

*for classes 3–8*

## Web Support

a portal dedicated to the series with free access for teachers

# In the Students' Book

## Skill Development

### Looking Back

- within-lesson questions
- immediate feedback for the teacher

### Exercises

- multiple choice questions (MCQs)
- true or false
- fill in the blanks
- diagram-based questions
- short- and long-answer questions

*…and more*

### Activities for Assessment

- science experiments
- written assignments
- simple projects
- presentations (IT)
- model making
- field trips

*…and more*

### Higher-order Thinking Skills

- questions to improve students' analytical and problem-solving skills

### Life Skills

- decision making
- problem solving
- critical thinking
- self management
- effective communication

*…and more*


NEW!

### Fun Activities

- activities that make learning science joyful

## Testing

NEW!

### Tests

- short tests to assess students' understanding of concepts

*for classes 3–8*

### National Science Olympiad Practice Papers

- for competitive examination practice

### Examination Papers

- for examination practice

## NCERT SYLLABUS

| Questions | Key Concepts | Resources | Activities/Processes |
|---|---|---|---|
| **1. Food** | | | **(Periods–22)** |
| *Food from where* | | | |
| How do plants get their food? | Autotrophic and heterotrophic nutrition; parasites, saprophytes; photosynthesis. | Coleus or any other plant with variegated leaves, alcohol, iodine solution, kit materials. | Need for light, green leaf for photosynthesis, looking at any saprophyte/parasite and noting differences from a green plant. |
| *Utilisation of food* | | | |
| How do plants and animals utilise their food? | Types of nutrition, nutrition in amoeba and human beings, Digestive system – human, ruminants; types of teeth; link with transport and respiration. | Model of human teeth, charts of alimentary canal, types of nutrition etc., chart and model of amoeba. The story of the stomach with a hole. | Effect of saliva on starch, permanent slide of *Amoeba*.<br>Role play with children. |
| **2. Materials** | | | **(Periods–38)** |
| *Materials of daily use* | | | |
| Do some of our clothes come from animal sources?<br>Which are these animals?<br>Who rears them?<br>Which parts of the animals yield the yarn? How is the yarn extracted? | Wool, silk – animal fibres.<br>Process of extraction of silk; associated health problems. | Samples of wool and silk; brief account of silkworm rearing and sheep breeding. | Collection of different samples of woollen and silk cloth. Activities to differentiate natural silk and wool from artificial fibres.<br>Discussion. |
| What kinds of clothes help us to keep warm?<br>What is heat?<br>What is the meaning of 'cool'/'cold' and 'warm' 'hot'? | Heat flow; temperature. | Potassium permanganate, metal strip or rod, wax, common pins, spirit lamp, matches, tumblers, Thermometer etc. | Experiment to show that 'hot' and 'cold' are relative.<br>Experiments to show conduction, convection and radiation. |
| How does heat flow from/to our body to/ from the surroundings? | | | Reading a thermometer. |
| *How things change/ react with one another*<br>What gets deposited on a *tawa*/*khurpi*/*kudal* if left in a moist state?<br>Why does the exposed surface of a cut brinjal become black? | Chemical substances; in a chemical reaction a new substance is formed. | Test tubes, droppers, common pins, vinegar, baking powder, $CuSO_4$, etc. | Experiments involving chemical reactions like rusting of iron, neutralization (vinegar and baking soda), displacement of Cu from $CuSO_4$ etc.<br>*Introduce chemical formulae without explaining them.* |
| Why is seawater salty? Is it possible to separate salt from seawater? | Substances can be separated by crystallisation. | Urea, copper sulphate, alum etc, beaker, spirit lamp, watch glass, plate, Petri dish etc. | Making crystals of easily available substances like urea, alum, copper sulphate etc. using supersaturated solutions and evaporation. |
| **3. The World of the Living** | | | **(Periods–42)** |
| *Surroundings affect the living* | | | |
| Why are nights cooler?<br>How does having winters and summers affect soil?<br>Are all soils similar? Can we make a pot with sand?<br>Is soil similar when you dig into the ground? What happens to water when it falls on the cemented/bare ground? | Climate, soil types, soil profile, absorption of water in soil, suitability for crops, adaptation of animals to different climates. | Data on earth, sun – size, distance etc, daily changes in temperature, humidity from the newspaper, sunrise, sunset etc. | Graph for daily changes in temperature, day length, humidity etc.; texture of various soils by wetting and rolling; absorption/percolation of water in different soils, which soil can hold more water. |

| Questions | Key Concepts | Resources | Activities/Processes |
|---|---|---|---|
| *The breath of life*<br>Why do we/animals breathe? Do plants also breathe? Do they also respire? How do plants/ animals live in water? | Respiration in plants and animals. | Lime water, germinating seeds, kit materials. | Experiment to show plants and animals respire; rate of breathing; what do we breathe out? What do plants 'breathe' out?<br>Respiration in seeds; heat release due to respiration.<br>Anaerobic respiration, root respiration. |
| *Movement of substances*<br>How does water move in plants? How is food transported in plants?<br>Why do animals drink water? Why do we sweat?<br>Why and how is there blood in all parts of the body? Why is blood red?<br>Do all animals have blood?<br>What is there in urine? | Herbs, shrubs, trees; Transport of food and water in plants; circulatory and excretion system in animals; sweating. | Twig, stain; improvised stethoscope; plastic bags, plants, egg, sugar, salt, starch, Benedicts solution, $AgNO_3$ solution. | Translocation of water in stems, demonstration of transpiration, measurement of pulse rate, heartbeat; after exercise etc.<br>Discussion on dialysis, importance; experiment on dialysis using egg membrane. |
| *Multiplication in plants*<br>Why are some plant parts like potato, onion swollen–are they of any use to the plants? What is the function of flowers?<br>How are fruits and seeds formed? How are they dispersed? | Vegetative, asexual and sexual reproduction in plants, pollination - cross, self pollination; pollinators, fertilisation, fruit, seed. | *Bryophyllum* leaves, potato, onion etc.; yeast powder, sugar. | Study of tuber, corm, bulb etc; budding in yeast; T.S./L.S. ovaries, w.m.pollen grains; comparison of wind pollinated and insect pollinated flowers; observing fruit and seed development in some plants; collection and discussion of fruits/seeds dispersed by different means. |
| **4. Moving Things, People and Ideas** | | | **(Periods–16)** |
| *Moving objects*<br>Why do people feel the need to measure time? | Appreciation of idea of time and need to measure it. | Daily-life experience; metre scale, wrist watch/ stop watch, string etc. | Observing and analyzing motion (slow or fast) of common objects on land, in air, water and space. |
| How do we know how fast something is moving? | Measurement of time using periodic events.<br>Idea of speed of moving objects – slow and fast motion along a straight line. | | Measuring the distance covered by objects moving on a road in a given time and calculating their speeds.<br>Plotting distance vs. time graphs for uniform motion.<br>Measuring the time taken by moving objects to cover a given distance and calculating their speeds.<br>Constancy of time period of a pendulum. |
| **5. How Things Work**<br>*Electric current and circuits*<br>How can we conveniently represent an electric circuit? | Electric circuit symbols for different elements of circuit. | Recollection of earlier activities. Pencil and paper. | Drawing circuit diagrams. |
| Why does a bulb get hot? | Heating effect of current. | Cells, wire, bulb. | Activities to show the heating effect of electric current. |
| How does a fuse work? | Principle of fuse. | Cells, wire, bulb or LED, aluminium foil. | Making a fuse. |

| Questions | Key Concepts | Resources | Activities/Processes |
|---|---|---|---|
| How does the current in a wire affect the direction of a compass needle? | A current-carrying wire has an effect on a magnet. | Wire, compass, battery. | Activity to show that a current-carrying wire has an effect on a magnet. |
| What is an electromagnet? | A current-carrying coil behaves like a magnet. | Coil, battery, iron nail. | Making a simple electromagnet<br>Identifying situations in daily life where electromagnets are used. |
| How does an electric bell work? | Working of an electric bell. | Electric bell. | Demonstration of working of an electric bell. |
| **6. Natural Phenomena**<br>*Rain, thunder and lightning*<br>What causes storms? What are the effects of storms? Why are roofs blown off? | High-speed winds and heavy rainfall have disastrous consequences for human and other life. | Experience; newspaper reports.<br>Narratives/stories. | **(Periods–24)**<br>Making wind speed and wind direction indicators.<br>Activity to show "lift" due to moving air.<br>Discussion on effects of storms and possible safety measures. |
| *Light*<br>Can we see a source of light through a bent tube? | Rectilinear propagation of light. | Rubber/plastic tube/ straw, any source of light. | Observation of the source of light through a straight tube, a bent tube. |
| How can we throw sunlight on a wall? | Reflection, certain surfaces reflect light. | Glass/metal sheet/metal foil, white paper. | Observing reflection of light on wall or white paper screen. |
| What things give images that are magnified or diminished in size? | Real and virtual images. | Convex/concave lenses and mirrors. | Open ended activities allowing children to explore images made by different objects, and recording observations.<br>Focused discussions on real and virtual images. |
| How can we make a coloured disc appear white? | White light is composed of many colours. | Newton's disc. | Making the disc and rotating it. |
| **7. Natural Resources**<br>*Scarcity of water*<br>Where and how do you get water for your domestic needs? Is it enough? Is there enough water for agricultural needs? What happens to plants when there is not enough water for plants?<br>Where does a plant go when it dies? | Water exists in various forms in nature.<br>Scarcity of water and its effect on life. | Experience; media reports; case material. | Discussions.<br>Case study of people living in conditions of extreme scarcity of water, how they use water in a judicious way.<br>Projects exploring various kinds of water resources that exist in nature in different regions in India; variations of water availability in different regions. |
| *Forest products*<br>What are the products we get from forests? Do other animals also benefit from forests? What will happen if forests disappear? | Interdependence of plants and animals in forests.<br>Forests contribute to purification of air and water. | Case material on forests. | Case study of forests. |
| *Waste Management*<br>Where does dirty water from your house go? Have you seen a drain? Does the water stand in it sometimes? Does this have any harmful effect? | Sewage; need for drainage/sewer systems that are closed. | Observation and experience; photographs. | Survey of the neighbourhood, identifying locations with open drains, stagnant water, and possible contamination of ground water by sewage.<br>Tracing the route of sewage in your building, and trying to understand whether there are any problems in sewage disposal. |

# Contents

13

# Time and Motion

**Learning Objectives**

By the end of the lesson, you will be able to:

- describe the history of measuring time
- explain the mechanism of a pendulum clock
- describe how clocks and watches work
- calculate speed
- explain the functions of speedometers and odometers
- plot a distance–time graph

## MEASURING TIME: A SHORT HISTORY

Humans have always felt the need to keep track of the passage of time. The change in the seasons, the seasonal availability of water, the migration of animals and the growth cycles of plants were events that were observed closely, because knowledge of the pattern of occurrence of such events was necessary for human survival. With the arrival of civilisation and later globalisation, the measurement of time has taken on greater significance.

Humans have been measuring time based on events that occur around them for many thousands of years. The rising and setting of the Sun, the waxing and waning of the Moon, and the movement of the planets around the Sun are some examples of periodic events that our ancestors used to measure time. Later on, as it became necessary to measure smaller amounts of time, people designed devices like the candle clock, water clock and the sand clock or hour glass. These clocks cannot by themselves tell us the time of day.

An early device that was used to tell the time of day was the **sundial**. A sundial consists of a flat surface on which a triangular structure is placed vertically.

a. Candle clock b. Water clock c. Sand clock d. Sundial

**Fig. 13.1** Devices that were used to measure time

Applying

**Activity 13.1**

**Aim:** To make a simple water clock

**Materials required:** plastic water bottle, nail, stone, water, Cellotape

**Method**

1. Cut a plastic water bottle in two in such a way that the top part is shorter than the bottom part.
2. Use the nail and stone to make a small hole in the cap of the bottle.
3. Invert the top part of the bottle into the bottom part. Make sure that there is space between the cap and the bottom of the bottle.
4. Use Cellotape to stick the two parts together at the top.
5. Pour some water into the top part of the bottle and count how many drops fall into the bottom part in a minute.
6. You can use this to measure time for a few minutes.

**Table 13.1 Conversion of time**

| | |
|---|---|
| 60 seconds | 1 minute |
| 60 minutes | 1 hour |
| 24 hours | 1 day |
| 365.25 days | 1 year |
| 10 years | 1 decade |
| 10 decades | 1 century |
| 10 centuries | 1 millennium |

The shadow of the vertical structure falls on the flat surface and is used to tell time. The five Jantar Mantars in India have sundials.

## ACCURATE MEASUREMENT OF TIME

In daily life and for most scientific purposes, it is now important to measure time—a change in time or a time interval—accurately.

You have studied SI units in class 6 and know that the SI unit of time is the second (s). The time taken for longer events is measured in minutes, hours, days and years.

## The Simple Pendulum and the Pendulum Clock

An important contribution to the measurement of time was made by the Italian astronomer and mathematician Galileo based on his observation of pendulums. *The **pendulum** is a device that is used to measure time using*

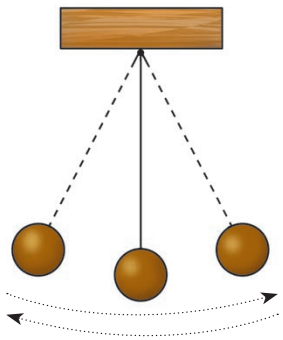


**Fig. 13.2** A simple pendulum

**Activity 13.2**

**Aim:** To measure the time period of a simple pendulum

**Materials required:** metal ball or stone, string

**Method**

1. Make a simple pendulum by hanging a weight such as a metal ball or a stone from a string about 1 m in length. Let the pendulum come to rest (this is the mean position).
2. Now, pull the bob to one side by about 5 cm and release it.
3. Using a stopwatch, find the time taken for 10 to-and-fro motions. For accurate results, measure the time between mean positions. Divide the time taken by 10. This gives the time period of the pendulum.
4. Increase the displacement of the bob to 10 cm and then to 15 cm. Does this have any effect on the time period?
5. Change the bob to one of a different weight and calculate the time period. Is there any change?
6. Change the length of the string to 120 cm and then to 80 cm. Measure the time period in both cases. How does the time period change with change in length of the simple pendulum?

*periodic oscillation*. It consists of a small, heavy, non-magnetic body called a **bob** that is suspended using a light, inextensible string. A pendulum can be made by tying a cotton thread to a small metal ball. The other end of the thread is fixed to a support.

*The time taken for one complete to-and-fro movement or one oscillation is called the* ***time period*** *of the pendulum.* Galileo observed the swinging of a lamp and timed the oscillations against his pulse rate. He found that the time taken for one to-and-fro movement or one oscillation was the same irrespective of the length of the arc of the swing. Based on Galileo's discovery, the first pendulum clock was invented by the Dutch scientist Christiaan Huygens in 1656.

From Activity 13.2, we find that:

- The amount of displacement has no effect on the time period.
- The mass of the bob has no effect on the time period.
- As the length increases, the time period of the pendulum increases.

**Fig. 13.3** A pendulum clock

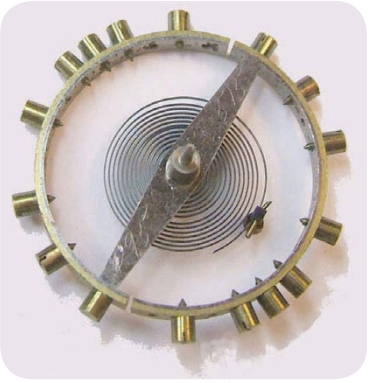


**Fig. 13.4** A balance wheel

**Fig. 13.5** Quartz watch

## Modern Clocks and Watches

In clocks, the pendulum was gradually replaced by a **balance wheel** which makes to-and-fro oscillations at regular intervals of time. These oscillations are maintained by a very fine **spring**. Making smaller clocks and watches became possible because of the balance wheel. Later, the vibrations of a crystal called **quartz** were used to measure time. The frequency of the vibrating quartz crystal is so regular that even ordinary quartz clocks or watches lose or gain only a few seconds a month.

**Science TIDBIT**

Atomic clocks are now used to measure time accurately. They work by measuring the frequency of vibrations of atoms (usually of caesium or rubidium). These clocks are used to synchronise watches all over the world.
In India, there are atomic clocks at the National Physical Laboratory, New Delhi, which are India's official timekeepers.

## Looking Back

Understanding

**Fill in the blanks.**

1. _____ events are used to measure time.
2. The SI unit of time is the _____.
3. A decade is equal to _____ years.
4. One to-and-fro movement of a pendulum is called an _____.
5. Electronic watches use vibrations of a _____ crystal to measure time..



## SPEED

All living things move from place to place in search of food, shelter and so on. Animals, people and vehicles move on land; birds, insects and aircraft move in air; fishes, boats, submarines and ships move on water; the Sun, Moon, planets, spacecrafts and artificial satellites move in space. Even sound and light travel!

Of the objects we see around us, some things such as a snail move slowly, while others such as aircraft move fast. Spacecraft and jet aircraft move very fast. But nothing can move as fast as light.

When anything moves, it covers a certain distance in a certain time. The faster it moves, the greater is the distance it covers in a given time. To understand how fast or slow anything moves, we need to know how far it moves in a given time.

The rate at which something moves is called speed. Speed is a physical quantity as it can be measured.

## Calculation of Speed

***Speed*** *is the distance moved by a body in a unit of time.*

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

If a body moves a distance $d$ in time $t$:

$$\text{speed } s = \frac{d}{t}$$

Trains, buses and cars normally do not move with a constant speed. They slow down, speed up and sometimes stop during their journey. Therefore, to determine how fast vehicles move, the average speed is calculated.

$$\text{average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$$

**Example 1:** If we travel from Chennai to Kolkata by the Coromandal Express, we cover almost 1664 km in about 26 hours.

### Solution

The average speed of travel is:

$$\text{average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$$
$$= \frac{1664}{26} = 64 \text{ km/h}$$

The SI unit of speed is the metre per second (m/s).

A more practical unit for objects such as aircraft, trains and cars, which move very fast, is the kilometre per hour (km/h).

(i) To convert speed in km/h to its equivalent in m/s:

$$1 \text{ km/h} = \frac{1 \text{ kilometre}}{1 \text{ hour}}$$
$$= \frac{1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{5}{18} \text{ m/s}$$

(ii) To convert speed in m/s to its equivalent in km/h:

$$1 \text{ m/s} = \frac{1 \text{ metre}}{1 \text{ second}}$$
$$= \frac{1/1000 \text{ km}}{1/(60 \times 60) \text{ h}} = \frac{18}{5} \text{ km/h}$$

**Example 2:** A car travels a distance of 75 km in 2 h at a uniform speed. Express its speed in km/h and m/s.

### Solution

(i) in km/h

distance $d$ = 75 km

time $t$ = 2 h

$$\text{speed } s = \frac{d}{t}$$
$$= \frac{75 \text{ km}}{2 \text{ h}}$$
$$= 37.5 \text{ km/h}$$

(ii) in m/s

distance $d$ = 75 × 1000 m

time $t$ = 2 × 3600 s

$$\text{speed } s = \frac{d}{t}$$
$$= \frac{75 \times 1000 \text{ m}}{2 \times 3600 \text{ s}}$$
$$= 10.4 \text{ m/s}$$

**Example 3:** A train runs at a speed of 60 km/h. How long will it take to cover a distance of 240 km?

**Activity 13.3**

**Aim:** To calculate speed

**Method:** Form groups of five and carry out the following activities.

**Keeping time constant:** Walk for exactly 1 minute. Measure the distance you have walked at the end of a minute using a measuring tape. Calculate the speed at which you walked. Find out which member of your group is the fastest.

**Keeping distance constant:** Calculate the perimeter of the playground in your school. Take turns to run around the boundary. Note the time taken by each one to cover the same distance and calculate your speeds.

## Solution

speed $s$ = 60 km/h

distance $d$ = 240 km

$$s = \frac{d}{t}$$

$$60 = \frac{240}{t}$$

$$t = \frac{240}{60}$$

$$= 4\,\text{h}$$


**Fig. 13.6** A speedometer with odometer

## *Speedometers and odometers*

Observe the **speedometer** in a scooter or car. It shows the speed of the vehicle in km/h at any point in time. The **odometer** in the vehicle shows the distance travelled in kilometres. This reading is often shown within the speedometer itself.

## DISTANCE–TIME GRAPHS

*When a body travels in a straight line and covers equal distances in equal intervals of time, it is said to be in* ***uniform motion***.

## Plotting a Distance–Time Graph

Consider a scooter travelling on a straight road. Its odometer reading is noted every 5 minutes. This is represented in tabular form as shown in Table 13.2.

**Table 13.2 A scooter in uniform motion**

| Time | 10.00 a.m. | 10.05 a.m. | 10.10 a.m. | 10.15 a.m. | 10.20 a.m. | 10.25 a.m. | 10.30 a.m. |
|---|---|---|---|---|---|---|---|
| Odometer reading | 5030 | 5033 | 5036 | 5039 | 5042 | 5045 | 5048 |
| Distance travelled in 5 min intervals | 0 | 3 km | 3 km | 3 km | 3 km | 3 km | 3 km |

It can be seen that the scooter travels 3 km every 5 minutes. Since the distance travelled by the scooter every 5 minutes is the same, it is in uniform motion. Its speed remains constant throughout the journey.

$$\text{The scooter's speed } s = \frac{3 \text{ km}}{5 \text{ min}} = 36 \text{ km/h}$$

Let us now plot the distance and time given in Table 13.2 on a graph.

1. Take a sheet of graph paper and draw the *X*-axis and the *Y*-axis perpendicular to each other. The point where the two axes meet is called the **origin**.
2. Time is represented on the *X*-axis and distance on the *Y*-axis. A suitable scale has to be decided on before working on the graph. In this case, let us take 1 cm = 5 minutes on the *X*-axis and 1 cm = 3 km on the *Y*-axis.
3. At 10.00 a.m., the scooter is at the starting point and so time and distance travelled are both 0. This is marked on the origin of the graph. At 10.05 a.m., the scooter has travelled 3 km in 5 minutes.
4. Mark the point that is directly above the point on the *X*-axis that represents 5 minutes and directly to the right of the point on the *Y*-axis that represents 3 km.
5. Mark the rest of the points and draw a line that passes through all the points and the origin. Now, you have plotted a distance–time graph based on the values in Table 13.2.

The distance–time graph for uniform motion is a straight line passing through the origin (Fig. 13.7).

In this case, the total distance travelled (*AB*) is 18 km.

$$\text{speed} = \frac{18 \text{ km}}{30 \text{ min}} = 36 \text{ km/h}$$

Now suppose the driver of the scooter encounters traffic on the road. Because of this, the driver can no longer move at a uniform speed. He/she has to slow down and speed up from time to time. The distance covered by the scooter every 5 minutes is shown in Table 13.3.

It can be seen that the scooter travels different distances every 5 minutes. Since the distance travelled by the

**Table 13.3 A scooter in non-uniform motion**

| Time | 10.30 a.m. | 10.35 a.m. | 10.40 a.m. | 10.45 a.m. | 10.50 a.m. | 10.55 a.m. | 11.00 a.m. |
|---|---|---|---|---|---|---|---|
| Odometer reading | 5048 | 5049 | 5050 | 5052 | 5052 | 5054 | 5057 |
| Distance travelled in 5 min intervals | 0 | 1 km | 1 km | 2 km | 0 | 2 km | 3 km |

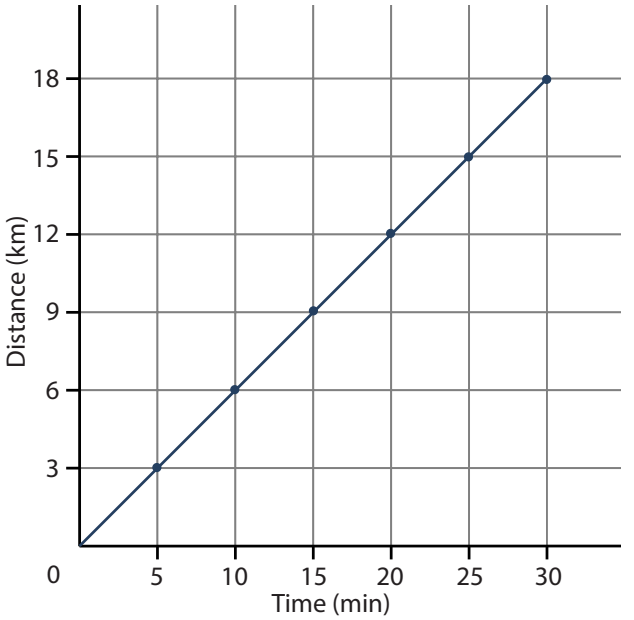



**Fig. 13.7** Distance–time graph for uniform motion

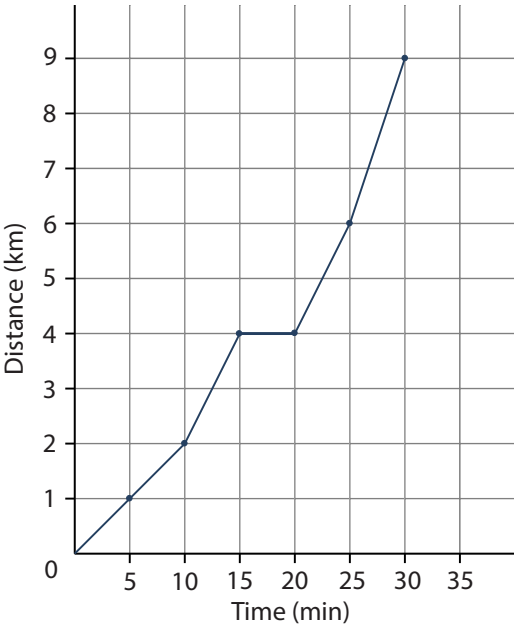



**Fig. 13.8** Distance–time graph for non-uniform motion

scooter every 5 minutes is not the same, it is in **non-uniform motion**. Its speed is not constant during the journey.

Plot the graph for the values in Table 13.3. What kind of graph do you obtain?

The graph for non-uniform motion is not a straight line. It is steep when the speed is greater and less steep when the speed is less (Fig. 13.8). We also observe that when the scooter is not moving, the graph corresponding to that period is parallel to the *X*-axis. When an object travels in non-uniform motion, its average speed for the journey can be calculated using the formula:

$$\text{average speed} = \frac{9\text{ km}}{30\text{ min}}$$

$$= 18\text{ km/h or } 5\text{ m/s}$$

## Looking Back

Understanding

**Fill in the blanks.**

1. _____ is the distance moved by a body in unit time.
2. The _____ shows the speed of a vehicle at a given point in time.
3. The SI unit of speed is _____.
4. The distance–time graph for uniform motion is a _____ line passing through the origin.
5. In _____ motion, the speed of an object is not constant.

## Assess Yourself

**Mark ✓ if you have understood the concept.**

- Time is measured using events which occur periodically, that is, events which repeat at regular intervals of time.
- The SI unit of time is the second (s).
- The time taken by a pendulum to complete one oscillation is called the time period of the pendulum. It is independent of the displacement or the mass of the bob.
- Speed is the distance moved by a body in a given time.
- The SI unit of speed is the metre per second (m/s).
- Average speed is the total distance covered by a body divided by the total time taken.
- When a body travels in a straight line and covers equal distances in equal intervals of time, it is said to be in uniform motion.
- The distance–time graph for uniform motion is a straight line passing through the origin.
- When a moving body does not cover equal distances in equal intervals of time, it is said to be in non-uniform motion.

*For self assessment*



# Exercises

**Remembering/Understanding/Applying**

## Multiple choice questions

### A. Choose the correct option.

1. Which of the following can tell the time of the day by itself?

   a) sand clock  b) candle clock
   c) sundial  d) water clock

2. On which factor does the time period of a simple pendulum depend?

   a) mass of bob
   b) length of pendulum
   c) extent of swing
   d) volume of bob

3. The most accurate of all clocks is the _____.

   a) quartz crystal clock
   b) atomic clock
   c) pendulum clock
   d) balance wheel clock

4. Which of these is **not** a unit of time?

   a) second
   b) hour
   c) day
   d) light year

5. Which of these is the SI unit of time?

   a) second  b) minute
   c) hour  d) millenium

6. The period of oscillation of a simple pendulum which takes 38 s for 20 oscillations is _____.

a) 38 s b) 76 s c) 3.8 s d) 1.9 s

7. Which of these cannot be a unit of speed?

a) m/s b) km/h
c) km/min d) s/m

8. 20 m/s is equal to _____.

a) 5.5 km/h b) 48 km/h
c) 72 km/h d) 40 km/h

9. The average speed of a car that covers a distance of 150 km in 3 h is _____.

a) 450 km/h b) 0.02 km/h
c) 50 km/h d) 153 km/h

10. A car travelling from Chennai at an average speed of 60 km/h reaches Bangalore in 5.5 hours. The distance between the two cities is _____.

a) 66 km b) 400 km
c) 330 km d) 240 km

*For peer assessment*

## Objective-type questions

### B. Fill in the blanks.

1. The fact that the time period of a pendulum remains the same is used in a _____ clock.
2. Before crystals were used, the _____ was used to measure time in watches.
3. In a modern wrist watch, time is measured by the vibrations of a _____ crystal.
4. The SI unit of speed is _____.
5. The distance travelled by an object divided by the time taken for travel gives us the _____ of the object.
6. When the _____ of a body moving in a straight line is constant, it is in uniform motion.
7. A distance–time graph has time as the _____ and distance as the _____.

### C. Say whether the statements are true or false.

1. A sand clock can tell the time of day.
2. The time period of a pendulum remains constant even if the length is changed.
3. speed = distance × time
4. An odometer measures speed.
5. 72 km/s = 20 m/s
6. If part of a distance–time graph is parallel to the time axis, the body is in uniform motion for that period of time.

## Short answer questions

### D. Answer in brief.

1. What are periodic events? Give three examples.
2. What property of a simple pendulum makes it useful in measuring time?
3. What factors determine the time period of a simple pendulum?
4. Define speed and express the relationship between distance and time as an equation.
5. When is an object said to be moving in uniform motion?
6. What is the function of a speedometer?
7. The distance–time graph of an object is found to be a straight, sloping line. What can you say about the motion of the object?

## Long answer questions

### E. Answer in detail.

1. Write a short note on sundials.
2. Distinguish between the speed and average speed of a moving object.
3. Describe the steps to be followed to draw a distance–time graph.
4. Differentiate between uniform and non-uniform motion.

## F. Numerical problems

1. Calculate the average speed of a train which covers a distance of 624 km in 13 hours. [*Ans.: 48 km/h*]
2. A car in uniform motion travels 500 m in 20 s.
   (i) What is its speed? [*Ans.: 25 m/s*]
   (ii) How far does this car travel in (i)1 s and (ii) 5 s? [*Ans.: 25 m, 125 m*]
   (iii) How long does it take to travel 90 m? [*Ans.: 3.6 s*]
3. Convert:
   (i) 36 km/h to m/s [*Ans.: 10 m/s*]
   (ii) 15 m/s to km/h [*Ans.: 54 km/h*]
4. A car starts from rest and covers 20 m every second. Represent this motion for 10 s in tabular and graphical form.
5. The table shows the distance travelled by a scooter every second for 7 s. Plot a distance–time graph showing the total distance travelled. Calculate the scooter's average speed and the total distance travelled.

| Time (s) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Distance (m) | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

6. A body in uniform motion covers a distance of 200 m in 10 s. Draw the distance–time graph and calculate the speed of the body.
7. A motorcycle passes a lamp post. The distance from the lamp post at each time interval is given in the table.

| Time (s) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Distance (m) | 0 | 3 | 10 | 22 | 34 | 46 | 54 | 56 | 56 | 56 |

Plot the distance–time graph. On the graph mark where the motorcycle:
(i) moves fastest
(ii) moves slowest
(iii) is stationary
(iv) moves at a constant speed for at least 3 s.

## Higher-order Thinking Skills

The swing of a pendulum gradually decreases with time. However, it is still regarded as a reliable time-keeping device. Why?

## Life Skills

Punctuality is a very important quality that everyone should have. It is very important to be on time at events.

- Make sure that you plan your work in such a way that it is completed in time.
- Always reach the bus station or the railway station before time so that there is no rush.
- Aim to reach a venue at least 5 minutes before an event starts.

## Enrichment Activities

### I. Research project: Time zones

Applying

When it is 11.30 a.m. in India, it is already 3 p.m. in Japan. At any given moment, the time of the day is different in different parts of the world. This was not a problem as long as people were only dealing with other people living close by, since the time of day is almost the same over distances of a few hundred kilometres. However, advances in transport and communication mean that people nowadays often need to know exactly what time it is in some faraway part of the world. To help with this, people have come up with the concept of **time zones**. All places in a given time zone are defined to have the same time of the day at any given moment, and have a well-defined relationship with the time of the day in other time zones.

a. Find out the time zone that India lies in. How much ahead or behind is India from the standard time?

b. Find out what daylight saving time (DST) is. Why is this followed in many countries? What are its advantages and disadvantages?

### II. Experimental project

Applying

While travelling to school in a bus or car, note down the distance covered by the vehicle every two or four minutes. Use the vehicle's odometer to measure the distance. Record your observations in tabular form.

Plot a distance–time graph for the data gathered and calculate the average speed of the vehicle.

### III. Make and present

Applying

Make a presentation or a website on the different methods that were used for the measurement of time through the ages.

To make and share a website, go to http://www.students.websiteforever.com, the safest website builder for students. This facility comes to you courtesy Orient Blackswan and Akmin Technologies, and does not require any technical expertise.



## Be Inspired!

**Dorris Francis**

Dorris Francis lost her daughter in an accident, when a speeding car hit the rickshaw in which she and her family were travelling. She did not want this to happen to any other family. Every morning, between 7 a.m. and 10 a.m., she stands at a busy intersection in Ghaziabad. She manages the traffic at that intersection with just her whistle and a baton.

## Internet Links

http://science.howstuffworks.com/atomic-clock1.htm

http://www.love-watches.com/History-Watches-Clocks.htm

http://www.tutorvista.com/content/science/science-i/motion/distance-time-graph-non-uniform.php

18

# Forests—Our Lifeline

**Learning Objectives**

By the end of the lesson, you will be able to:

- describe a forest and its different layers
- explain the importance of forests
- describe food chains and food webs
- explain the importance of conservation of forests

## WHAT IS A FOREST?

*A **forest** is large area of land covered with trees, shrubs and other vegetation*. Forests develop where the climate provides a reasonably long growing season, temperature generally over 10 °C and a suitable amount of moisture.

Forests are of many types. **Tropical rainforests** are found in tropical regions where the rainfall is high throughout the year. These dense forests are home to more plants and animals than any other habitat on the Earth. **Deciduous forests** are found in both tropical and temperate regions. The trees in these forests shed their leaves seasonally. **Coniferous forests** are found in temperate regions. The trees here are mostly evergreen conifers. **Scrub** or **thorn forests** are found in hot, dry regions. The trees here are adapted to surviving drought. Let us study rainforests in greater detail.

### Rainforests

*A **rainforest** is a type of forest found in regions that receive a high amount of rainfall.* Most rainforests are found in the tropics. The trees in a rainforest are evergreen. Rainforests are found on all continents except Antarctica. More than half of the kinds of plants and animals found on the Earth are found in rainforests. They produce about 20% of the oxygen on Earth, store large amounts of freshwater and help to maintain the climate of our planet. The Amazon rainforests, found in South America, are the largest in the world.

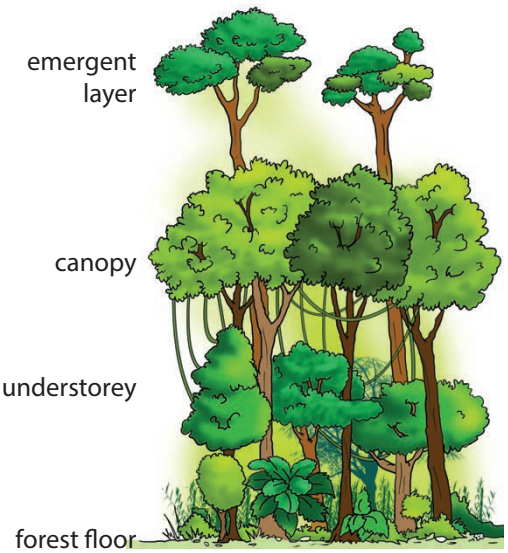



**Fig. 18.1** Rainforest structure

**Fig. 18.2** Forest canopy

**Fig. 18.3** Understorey

**Fig. 18.4** Forest floor

Rainforests have four distinct layers—the **overstorey** or the **emergent layer**, the **canopy**, the **understorey** and the **forest floor**.

### *Emergent layer*

The emergent layer is the top layer of the rainforest. It is the tallest layer of the rainforest and consists of very tall trees (50 m and more in height) whose foliage rises above all other trees in the forest.

The trees in this layer receive maximum sunlight and face high wind speeds. Their branches spread out wide to catch as much sunlight as possible. The leaves of these trees are small and have a waxy covering to protect them from the harsh sunlight and also save water. The seeds of these trees are spread all over the forest by strong winds. Some animals which live in this layer are birds such as eagles and hawks, gliding animals and bats.

### *Canopy*

The canopy is the second tallest layer of the rainforest. It is formed by trees that grow to a height of 20–40 m. The tops of the trees are called **crowns**; they grow very close together and form a lush green roof over the other plants.

The canopy protects the layers and ground below from direct sunlight, wind and direct rainfall. Most of the trees have smooth, oval leaves that end in a point, known as a **drip tip**. This lets rainwater run off the leaves and not accumulate on them. This keeps the leaves dry and prevents mould from growing on them. Many trees in the canopy have seeds inside sweet fruits. This attracts animals which eat the fruit and disperse the seed through their droppings.

Many different kinds of birds, butterflies, monkeys, insects and reptiles live in the canopy. Since there is a large amount of food available, some animals never go down to the forest floor.

### *Understorey*

The understorey is the layer that is below the canopy. It has many shrubs, smaller trees, bushes and plants such as ferns. There is very little air movement and therefore the humidity is high. The

understory gets only a small amount of sunlight since the canopy blocks most of it. Therefore, the plants found in the understorey have large leaves to trap maximum sunlight. Woody climbers called **lianas** overcome this problem by climbing up tall trees. Understorey plants have large flowers to attract pollinators and juicy fruits that attract animals.

The jaguar prefers the dimly lit areas of the understorey. Boas, other reptiles, small mammals, tree frogs, insects and spiders also live in the understorey.

### *Forest floor*

The forest floor is the lowermost and darkest layer of the forest. Very few bushes and herbs can grow on the forest floor because almost no sunlight reaches here, and so the forest floor is relatively clear.

Large animals, such as wild boars, wild pigs, armadillos, anteaters and deer make the forest floor their home. The leaves which drop from the upper layers provide food and shelter for animals such as mice, frogs, snakes and beetles that live on the forest floor.

The leaf litter is quickly broken down by organisms like termites, earthworms and fungi. The heat and humidity provide an ideal environment for microorganisms to remain active throughout the year. They quickly decompose matter on the forest floor. The nutrients obtained after decomposition are absorbed by roots in the soil. However, both soil and nutrients tend to be washed away due to the heavy rains, and therefore rainforest soil is thin and poor in nutrients.

## INTERDEPENDENCE OF PLANTS AND ANIMALS

We know that animals depend directly or indirectly on plants for their food. Living things can be classified based on their food habits as follows.

### Producers

Plants make their own food and they are therefore called **producers** or **autotrophs**. Plants have chlorophyll in their leaves which helps them to make their own food by photosynthesis.

### Consumers

All animals depend on plants for food, since they are unable to make their own food. So, they are called **consumers**, or **heterotrophs**.

Consumers are divided into the following groups depending upon what they eat.

- **Primary consumers** or **herbivores** are animals that eat plants and thus get their food directly from plants. The cow, deer and giraffe are examples of herbivores.

- **Secondary consumers** or **carnivores** eat other animals and thus get their food indirectly from plants. The lion, tiger and wolf are examples of carnivores.
- **Omnivores** consume both plants and animals and so can be either primary or secondary consumers. Humans, bears and crows are examples of omnivores.

***Scavengers*** *are animals that eat the dead bodies of other animals or plants*. This ensures that the bodies of dead organisms do not remain on the ground for a long time. The vulture, hyena and some kinds of beetles are examples of scavengers. Scavengers are also consumers.

## Decomposers

***Decomposers*** *are organisms that help to break down the dead bodies of plants and animals into nutrients*. In this way, decomposers help to return the nutrients taken from the soil back to the soil. Bacteria and fungi are examples of decomposers. The action of the decomposers is very important, since plants and animals would not be able to survive if nutrients were not returned to the soil.

## Plants Depend on Animals

- Plants depend on insects like the bee and other animals for pollination and also for seed dispersal.
- Insectivorous plants trap insects to fulfill their nutritional requirements.
- Animals breathe out carbon dioxide. Plants use carbon dioxide to make food.

## Animals Depend on Plants

- All animals directly or indirectly get their food from plants.
- Plants give out oxygen which animals breathe.
- Many animals live under trees, on branches and so on.

# FOOD CHAINS

*A* ***food chain*** *is a sequence of organisms that are each dependent on the previous organism for food*. It shows the interdependence of organisms on each other. All food chains begin with producers. An example of a food chain is given in Fig. 18.5.


**Fig. 18.5** A food chain

*Animals that hunt and kill other animals for food are called* ***predators***. In the food chain in Fig. 18.5, the tiger is the predator of the goat and the goat is the tiger's **prey**.

Can you think of a few other food chains in different habitats?

## Flow of Energy in a Food Chain

Organisms get energy from the food they eat. A food chain shows us how energy is transferred from one organism to another.

The Sun is the source of energy for all organisms on Earth. Plants convert the light energy in sunlight into chemical energy during photosynthesis. This energy is passed on to other organisms through food chains.

When a rabbit eats grass, the energy stored in the grass is transferred to it. The energy in the rabbit is transferred to the fox that eats it. When the producer or consumer dies, the energy passes on to the decomposers.

### Looking Back

Understanding

**Give one word for the following.**

1. The tallest layer in a rainforest
2. Organisms that make their own food
3. Organisms that depend on plants for food
4. Organisms that eat dead organisms
5. Organisms that break down the dead bodies of other organisms



## FOOD WEBS

In a habitat containing a large number of organisms, an animal becomes a part of more than one food chain.
For example, consider the food chains:

grass → rat → eagle

grass → rat → snake → eagle

We can see that the rat is a part of both food chains and a snake can also be eaten by an eagle.

The two food chains can be combined.

grass → rat → snake
↘ ↙
eagle

There are organisms other than the rat that eat plants. There are also other animals that eat the rat. Thus, a number of food chains link up in a habitat to form a complicated **food web**.

These linkages between all animals and all plants are often referred to as the **web of life**.

### *Balance in nature*

Food webs make sure that the populations of different organisms in a habitat remain steady. For example, if the population of rats in a habitat increases, plenty of food will then be

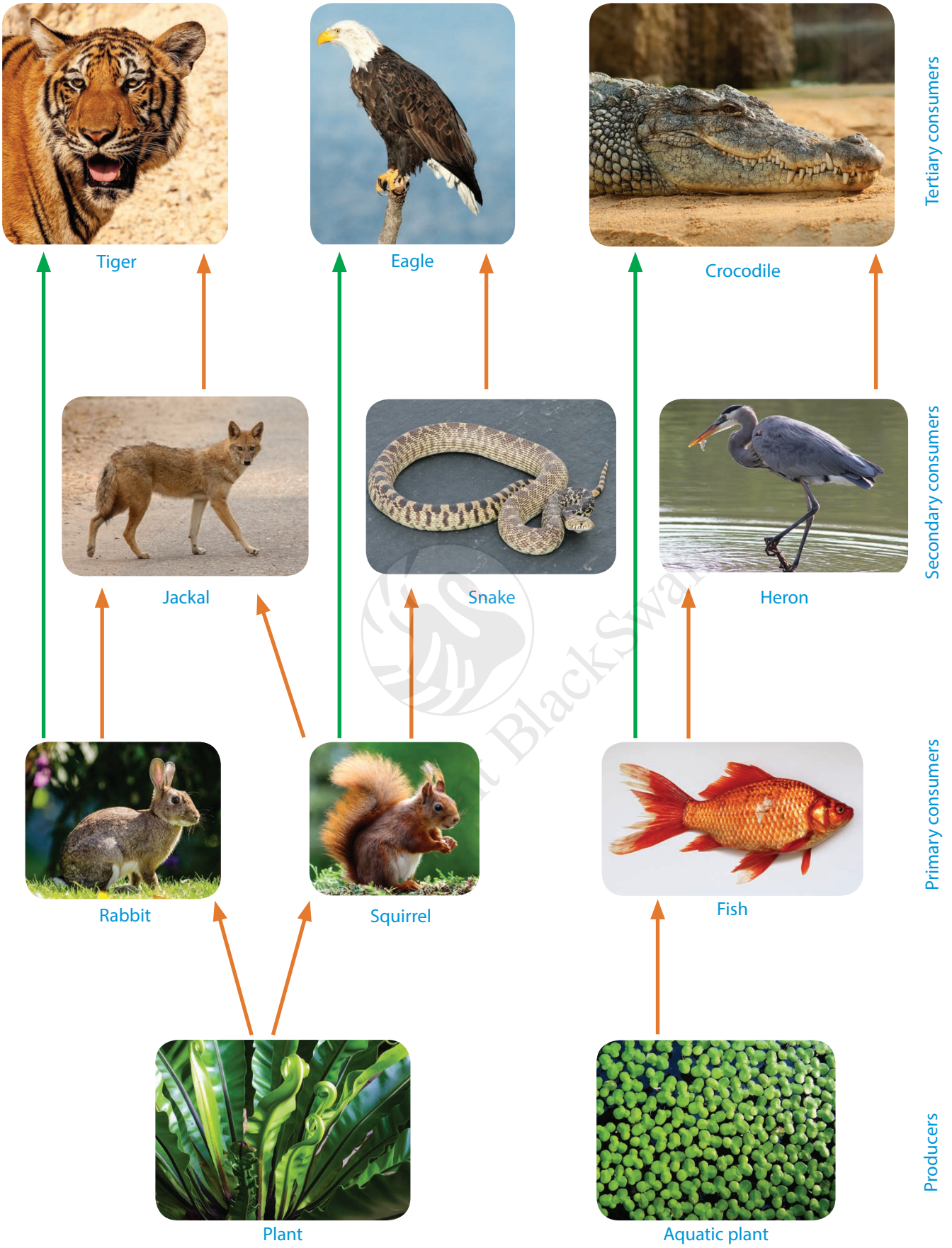



**Fig. 18.6** An example of a food web

available for eagles and snakes. Their population will also increase. They will eat more and more rats. This will cause the rat population to reduce. Once this happens, the food available for snakes and eagles will reduce and their population will again reduce.

## IMPORTANCE OF FORESTS

- Forests provide food and shelter for animals. We know that all animals depend directly or indirectly on plants for food. Monkeys and other animals live on trees, birds make nests on trees and several insects find shelter among plants.
- Forests provide oxygen. Plants and trees release oxygen as a by-product during photosynthesis. That is why forests are called the lungs of the Earth.
- Forests absorb carbon dioxide from the air during photosynthesis. This helps lower the level of carbon dioxide in the air.
- Forests cool the atmosphere because of transpiration. Transpiration also helps to increase humidity in the air. This helps in the formation of clouds which leads to increased rainfall.
- Forests prevent soil erosion because roots of plants and trees hold the soil and prevent it from being eroded by water or wind.
- Forests help to recharge groundwater as plants slow down the flow of rainwater and thus help in the percolation of rainwater into the soil. This helps to raise the water table.
- Forests provide many useful products. We get timber, medicines from neem, cinchona and foxglove, wood pulp for making paper, latex for making rubber, resin, gum, oils and so on from forests.

## CONSERVATION OF FORESTS

We have seen how important forests are for all living things. Unfortunately about 80% of the Earth's forest cover has already been destroyed. Forest areas have been cleared to make more land for building roads, houses, farms, factories and so on. Trees in the forests are also cut to obtain timber and fuel.

**Fig. 18.7** Foxglove

**Fig. 18.8** Latex extraction

**Fig. 18.9** Gum from a tree

***Deforestation*** *is the clearing of trees.*

The clearing of forests has not only destroyed plants and animals but also their homes. It has also interfered with the balance between oxygen and carbon dioxide. This has caused an imbalance in nature.

Deforestation also affects the climate as it interferes with the water cycle and the rainfall in a region. When there is reduced rainfall, the land becomes dry. This leads to plants and animals dying due to lack of water. It is therefore important to put an end to the destruction of our forests and try to reverse this loss through forest conservation.

We should protect forest resources by the following actions.

- Controlling the cutting of trees in forests
- Planting trees (afforestation) to cover vast areas of land
- Preventing overgrazing by cattle, sheep, goats and other animals
- Preventing forest fires that are not natural
- Avoiding activities that lead to soil erosion like unnecessary construction
- Establishing **national parks** and **wildlife sanctuaries**

**Fig. 18.10** Deforestation

**Fig. 18.11** Forest fire

## Case Study

### Sendenyu Community Reserve

In the 1990s, the village of Sendenyu in Nagaland decided to take action to deal with the water crisis, and lack of wildlife around their village. In the year 2000, the village council declared 16 square kilometres as the village's community biodiversity reserve. This land was contributed by the members of the community themselves, after much convincing. Hunting, fishing and all agricultural activities are banned in this reserve. So is collecting vegetables

and other forest produce. Villagers are not allowed to enter the reserve without permission. Guards patrol the area and inform everyone of these rules.

Most of the work connected with the reserve is done by volunteering. The village council has also started discouraging shift farming and promoting permanent terrace farming. Today, the reserve is spread over 22 square kilometres. This community-conserved area shows how the actions of a community can help restore nature.

**Science TIDBIT**

It is estimated that roughly one in five plant species is threatened with extinction. The Ebony tree (Karnataka), Indian mallow (Tamil Nadu), Malabar lily (Tamil Nadu), Pygmy water lily (Jammu and Kashmir) and the Assam catkin yew (Arunachal Pradesh) are examples of some plants in India that are threatened or endangered.

## Looking Back

Understanding

**Say whether the statements are true or false.**

1. A food chain is formed by linking up many food webs.
2. Food webs help to keep a population of an organism under control.
3. Forests take out oxygen from the air and add carbon dioxide.
4. Afforestation helps to save forests.

## Assess Yourself

**Mark ✓ if you have understood the concept.**

- A forest is large area of land covered with trees, shrubs and other vegetation.
- A rainforest has four layers—the overstorey or the emergent layer, the canopy, the understorey and the forest floor.
- Plants are producers or autotrophs as they can make their own food.
- Animals are consumers or heterotrophs as they depend on plants for food since they are unable to make their own food.
- Herbivores are primary consumers and carnivores are secondary consumers. Omnivores and scavengers may be primary or secondary consumers.
- Decomposers are organisms that help to break down the dead bodies of plants and animals into nutrients that can be used by plants.
- Plants depend on animals for pollination, seed dispersal and nutrients.
- A food chain is a sequence of organisms that are each dependent on the previous organism for food.

- A food web consists of several interlinked food chains in a habitat.
- Forests provide food, shelter and oxygen, absorb carbon dioxide, cool the atmosphere, prevent soil erosion, recharge groundwater and provide useful products.
- Cutting down trees is called deforestation while planting trees is called afforestation.
- Forest can be conserved by controlled harvesting of trees, afforestation, prevention of overgrazing, protection from fire and the creation of sanctuaries.

*For self assessment*

# Exercises

**Remembering/Understanding/Applying**

## Multiple choice questions

### A. Choose the correct option.

1. The tallest layer in a forest is the _____.
   a) canopy b) understorey
   c) overstorey d) forest floor

2. The canopy is formed of _____.
   a) bushes and herbs b) grass
   c) the crowns of trees d) decomposers

3. The understorey has _____.
   a) an abundance of light and wind
   b) an abundance of light but no wind
   c) very little light and wind
   d) very little light but strong winds

4. Which statements are **not** true about the forest floor?
   (i) Almost no sunlight reaches here.
   (ii) Very few bushes and herbs grow here.
   (iii) The plants have huge dark green leaves to trap solar energy.
   (iv) Eagles and hawks are found in this layer.
   a) (i) and (ii) b) (ii) and (iii)
   c) (iii) and (iv) d) (i) and (iv)

5. Which of the following are producers?
   a) plants b) mushrooms
   c) herbivores d) carnivores

6. Which of these are **not** decomposers?
   (i) fungi (ii) bacteria
   (iii) crows (iv) vultures
   a) (i) and (ii) b) (ii) and (iii)
   c) (iii) and (iv) d) (i) and (iv)

7. When the population of a prey increases, the population of the predator first _____.
   a) increases b) decreases
   c) remains the same d) becomes zero

8. Plants depend on animals for _____.
   (i) pollination (ii) sunlight
   (iii) seed dispersal (iv) shelter
   a) (i) and (ii) b) (ii) and (iii)
   c) (iii) and (iv) d) (i) and (iii)

9. Which of the following does a forest **not** do?

a) supply oxygen b) supply carbon dioxide
c) cool the air d) prevent soil erosion

10. Which of these do **not** help forests?

(i) national parks
(ii) deforestation
(iii) overgrazing by cattle
(iv) afforestation

a) (i) and (ii) b) (ii) and (iii)
c) (iii) and (iv) d) (i) and (iv)

## Objective-type questions

### B. Fill in the blanks.

1. The _____ layer receives maximum sunlight in a forest.
2. Carnivores are _____ consumers.
3. _____ are animals that depend on plants for food.
4. A food _____ is made up of several connected food chains.
5. Decomposers add _____ to the soil.
6. Forests are called 'green lungs' because they supply _____ to the atmosphere.
7. Forests release _____ into air. This helps in cloud formation.
8. Cutting down forests will cause extensive soil _____.

### C. Say whether the statements are true or false.

1. Forests can exist in the temperate region.
2. The humidity in the overstorey of a forest is very high.
3. Heterotrophs can make their own food.
4. Scavengers mostly hunt and consume live prey.
5. In a food chain, the deer is the predator and lion is its prey.
6. The ultimate source of energy flowing through a food web is grass.
7. Forests warm the air during photosynthesis.
8. In afforestation, many trees are cut down for timber.

## Short answer questions

### D. Answer in brief.

1. What is a forest?
2. Under what conditions are tropical rainforests usually found?
3. Why is the understorey of a forest always in constant shade?
4. What are scavengers?
5. What is a food chain?
6. Explain what is meant by predator and prey.
7. How do forests increase rainfall?
8. When forests are cut, soil erosion occurs. Why?
9. Name four products that we get from forests.

## Long answer questions

### E. Answer in detail.

1. Describe the different layers of a rainforest.
2. How are animals classified based on the food they eat?
3. What are decomposers? Explain the role that they play in a forest.
4. In what ways are plants dependent on animals?
5. Explain a food web with an example.
6. How are the populations of organisms in the environment kept under control?
7. Why are forests considered a very important natural resource?
8. What are the reasons for deforestation?
9. List four methods that can be used for preserving forests.

## Higher-order Thinking Skills

1. Why is it necessary to have carnivores in a forest?
2. In what way is energy flow different from nutrient flow in a food chain? (*Hint*: Does energy return to the Sun from the decomposer?)

## Life Skills

**Forest saving tips**

Although we may not interact with the forest on a daily basis, we can still help protect forests by following some steps.

- Go paperless wherever possible. Send e-mails instead of faxes and letters wherever possible.
- Print only when necessary. Always print on both sides.
- Help plant trees to restore ecosystems.
- While hiking and camping, follow nature trails as closely as possible to avoid damaging the forest.
- Do not throw the plastic and garbage in forest areas.

## Enrichment Activities

**I. Research project** Applying

Make a list of the national parks and wildlife sanctuaries in India and plot them on a map. Find out details of the important plants and animals that are found in those parks or sanctuaries.

**II. Research project** Applying

Find out about the famous Chipko Movement, which was initiated by Sunderlal Bahuguna to save forests from being cut down. Make a presentation on the movement and its achievements.

**III. Visit and assess** Analysing

Take a walk along a nature trail. The rule is to observe and not to disturb! Make a note of the kinds of organisms that live there—burrowing animals, those that live on trees, those that live in the shade of tall trees, those that live in leaf litter and so on.
What is the vegetation like? Is there any difference in the temperature and the humidity in the forest and in the city? Tabulate your results.

**IV. Meet and discuss** Analysing

More than 10 square kilometres of rainforests disappear every minute. What changes can you make in your lifestyle which can help save trees from being indiscriminately cut? Share your views in class.

## Be Inspired!

### Jadav Payeng

Jadav Payeng is known as the 'Forest man of Assam'. He has single-handedly grown a forest on a 1360 acre island in the middle of the Brahmaputra. It is called Molai's Forest and is home to different types of trees, birds, reptiles, elephants and endangered animals, like tigers and one-horned rhinoceroses. For almost 30 years, Payeng planted seeds and saplings in the island and nurtured them without any help. In 2015, Jadav Payeng was honoured with the Padma Shri by the Government of India for his achievement.

## Internet Links

http://www.indianetzone.com/2/indian_forests.htm

http://forestry.about.com/library/tree/blwrldx.htm

http://nationalgeographic.org/encyclopedia/rain-forest/

OUR HERITAGE

### Medicinal Plants

We get many medicines from plants. Ginger is used to increase the formation of saliva, gastric juice and bile which in turn help in digestion of food. The neem leaf has antifungal and antibacterial functions. It is therefore used to treat fungal and bacterial infections. Turmeric is used to treat inflammations where a part of the body may become swollen, painful and red.

# NEW SCIENCEAHEAD
CLASS 7

Orient BlackSwan

The National Education Policy (NEP) 2020 emphasises certain crucial parameters based on content and pedagogy. The New ScienceAhead series provides a rich range of exercises and activities for each of the parameters. Here is a quick reference guide to some of the examples in this book.

The New ScienceAhead series is mapped perfectly to the National Education Policy 2020.

## 21st Century Skills

A broad set of skills, knowledge, work habits and character traits that are important for success in the 21st century

| The NEP parameters | Features | Page nos. |
|---|---|---|
| The 4Cs | | |
| Communication | Enrichment Activities | 68 |
| Collaboration | Enrichment Activities | 208 |
| Critical Thinking | Higher Order Thinking Skills | 9 |
| Creativity | Enrichment Activities | 40 |
| Social and Emotional Learning | Enrichment Activities | 117 |
| | Life Skills | 208 |
| Multiple Intelligences | Enrichment Activities | 51 |
| | Enrichment Activities | 231 |

## Experiential/ Constructivist Approach

Learners construct their knowledge, based on what they already know, through experience or by doing and reflection

| The NEP parameters | Features | Page nos. |
|---|---|---|
| Experiential/Constructivist Approach | Activity | 12 |
| | Activity | 42 |
| | Activity | 163 |

## Integrated Approach

An approach to teaching and learning that works by connecting knowledge and skills across the curriculum, by bringing real life examples to the classroom

| The NEP parameters | Features | Page nos. |
|---|---|---|
| Subject Integration | Enrichment Activities (Language) | 92 |
| | Enrichment Activities (Language) | 231 |
| Art Integration | Enrichment Activities | 20 |
| | Enrichment Activities | 106 |
| Health and Wellness | Life Skills | 19–20 |
| | Science Tidbit | 71 |
| | Text | 227–228 |

## Sustainable Development Goals

A framework of 17 global goals designed to be a blueprint to achieve a better and more sustainable future for all

| The NEP parameters | Features | Page nos. |
|---|---|---|
| Values | Life Skills | 92 |
| | Be Inspired! | 106 |
| | Be Inspired! | 209 |
| Life Skills | Life Skills | 67 |
| | Life Skills | 196 |

| The NEP parameters | Features | Page nos. |
|---|---|---|
| Sustainable Development Goals | Text | 203–204 |
| | Text | 227–228 |

| The NEP parameters | Features | Page nos. |
|---|---|---|
| Know more about India | Our Heritage | 68 |
| | Our Heritage | 117 |
| | Our Heritage | 209 |

## India Knowledge

A strong focus on ancient knowledge from India, traditional values, modern developments and future aspirations

## Digital Integration

The use of digital tools to enhance and support the teaching–learning process

### ICT/Digital resources

Orient BlackSwan Smart App - MCQ-based Quizzes for Practice and Revision

Teacher's Smart Book - Flipbook, Audio, Animations, Presentations, Picture Galleries, Interactive Activities, Embedded Questions, Worksheets with Answer Key, Games

### Teacher Empowerment

Teachers' Resource Pack - Lesson Plans with Enrichment Activities, Question Bank with Answer Key, Worksheets with Answer Key, Periodic Tests with Answer, Sample Papers for Assessment with Answers, Students' Book Answer Key

Teachers' Portal - Lesson Plans, Question Bank with Answer Key, Worksheets, Sample Assessment, Answer Key (for Exercises and Assessment Papers in the Students' Book; Worksheets and Assessment Papers in the TRP), Periodic Tests with Answer Key



Follow us at
OrientBlackSwanSchools

3-6-752 Himayatnagar, Hyderabad 500 029, Telangana, INDIA
customercare@orientblackswan.com | www.orientblackswan.com