New Oxford Primary Science
Teaching Guide
Level 3
Second Edition
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Introduction

This Teaching Guide has been written with the purpose of assisting the teacher to transmit concepts clearly, correctly and effectively in a limited period of time. Ideas to begin, build and conclude a lesson have been given; yet, these are not the only or best way to teach: a good teacher comes up with new ideas and strategies.

When teaching science, or any other subject, to young pupils, one must never forget that at this stage they need concrete examples in order to understand abstract concepts. For example, during a lesson on air, if they do not actually experience the air in a balloon being released, causing it to deflate, they will never truly understand the concept of air since they cannot hold or see it.

A successful teacher uses a number of strategies in the classroom:

- **Posing questions and inviting pupils’ questions:**
  In order to keep the pupils engaged in the lesson, ask short, relevant questions. Write a summary of different responses on the board and then summarize them. For example:

  *When you look in the mirror, what do you see?*

  Expected responses are:

  I see myself.

  I see my body.

  I see my face, eyes, nose…

  Write the responses on the board and then sum up, e.g. We see our body, face, eyes, nose, etc. in the mirror. Before beginning a lesson, tell the class the topic and ask them to think of any questions that come to their minds regarding it.

- **Conducting interactive demonstration**
  The teacher should be well aware of the purpose of the demonstration and should have conducted it beforehand to ensure that the results are as desired. Ask a question and have the pupils predict the outcome of the demonstration. They could respond before or after discussion with another child. For example:

  *Which do you think will sink in water—an egg or an egg shell?*

  There could be various responses to this. Demonstrate practically, and then conduct a class discussion. Conclude the discussion by summarizing all the ideas shared.
• **Using cooperative learning in the classroom**

Two examples of cooperative learning strategies are described below:

**Think-Pair-Share**

Begin by posing a question to the class that requires the pupils to think critically.

a. **Think**

Give a specified amount of time for the pupils to think alone about the answer to the question. Pupils would record their own answers.

b. **Pair**

Pupils pair up with a partner to discuss the question, listen to, and expand on each other’s ideas.

c. **Share**

Pupils share their answers with the whole class.

**Jigsaw**

Research shows that pupils learn best when they teach others what they have learned. Jigsaw helps pupils learn and teach one another. It has four steps:

1. Form cooperative groups called **HOME** groups with each group member being given different material to read or learn. For example, the first group member is given page 1 of an assigned text, the second member page 2, etc.

2. **EXPERT** groups are formed of groups of pupils with the same assigned material. This group must study the material together and plan ways to teach the material to their **HOME** group members and check for understanding.

3. Pupils return to their **HOME** groups and take turns teaching their **HOME** group members the material they were assigned and are now experts on. The goal is that every member of the group should master all the material presented.

4. Check how well the pupils have worked together by giving a quiz or asking them to make a presentation.

**How to do Circus Format Activity**

This activity usually requires two consecutive periods.

Arrange some tables and chairs (according to the number of pupils) in the class. Each table is a ‘station’.

Activities must relate to the current topic. Instructions must be written along with the activity. If the pupils are young, give them verbal instructions. Remind them to handle things with care and to leave the station as soon as the bell rings.
**Grouping the class**
Arrange the pupils into five groups according to the strength of your class.

Allocate time, (usually five minutes).
- Group 1 will sit at station 1.
- Group 2 will sit at station 2.
- Group 3 will sit at station 3.
- Group 4 will sit at station 4.
- Group 5 will sit at station 5.

Pupils will perform the activities and record their observations in their notebooks. After five minutes, ring the bell as a signal for groups to move to the next station.
- Group 1 will move to station 2.
- Group 2 will move to station 3.
- Group 3 will move to station 4.
- Group 4 will move to station 5.
- Group 5 will move to station 1.

In this way, all the pupils will perform all the activities.

At the end of the activity, they will give a presentation on what they have learnt. Give them ten minutes to prepare their presentations.

**Presentations**
Group 1 will give a presentation on station 1 activity.

Group 2 will give a presentation on station 2 activity, and so on.

The teacher can provide input where necessary, by prompting words, etc.

The primary objective of this entire process is that the pupils are actively involved in the learning process rather than being ‘lectured’. **In all cases, do not begin to read the lesson from the textbook before you begin a discussion leading up to it. Reading the text comes after the discussion and brainstorming has taken place.**

**Using the photocopy masters**
The worksheets are a reinforcement of the lesson and can be used for homework or classwork.
Unit 1

Topic: The five senses

Teaching objectives:
• To familiarize the pupils with the five senses and how they work
• To introduce the vocabulary relevant to the five senses
• To explain briefly the working of each sense organ

Key vocabulary: retina, vibrate, cochlea, receptors

Lesson 1: 40 min

Introduction: 5 min
• This is the introductory unit and lays the foundation for work relating to the study of the five senses.
  Confirm that the pupils can identify the five senses and their uses. Eyes …what do we do with our eyes? Emphasize that the most effective way to receive information is to use all our senses together. While one sense can compensate for another (a blind person might have a better sense of touch), we cannot function properly unless we receive information through all our five senses. Each function is important in its own right, but has limitations (while a blind person might be able to appreciate the contours of an object through touch, they cannot appreciate its colours).

Main teaching: 30 min
• Lead a class discussion on what life would be like without the sense organs. What would it be like if you couldn’t see? The sense organs help us to see, hear, taste, smell, and feel. Both people and animals learn about the world through their senses, which is why the senses are so important. For example, the world would be dark without the sense of sight. The world would be silent without the sense of hearing, and we would not be able to smell the fragrance of a flower even if we could pick it. Wouldn’t we miss out on a great deal in life?

Sight
• If possible, bring a model of an eye to the class. If not, display a large picture of the internal structure of the eye on the board. You can make an enlarged photocopy of the diagram shown on page 3 of the textbook.
• Remind the pupils that the eye is able to see in bright or dim light, but it cannot see objects when light is absent.

• Explain the anatomy of the eye: The eyes lie in the sockets of the skull, and are shaped like balls. It is because of your eyes that you can see the beauty of the world. The eye is the most complicated organ of the body. Light enters the eye through a small opening called the pupil, and falls on the back surface of the eyeball, known as the retina. Here, the image that is formed is upside down. It is the brain's job to flip the image over, and then tell you what you are looking at.

• Explain that the eye can be compared to a camera. They both gather light and change it into a picture that the brain can understand. Like a camera, the eye too has a lens. Point to the retina in the diagram on page 3. The retina produces an image, just as the camera uses film.

• The cornea is the transparent front part of the eye. Since it is transparent, it is able to admit light. Light waves from an object (such as the tree in the picture at the bottom of page 3) enter the eye through the cornea. You can draw the following on the board as a short, simple explanation.

![Light enters the cornea. It then enters the pupil. It then passes through the lens. The image is turned backwards and then upside-down. The brain turns it the right way up.](image)

• Spend some time discussing how one can look after ones eyes and how defects of the eyes can be corrected by wearing spectacles.

Hearing
• Lead a discussion about hearing:

Imagine it is morning. You are just beginning to wake up. The alarm clock rings. Your mother or father call you to breakfast. The phone rings, the television is on. In school, you can hear your friends talking and the teacher speaking in class. Our world is full of sounds: loud or soft, pleasant or unpleasant. Our ears are the organs that help us to hear these sounds. Touch your ears. What do you think is inside them? When an object produces a sound, the outer ear collects the sound and sends vibrations speeding into the ear.
Display a model of the internal structure of the human ear. If this is not available, draw a diagram of the internal ear on a sheet of card and display it on the board. Explain that the human ear has three parts:

**a) Outer ear**
*The outer ear continues as the ear canal. It catches sound waves and directs them to the eardrum.*

**b) Middle ear**
*There are three tiny bones in the middle ear called the hammer, anvil, and stirrup which transmit sound vibrations to each other.*

\[ \text{eardrum} \rightarrow \text{hammer} \rightarrow \text{anvil} \rightarrow \text{stirrup} \rightarrow \text{inner ear} \]

**c) Inner ear**
*The cochlea, in the inner ear, contains fluid which moves and bends hairs on the outside of cells. There are thousands of tiny hair cells in each ear. Some of these hair cells create signals which are sent to the brain. The brain then works out what we are hearing.*

- Lead a discussion on why it is necessary to take care of our ears. *Why do old people lose their ability to hear sounds? What other function do our ears have? They help us keep our balance when we move. Any damage to the ear parts could lead to ear problems and hearing loss (deafness).*
- The pupils can then do the exercises on pages 7 and 8.

**Wind up:** 5 min
- Ensure that the pupils have understood the functions and importance of the eyes and ears.

**Lesson 2: 40 min**

**Introduction: 5 min**
- Do a very quick recap of the previous lesson.
- The senses of smell, touch and taste are as important as the other senses. Not only do they make us aware of everything around us, but they also help protect us from danger.

**Main teaching: 30 min**

**Smell**
- Talk about the nostrils, the importance of the small hairs in the nose; that the nose is built to smell, moisten, and filter the air we breathe because it contains a lot of dust and dirt.
- Smell is actually ‘odour particles’ that are recognized by special structures in the nostrils, which then send messages and signals to the brain. The brain recognizes the smell, e.g. sweet smelling flowers or something burning. *Did you know that a dog has a better sense of smell than humans? This is why it can sniff out dangerous things like bombs.*

**Touch**
- *As the organ of touch is the skin, our sense of touch is found all over the body because the entire body is covered by skin. The skin is made up of several layers. These layers have thousands of tiny blood vessels and nerves, called receptors, which transmit information about the things the body comes into contact with. They send a message to the brain, which is where the feeling is recorded.*
• Ask: Do you have a pet cat at home? Observe the cat carefully. Have you noticed that the cat has long whiskers that are sensitive to touch, just like the skin of our fingers?

Taste
• Ask the pupils questions related to the sense of taste: What did you have for breakfast? What do you like to eat at lunch time? Which flavour of ice cream do you like? Which organ do we use to detect flavours? Where is this organ located? You need your tongue to chew, swallow, talk and taste. Is your tongue smooth? The surface of the tongue is not smooth. It is covered by tiny bumps. It also contains thousands of tiny taste buds, which are found in special areas on the tongue.
• Draw a tongue on the board. Identify the four main areas of taste. Explain: When you put food into your mouth, it touches the taste buds on your tongue. These send a message to your brain. Your brain then tells you which flavour you are tasting.
• Discuss the other important function of the tongue: Do you know about another important function of your tongue? It helps you to talk. The muscles in the back of the tongue help us make certain sounds, like the letters ‘k’ and ‘g’.
• Recap all the main points, and ask:
  What do we call a person who cannot speak? What important job does the tongue do, other than helping us taste our food? How many types of taste are there? Have you ever had a sore tongue? Were you able to taste your food properly then?

Wind up: 5 min
• Emphasize the important roles that the five senses play in helping us make sense of the world around us.

EXERCISE (pages 7 and 8)

A 1. People protect their eye sight by:
   a) using dark glasses or wearing hats when going out in the sun
   b) having their eyes checked regularly by an eye doctor
   c) eating green, leafy vegetables and carrots
   d) not reading while lying down
   e) reading in plenty of light
   f) watching TV from a suitable distance
   g) having enough sleep and rest
   h) not sitting at the computer for a long time

2. The image of an object seen by the eye is corrected by the brain.

3. The ears perform two important functions:
   a) They help us to hear.
   b) They maintain our balance.
4. It is dangerous to put any long, sharp object into the ear canal, because it can damage the eardrum.
5. Almost everything produces odour particles, but the human nose does not detect every smell.
6. There are fine hairs in the nostrils to filter all kinds of things trying to enter the nose.
7. When you have a cold your nose is blocked with mucus, so your sense of smell becomes weak.
8. The sense of smell is useful in many ways:
   • We get pleasure from smelling flowers and perfumes.
   • It helps us to identify pollution.
   • It alerts us to dangers, for example, fire and gas leaks.
   • It helps us to savour our food while it is cooking.
9. Our taste buds send a message to our brain, to tell us which flavours we are tasting.
10. The different kinds of taste are sweet, salty, sour, and bitter.
11. Some people can do all sorts of things with their tongue—twist it round, roll it back, curl it, and even touch their nose with it.
12. The top layer of the skin is alive.
13. Receptors are tiny blood vessels and nerves. They relay information to the brain about the things our body comes into contact with.

B
1. flavours
2. skull
3. brain
4. a) sight, hearing, taste, touch, and smell

C Answers will vary.

**ACTIVITY (pages 9 and 10)**

1. Explain that the pupil of the eye gets very small in bright light, and bigger in dim light.
2. Eyes are very delicate organs. They need to be looked after very carefully. If pupils cannot see the words written on the board, or the writing looks blurry, they need to inform their parents and teachers.
3. The pupils will enjoy making the visors. Emphasize the importance of protecting the eyes from the glare of sunlight.
4. The pupils can include the following:
   dog, fox, rabbit, cat, wolf, etc.

For questions 5 to 11 answers will vary.
Answers to Worksheet Unit 1

Across
1. Tiny blood vessels present in the skin that give information about the objects that the body touches
2. A fleshy muscle in the mouth
3. It corrects the upside-down image that the eye receives

Down
4. Sound waves
5. They help keep the eye clean by protecting it from dust and dirt
6. The layer at the back surface of the eye ball on which light rays fall
Unit 2
Topic: Food chains

Teaching objectives:
• To explain the four main parts of the food chain
• To emphasize that a food chain is the transfer of food energy in organisms
• To explain that all food chains begin with plants, and that arrows present in a food chain represent energy transfer and feeding relationships

Key vocabulary: food chain, photosynthesis, herbivore, carnivore, omnivore, decomposer

Lesson 1: 40 min

Introduction: 5 min
• Recall the definitions of herbivore, carnivore, and omnivore. Show the pupils flashcards of a variety of animals, and ask them to classify these under the three headings. Make three columns on the board to write their responses. If possible, collect pictures of animals that show them eating. You can also draw pictures of the main food eaten besides each heading; herbivore, carnivore, omnivore.

Main teaching: 30 min
• Write the following words on the board: bird, caterpillar, leaves, cat
  Ask the pupils to link the words based on their feeding habits—the caterpillar feeds on leaves, the bird feeds on the caterpillars, and the cat feeds on bird.

Teacher input:
• All living things need food for the energy that passes from one plant or animal to another. Each time an animal is eaten, some of its energy is passed on to the animal that eats it. This relationship, between different organisms, is called a food chain. Food passes from plants to animals in a series of steps. Each organism in a food chain is called a link. A food chain always begins with plants, which are called producers as they make their own food with the help of sunlight. Even though we do not eat grass, it is important for us because it is the main food of the cows and goats that we eat. Living
things that cannot produce their own food are called consumers. They include herbivores, carnivores, omnivores, and scavengers. Scavengers are those animals that feed on dead matter. Some birds, like crow and vulture, and insects are scavengers and decomposers.

- Ask the pupils to turn to page 12 of their books. Observe the photograph of the vultures feeding on a dead animal. Lead a discussion about how fish and birds eat. *How do they swallow their food? Do they have teeth?* Encourage the pupils to observe water-birds catching fish, and note how they straighten their heads and necks to help the fish pass down to their stomachs. *Flesh-eating fish have teeth; some have no teeth, but bones in their throats grind their food. Some vegetarian fish have teeth so that they can scrape vegetation off the rocks.*

**Wind up:** 5 min
- Conclude the lesson by summarizing the concepts that were discussed. *Animals are classified as herbivores, carnivores, and omnivores.*
  
  They depend on each other for food. *Green plants make their own food with the help of sunlight. Herbivores get their energy from the plants they eat. They in turn, are eaten by carnivores. These carnivores may be eaten by larger carnivores.*

  Play a quick game: *Which creature does not fit into each group?*
  
  carnivore – cat, tiger, sheep, dog
  herbivore – buffalo, deer, horse, lion
  omnivore – humans, bear, crow, chicken

**Lesson 2: 40 min**

**Introduction:** 5 min
- After a quick recap of the previous session, ask the pupils to find the meaning of the word ‘decomposer’ from the dictionary. After sharing the definition, write its main points on the board.

**Main teaching:** 30 min
- *Decomposers, for example, ants, flies, fungi, and bacteria, are living things that break up the bodies of dead animals and plants. Fungi and bacteria are very tiny organisms that can only be seen with a special microscope. Decomposers are vital as they recycle nutrients, so that they can be reused by producers.*

  - Discuss what would happen if there were no decomposers. Referring to page 13 of the book, ask the pupils to study the given chain carefully. *What would happen if any one of the animals was removed from the food chain?* Lead a discussion on the importance of each organism in a food chain—*each organism passes energy from one living thing to another.*

  - Write the names of as many animals as you can on the board. Ask the pupils to select some of the animals and construct a food chain of their own. Randomly, call on some of the pupils to share their constructed food chains with the class. Ask them to identify the producer and consumers in their food chains.

**Wind up:** 5 min
- Summarize the lesson:
  
  a) *Plants and animals living near each other often depend on each other.*
b) What happens to one plant or animal often affects others in the area.

c) All animals depend upon plants directly or indirectly for their food.

d) All food chains begin with green plants.

e) Food chains are the transfer of energy from one living thing to another:

\[
\text{cabbage} \rightarrow \text{snail} \rightarrow \text{small bird} \rightarrow \text{hawk}
\]

The cabbage is eaten by a snail. The snail is eaten by a small bird, for example, a thrush. The thrush is hunted and eaten by a hawk.

An interactive session on the topic is available on the following website, which would greatly facilitate the pupils’ understanding of this concept:

http://www.sheppardsoftware.com/content/animals/kidscorner/games/producersconsumersgame.htm

**EXERCISE** *(page 14)*

1. a) bodies of dead animals and plants  
   b) their own food  
   c) produce their own food  
   d) how living things by their food, depend upon each other

2. The cabbage is a producer, while the rest are consumers.

3. Answers will vary.

4. a) grass \(\rightarrow\) deer \(\rightarrow\) lion

5. caterpillar

**ACTIVITY** *(page 14)*

1. Grass, roots and leaves are at the bottom of the food chain.

2. The animals that feed on that species will no longer be able to find food, and will die and become extinct.

**Answers to Worksheet Unit 2**
Unit 3
Topic: Insects

Teaching objectives:
• To examine the body and characteristics of insects, the most populous of all species of animals
• To compare harmful and useful insects

Key vocabulary: species, thorax, antenna, chitin, social insect, colony
(pest – harmful insect)
(social insect – insect that lives as part of a group called a colony)

Lesson 1: 40 min

Introduction: 5 min
• Take the class to the bio-lab to see a real specimen of an insect. Ask them to observe the specimen carefully and then to draw it in their exercise books, and name other insects they are familiar with. Write their responses on the board, even if they name spiders, slugs, or scorpions as insects.

Main teaching: 30 min
• Advance preparation: You will need scissors, sheets of card, markers, masking tape.
  See page 16 of the textbook. Prepare the body parts of an insect by cutting them out of the sheets of card. Randomly, choose the pupils to stick the body parts on the board to create a typical insect. Lead a discussion about an insect’s body parts, wings, legs and antennae.
• There are more than one million different kinds of insect in the world. Insects get their name because their bodies are divided into sections – a head, a thorax, and an abdomen. Insects do not have bones. Their bodies are supported and protected by a hard covering called chitin.
• Lead a discussion on the location of insects’ eyes, legs, and feelers or antennae. Insects use the antennae to detect smells, vibrations and sounds. Antennae or feelers also help the insects to find their way.
• Ask the pupils to open their books at page 15. Count the number of legs of the spider in the middle of the collage. Does it have antennae and wings? Spiders, scorpions, slugs, and snails are not insects because they do not have six legs, nor do they have antennae or wings. Also, their bodies are only divided into two parts. Worms, ticks and centipedes are not insects either.

Wind up: 5 min
• Summarize the lesson by asking the following:
  a) Name the three main parts of an insect.
  b) Name some creatures that are as small as an insect but are not insects.
  c) How do the antennae help an insect?
Lesson 2: 40 min

Introduction: 5 min
• Remind the pupils that insects can be both useful and harmful to human beings. Does your head sometimes itch so that you want to scratch it? Lice are tiny insects that live in the hair. They irritate the skin and make it itchy. Has anyone in the class ever been bitten or stung by any insect?
• Some insects live together in groups and are called social insects.
• Make two columns on the board headed ‘Useful insects’ and ‘Harmful insects’. Ask the pupils to name insects for each heading. Write their responses on the board under the respective headings.

Main teaching: 30 min
• Lead a discussion about diseases caused by insects. Which diseases are caused through mosquito bites? Why should food be covered properly? When a fly sits on food, it transfers the germs that are present on its hairy legs. If that food is then eaten by humans, there is a chance that they might become sick and suffer from diseases like diarrhoea and vomiting. Termites are also pests because they eat wood.
• Show the pupils the picture of a locust on page 17 of the textbook. One insect that destroys plants and crops is the locust. Such insects are called pests.
• Discuss social insects such as bees. If possible, bring in an old beehive so that the pupils can see how the honeybees work hard to make their homes. Which insect is responsible for providing us with honey and pollinates the flowers? Bees are social insects that live together in groups called colonies. In a colony, there can be hundreds or even thousands of insects living together. Honeybees work together in a disciplined manner and carry out the duties assigned to them efficiently. Similarly, ants always march along in a straight line, leaving a scent trail behind for the other ants to follow. We can learn from these insects how we should be disciplined while doing our work.
• Insects play an important role in the environment. Like humans, they do a variety of jobs. They make food, they make silk yarn, and they recycle waste, such as dead leaves.

Wind up: 5 min
• Summarize the lesson by discussing the following points:
  There are more than a million different kinds of insects in the world.
  Insects’ bodies are divided into three sections (head, thorax, abdomen).
  Their bodies are covered by a hard covering known as chitin.
  They have three pairs of legs attached to their abdomens.
  They have a pair of antennae or feelers, which help them find their way and detect smells and sounds.
  Some insects are useful, while others are harmful.
EXERCISE (page 18)

1. The honeybee is of use to us as it provides us with honey, and helps to pollinate flowers. The locust is a pest. It destroys plants and crops.

2. An insect has three pairs of legs, while a bird has a single pair of legs. Insects do not have bones, while a bird has light and hollow bones that allow it to fly.

3. An insect’s body is supported and protected by a hard covering called chitin.

4. a) kinds  b) wings  c) colony  
d) locusts  e) diseases  f) bones, chitin

5. | What all insects have | Some common insects | Insects causing harm | Insect diet |
--- | --- | --- | --- |
• three body parts; head, thorax and abdomen  
• six legs  
• do not have bones | butterfly  
bees  
mosquito  
fly  
ant | fly  
mosquito  
termite  
locust  
lice | plant  
dirt  
other insects  
cloth, paper  
fruits |

ACTIVITY (page 19)

1. Explain to the pupils that ants live together in a colony, in which each ant has a specific job. Each colony has its own smell, and members of a colony will only follow the scent of their own colony. This is why we often see ants walking in single file.

2. Provide the pupils with the addresses of useful websites to help them put together the booklet.

3. 

| ant  dragonfly  bee  fly  beetle  grasshopper  butterfly  cockroach  cricket |
|---|---|---|---|---|---|---|---|---|
| G | X | C | O | C | K | R | O | A | C | H |
| R | N | L | F | D | X | G | P | L | G | D |
| A | V | S | C | R | I | C | K | E | T | R |
| S | X | L | O | A | M | A | N | T | C | E |
| S | E | M | A | G | G | J | Y | V | X | T |
| H | L | Y | D | O | R | F | J | C | G | T |
| O | J | K | D | N | F | L | Y | I | X | E |
| P | E | P | I | F | E | K | G | I | L | R |
| P | I | Q | U | L | E | R | E | E | N | F |
| E | E | Z | Q | V | E | H | L | V | F | L |
| R | T | I | Q | B | E | E | T | L | E | Y |
Unit 4
Topic: What plants produce

Teaching objectives:
• To identify the different parts of a plant, along with the function of each part
• To examine and discuss different types of vegetables that are actually different parts of a plant
• To explain the process of germination
• To explore the conditions required for the process of germination

Key vocabulary: reproduce, germinate, germination

Lesson 1: 80 min

Introduction: 5 min
• If your school has a garden, take the entire class into it, and show them the different parts of a plant. Alternatively, bring a potted plant into the classroom. Ask the pupils to observe the flowers, leaves, stem, and roots carefully. Encourage them to discuss among themselves the functions of the various parts of a plant.

Main teaching: 70 min
This method will be most effective if you can conduct the teaching over two consecutive periods.
• Divide the class into four groups. Ask each group to read the given reading material (page 16 of this guide). Ensure that each topic of the reading material is photocopied on a separate sheets of paper in advance. Allocate time for reading and presentation. The suggested time for reading is 15 minutes, and 5 minutes for each presentation.
• Spend some time with each group. Help them if they have any problems in understanding the text or in arranging the resources for their presentations.
  Group 1: Flowers – different types of flowers, some seeds (dry and soaked), stem with a bud, stem with a flower, tomato, green chillies, a fruit with one seed, a fruit with many seeds
  Group 2: Stem – sugar cane, celery, a long stem in a beaker of water with any food colouring (to show the upward movement of water)
  Group 3: Roots – root with root hairs, turnip, carrot, radish
  Group 4: Leaves – different types of leaves: spinach, cabbage, mint leaves, lettuce

Instructions:
Each group will give their presentation. Each group member should participate equally. Presentations should not exceed the given time. The teacher can provide input where necessary.
Bring the following things into the classroom and lead a class discussion:
ginger, broad beans and peas, potatoes, onions, cauliflower
Potatoes and ginger are tubers. They grow as underground stems, and can grow without seeds. Notice the eyes of the potatoes.
An onion is a bulb that grows from another bulb or from seeds.

Cauliflowers are flower buds. The white part of the flower, i.e. the vegetable, is surrounded by leaves.

Broad beans and peas are seeds that grow in pods above the ground.

- Vegetables can be classified or sorted according to the part of the plant from which they come. Draw the following table on the board.

<table>
<thead>
<tr>
<th>Part of the plant</th>
<th>Some examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>cabbage, spinach, lettuce</td>
</tr>
<tr>
<td>Fruits</td>
<td>tomato, cucumber, pumpkin</td>
</tr>
<tr>
<td>Seeds and pods</td>
<td>peas, runner, broad and French beans</td>
</tr>
<tr>
<td>Roots</td>
<td>carrot, beetroot, turnip, radish</td>
</tr>
<tr>
<td>Flowers</td>
<td>cauliflower, broccoli</td>
</tr>
<tr>
<td>Bulbs</td>
<td>onion</td>
</tr>
<tr>
<td>Tubers</td>
<td>potato, ginger, yam</td>
</tr>
<tr>
<td>Stems</td>
<td>celery, sugar cane</td>
</tr>
</tbody>
</table>

- Show the class some pictures of food plants. Alternatively, you can arrange a tray of vegetables and fruits. Ask the pupils to identify as many of the fruits and vegetables as they can. Discuss which ones are roots that grow under the ground, plants that grow upwards, or fruits that grow on trees.

- The pupils can be guided to sort the fruits and vegetables in different ways—by fruit or vegetable, by root or shoot, by colour, or by the parts of the plant.

**Wind up: 5 min**

- Reflect on the main points of the lesson by asking the following:

  * What are the functions of stems and flowers? Why are insects attracted to flowers? Name some fruits with one, and with many, seeds.

**Lesson 2: 40 min**

**Introduction: 5 min**

- Let the pupils recall their existing knowledge of seeds:
  a) What is a seed? (part of a plant)
  b) What is its function? (to reproduce or make more plants)
  c) Where is it found? (inside fruits)

**Main teaching: 30 min**

- Explain that seeds come in different sizes, shapes and colours. Seeds travel, though they do not have legs to walk like we do! Wind, water, birds and animals help seeds to move to a new place.

- Seeds can only begin to grow if the conditions are suitable for germination. All seeds need water, oxygen, and a suitable temperature in order to germinate. They also need the correct amount of sunlight, not too much, nor too little.
• Read page 22 of the textbook, asking related questions as the pupils read:
  a) Where do fruits come from? (flowers)
  b) Where are seeds found? (fruits)
  c) What is meant by the germination of a seed? (The growth of a seed into a plant is called germination.)

• A good way to explain the stages of germination is with the help of flashcards.

Wind up: 5 min
• Ask the pupils to recall all they know about seeds and their germination. Remind them that seeds remain inactive until conditions enable them to germinate. Water, oxygen, sunlight and a suitable temperature enable seeds to germinate.

EXERCISE (page 25)
1. a) tomato fruit
   b) carrot root
   c) pea seed
   d) lettuce leaf bud
   e) cauliflower flower bud
2. Tomato and chilli are considered to be fruits because they contain seeds.
3. leaf bud lettuce
   leaf spinach
   root turnip
   stem sugar cane
   tuber potato
   flower bud cauliflower
   seed peas
   fruit tomato
   bulb onion
4. a) Leaves b) water c) leaves d) flowers, seeds

ACTIVITY (page 25)
1. The pupils can observe the assortment of seeds, colours, skin textures and flavours of different vegetables. They can also differentiate between true vegetables and those that are actually fruits by cutting them open and looking inside.
2. The carrot is a root and contains a store of food. The pupils will enjoy watching the vegetables sprouting new shoots.
Reading Material

Flowers
- Flowers are the parts of some plants that become the fruits and seeds.
- Flowers are lovely, colourful, and fragrant.
- All seeds come from flowers.
- Flowers help plants to reproduce (make copies of themselves).

First, a tiny bud appears on the stem of a plant. The bud grows into a flower. Later on, the flower grows into a fruit.

Fruits grow from flowers that contain seeds. Some fruits, like mangoes, have only one large seed. The papaya has hundreds of tiny seeds. Tomatoes and chillies are fruits because they contain seeds.

Seeds are protected by the skin and flesh of the fruit. They usually have a hard covering. There is a baby plant inside each seed. When a seed is buried in soil and has enough water, sunlight, and air, it can grow into a new plant; this process is known as germination.

Stems
Stems store food for the plants. Stems are the stalks that move the water and nutrients through the plant, to the leaves and flowers. They support the parts of a plant and hold the leaves up to the light. They can be hollow or solid, round or square, rough or smooth. Sugar cane and celery are stems. Stems are also called leaf stalks.

The stems of plants like tomatoes and marigolds are soft and green and contain little woody tissues. They die each year.

The stems of woody plants like oak, maple or apple trees are hard and can be used to make things like furniture and houses.

Roots
The roots take in the water and nutrients for the plant. The very first root to come out of the seed is called the taproot. It is covered at the end, by a root cap which helps the root to penetrate the soil. The secondary and tertiary roots arise from the taproot.

Root hairs at the end of each branch of the root absorb water from the soil. The hairs work like straws, sucking up the water.

The roots also help to hold the plant firmly in the ground. Roots of many plants swell up and store food inside them. These swollen roots provide food for animals and humans. Carrot, radish, and turnip are some examples of swollen roots.

Leaves
Leaves are green, the colour coming from a chemical called chlorophyll. They need sunlight, water, air, and chlorophyll to make their own food. This means that life on Earth depends on plants.

Leaves are said to be the food factories of the plant because they make the plant’s food. The process by which they make food is called photosynthesis (‘photo’ means ‘light’, ‘synthesis’ means ‘to make’).

During the making of the food, the leaves produce a gas called oxygen which is necessary for all living things to remain alive.

The leaves of some plants are edible, for example, spinach and chives are leaf vegetables. The buds of some plants contain many leaves, for example, cabbage and lettuce.
Unit 5

Topic: Life cycle of plants

Teaching objectives:
- To explain the life cycle of flowering plants, including pollination and fertilization
- To investigate the various means by which seeds are dispersed

Key vocabulary: life cycle, pollen, chlorophyll, explosion, scatter

Lesson 1: 40 min

Introduction: 5 min
- At least one week before the lesson ask the pupils to draw the shape of the beans/seeds in their notebooks. Then place the beans/seeds on moist cotton wool. During the lesson, show the pupils the germinating beans/seeds.

Main teaching: 30 min
- Show the pupils the different types of seeds and the germinated seeds that you have prepared. What comes out of a seed? What goes upwards? What goes downwards? Show them the roots and the shoots of the germinated seed.
- A plant starts its life as a seed, which germinates and grows into a plant. The fully grown plant produces flowers. The flower produces seeds in a fruit or seed pod. The seed germinates to produce new plants.
- Divide the class into pairs. Referring to page 26 of the textbook, ask them to discuss the life cycle of the plant with their partner. Allocate time for discussion.
- Focus the lesson on the concepts explained on page 27.
  Show them a flower with anthers. Cut the flower to show the yellow dust. Explain that in order for a flower to produce seeds, the pollen from one flower has to be carried to another flower. Do you know how it is carried? By wind, by water, by small insects like butterflies or humming birds. If possible, take them into a garden and show them the insects crawling on the flowers.
  Before flowers can produce seeds they must be pollinated. Pollination is the transfer of pollen by pollinators, with the help of wind, or by other means. This happens when pollen, which is like yellow dust that is present in flowers, is carried to another place. Once pollination has taken place, seeds begin to develop. Pollination is an important part of a plant’s life cycle, from flowering plants to non-flowering ones. Without pollination, most plants could not produce fruit or set seeds.

- A natural attraction
  Pollination is usually assisted by insects, birds, and small mammals. The sticky pollen from flowering plants clings to their bodies and is carried from one plant to another. Honeybees carry out more pollination than any other insect, including ants, beetles, butterflies and moths. Birds are also responsible for pollination, especially hummingbirds. Small mammals, such as bats, are also pollinators.
Discuss with the pupils the role of insects and other pollinators, and the various ways that flowers attract them. Some insects are attracted to specific flowers due to their colour, fragrance, and shape. The colour or markings of a particular flower help attract and guide insects to them for pollination. For instance, bees are often attracted to bright blue and violet coloured flowers; hummingbirds are often seen on red, pink, or purple flowers. Butterflies also enjoy bright colours, such as yellow, orange, pink and red, as well as the fragrance of flowers.

• **Pollination by wind and water**
  Pollination is also carried out by wind. Wind-blown seeds are normally dry and dust-like. Wind-pollinated plants are generally not as colourful or scented as others. These plants consist of feathery looking flowers. Many trees and grasses depend on wind for pollination too. Sometimes pollination can occur by other means. For example, water can sometimes carry pollen from one plant to another. This often takes place with pond plants, such as pondweed. There are also some instances when people transfer pollen as they handle flowers in the garden.

**Wind up: 5 min**
- Recall the concepts learnt in the lesson:
  - Discuss with your partners the steps in the germination of seeds.
  - What is the difference between a shoot and a root?
  - How are insects, wind, and water useful in the dispersal of seeds?

**Lesson 2: 40 min**

**Introduction: 5 min**
- Bring a real pot-plant to class. Ask the pupils to identify its main parts (flowers, stem, leaves, and roots). Lead a discussion about functions of the different parts, and write their responses on the board.
- How are plants useful? They provide all animal life with food. Without plant life, there would be no animal life. While some carnivores eat few or no plants, they depend on other animals that do eat plants. Clothes are made from cotton which is a plant product. Medicines like aspirin are made from plant chemicals. Look around the classroom for items made from plants. Pupils can bring one or two products from home that are made from plants. Have a ‘Show and Tell’ activity on plant products.
- Plants adapt themselves to their environments. The roots, stems, and leaves are shaped differently to suit their varied environments.

**Main teaching: 30 min**
- Humans and animals move around in search of their food. Plants are also living things. Do they move around looking for their food, as humans and animals do? Why not? Unlike animals, plants cannot hunt their food. So where and how do plants get their food in order to survive? To survive, in any environment, plants have to be able to make their own food. They do this by a process known as photosynthesis.
  - To further clarify the term ‘photosynthesis’, write it on the board as: ‘photo’ means ‘light’ and ‘synthesis’ means ‘to make’.
- Plants use sunlight to make food. They also need carbon dioxide from the atmosphere, and water.
Show them some green leaves. Do they know what the green pigment present in the leaves is called? The green colouring matter in the leaves is called ‘chlorophyll’, and it traps energy from sunlight. Plants use this energy to make food. At the same time, plants also make oxygen which is not useful for them. They release the oxygen, which is essential for our survival, into the air.

Photosynthesis takes place mainly in the leaves of a plant, though it can take place in any green part of the plant, e.g. a young stem.

The following drawings can be drawn on the board to help explain photosynthesis.

Leaves are flat and thin, so they are easily able to absorb light energy.

Leaves are arranged in such a way that the plant captures the maximum amount of light.

Look at the shadow cast on the ground: hardly any light at all gets through, which shows how efficient the arrangement of leaves is at capturing light.

Ensure that they appreciate how useful plants are for us. Plants provide us with food, which may be stored in the roots, stem, leaves, fruits, and seeds.

Pupils should do the exercise on page 29.

Wind up: 5 min

- Summarize the main points of the lesson.
- Divide the class into pairs. Ask the pupils to discuss with their partners the ways in which we can help save the environment by protecting and planting more plants.
EXERCISE (page 29)

1. a) seed  b) germinates  c) fruit  
   d) wind, water, and animals  e) Sun

2. Photosynthesis helps plants to make their own food, using sunlight, water, carbon dioxide, and chlorophyll.

3. Roots help to hold the plant firmly in the soil. Also, they absorb water and nutrients from the soil. In many plants, they store food. Leaves make food for the plant. They also make oxygen, which animals need to stay alive.

4. Some animals, for example birds, bees and squirrels, help plants in the dispersal of their seeds.

5. Ordering:
   i. The seed germinates.  
   ii. The plant grows.  
   iii. The plant flowers.  
   iv. The flower produces fruit.  
   v. The fruit releases seeds.  
   vi. The plant dies.

ACTIVITY (page 30)

1. Answer will vary.

2. The grass will turn yellow as it is unable to produce food without sunlight.

3. Stems transport water to other parts of the plant. Since the water is coloured, the flowers will turn the same colour when the coloured water reaches them from the stems. The changed colour of the flowers will prove that the water has travelled from the stem to the petals.
Unit 6
Topic: Materials

Teaching objectives:
• To extend knowledge of the range of materials we use
• To discuss properties of materials, such as hardness, strength, and flexibility
• To compare materials in terms of these properties
• To understand that materials are suitable for making particular objects due to their properties

Key vocabulary: transparent, opaque, flexible, waterproof, magnetic, conductor

Lesson 1: 40 min

Introduction: 5 min
• Begin the session with questions relating to the pupils’ prior knowledge about materials. What are materials? Are different things made with different materials? Everything around us is made of some material. Wood, plastic, glass, and cloth are all materials. Our clothes and furniture are made of different materials. Some are man-made and some are natural.

Main teaching: 30 min
• Ask the pupils to bring from home one item made from each of the following materials: wood, plastic, wool or cloth, metal.
• Divide the class into groups that sit together. Write the following words on the board: flexible, transparent, opaque, waterproof, conductor, natural, man-made
• Ensure that each group has a dictionary. Then ask them to find the meanings of the words written on the board. Allocate an appropriate period of time for this. Then, ask the groups to share the meanings with the whole class, jotting down the points on the board. This task will ensure that they are confident when classifying the properties of different materials using the the given words as headings. The pupils can handle the objects and describe them, using the vocabulary written on the board.
Differentiate between natural and man-made materials with some examples.

**Natural materials**

a) Natural materials are obtained from animals, plants or the ground.

b) Leather comes from the skin of animals. It can be used to make shoes, bags, jackets and belts.

c) Wool comes from sheep, and fur comes from other animals with thick fur. Silk is produced by silkworms. Silk is used to make thread and cloth.

d) Wood comes from trees. It is used for making paper, furniture and houses.

e) Rubber comes from rubber trees. It is used to make tyres, rubber bands, erasers, gloves and balls.

f) Sand, clay and rocks are obtained from the ground. Clay is used to make bricks, tiles, pots and dishes. Sand and rocks are used for building roads, bridges and houses.

g) Metals are extracted from under the ground. There are many types of metal. Iron, copper, aluminium and gold are some examples. Metals are used to make kitchen utensils, electrical products, tools and jewellery.

**Man-made materials**

a) Man-made materials are processed from natural materials.

b) Plastic and synthetic fabrics are made from petroleum. Glass is made from sand.

Show them some magnetic objects (paper clips, pins, a key), a magnet, a waterproof material such as an umbrella, a piece of paper or cloth and some stones.

Demonstrate how magnetic materials are attracted to magnets. Also guide the pupils to differentiate between waterproof and non-waterproof materials by pouring some water on the umbrella, a piece of paper or cloth.

Lead a discussion about the properties of the different materials. How are they different from each other? Waterproof materials do not soak up water. Magnetic materials, like iron and steel, are attracted to magnets. Cloth and paper are easy to bend, so they are called flexible materials. Cloth is made when thin fibres are spun to form thread. Thread can be woven into fabric or cloth. It is difficult to break or scratch materials like stones and rocks.

Lead a discussion on the properties of different materials.

Ask the pupils to look out of the window. Can you see through the glass? Yes. Can you see through a piece of wood? No. What do you call the materials that allow light to pass through them? Elicit answers from the pupils and write them on the board.

Wind up: 5 min

Recall the properties of the different materials studied in the lesson.

Why is paper used for writing, printing, and packing?

What do we call those materials that allow light to pass through them? Which material is used in the lenses of your spectacles? Why is glass used to make lenses?
Give two examples of:

(a) natural materials (rubber and wood)
(b) man-made materials (plastic and synthetic cloth)

Lesson 2: 40 min

Introduction: 5 min
- Recall the previous lesson by asking the pupils if they can name the materials that are used to make the objects around them. They should have a clear concept of natural and man-made materials.

Hold up a ruler – What material is this ruler made of?

Ask them to name some common items, in their homes and in the classroom that are made from plastic.

Remind them that plastics are strong and waterproof, and can be made into any shape or colour. They are light in weight, and do not break easily.

Main teaching: 30 min
- Take the class into a kitchen. Boil some water in a saucepan with a wooden handle. Pick the saucepan up (using the handle). Ask: Is my hand being burnt? What would happen if I picked the pan up but but did not use the handle? What is the difference between the two materials?

The pan in which the water was boiled is made of metal, which comes from rocks called ‘ores’. Heat and electricity can pass through ores very easily. So, metals are called good conductors of heat and electricity. Materials that do not allow heat and electricity to pass through them are called insulators. Examples of insulators are wood and plastic. Metals are strong, hard, and shiny, and can be hammered into different shapes without breaking. Show them spoons, coins, knives and forks.

- Show the pupils a bare copper wire and a plastic-covered copper wire. Copper is a metal through which electricity can pass easily. Why is it important to use covered wires? A person can be electrocuted. Discuss, without going into explicit details, what happens to a person when an electric current passes through their body.

- Emphasize that different materials have different properties that make them suitable for different jobs.

Divide the class into pairs. Then ask the pupils to suggest suitable materials to make certain specific objects (e.g. gloves should be made of flexible material, a raincoat is made of a waterproof material, toys made of plastic), and explain why. Suggest a material each item could not be made from, and explain why.

Why do we use particular materials? Encourage the pupils to identify the links between the properties of any material and its uses. If a towel was made from metal foil, it would not absorb any water and would be uncomfortable. You can ask the class to provide you with their own examples of unsuitable use of materials, justifying their reasoning.

Wind up: 5 min

Sum up the concepts taught in the lesson:
- Each material has its own characteristics. We call these characteristics the properties of materials.
• Different materials have different properties.
• All metals conduct electricity and heat. They are known as electrical and heat conductors.

**EXERCISE (pages 35–36)**

A 1. Plastic
   2. Paper
   3. Metal
   4. Glass
   5. Fibre

B 1. Plastics
   2. Metals
   3. Conductors of heat
   4. Magnetic
   5. Strong and hard
   6. Flexible
   7. Strong and hard
   8. Waterproof
   9. Fibres
   10. Metal

C Answers will vary.

**ACTIVITY (page 36)**

1 and 2. Both the activities allow children to explore the properties of different materials. They can compare the strength, texture, uses and feel of different materials, and conclude what is their most appropriate use.
Unit 7

Topic: The solar system

Teaching objectives:
• To identify the heavenly bodies present in the solar system
• To describe the relative positions of the planets around the Sun
• To compare and contrast a moon and a planet
• To introduce man-made objects (satellites and telescopes) present in the solar system, with emphasis on their importance to the advancement of science and technology
• To create interest in scientific inventions and inventors

Key vocabulary: orbit, dwarf planet, rotation, revolution, astronomer

Lesson 1: 40 min

Introduction: 5 min
• Begin teaching the topic using a simple example. We study and work in school. The school includes students, teachers, head mistress or head master, the domestic helpers, etc. Similarly, our solar system contains many heavenly bodies. It is made up of the Sun, the planets, and satellites, dwarf planets, dust and gas. All these travel around the Sun which is at the centre of the solar system.

Main teaching: 30 min
• Have you ever wondered how the solar system was formed? It began billions of years ago, when gas and dust began to come together to form the Sun, planets, and the moons of the solar system. Let us study in detail all the objects present in the solar system.

The Sun
The Sun is the closest star to the Earth. It is a giant ball of very hot gases. Its light warms and illuminates our planet and helps sustain life on it.

Planets
Our solar system includes eight planets and five dwarf planets. The four rocky planets—Mercury, Venus, Earth and Mars are known as the inner planets. Jupiter, Saturn, Uranus and Neptune are composed mainly of gases and are known as the outer planets.
Dwarf planets

What is the difference between regular planets and dwarf planets?

a) Dwarf planets are smaller.
b) Their gravitational force is weak and they do not have a definite orbit.

Moons

All the planets except Mercury and Venus have smaller bodies orbiting around them. The Earth’s Moon is its natural satellite. A satellite is a body that revolves around another. The Moon orbits the Earth once every 29 days. It is a dead and silent place that has no wind or air, and no rain or weather of any kind.

Artificial satellites

An artificial satellite is a manufactured object that continuously orbits the Earth or some other body in space. Most artificial satellites orbit the Earth. People use them to study the universe, help forecast the weather, transmit telephone calls across the sea, assist in the navigation of ships and aircrafts, monitor crops and other resources, and support military activities.

The Hubble Space Telescope began to orbit the Earth in April 1990. Its position above the atmosphere gives it a complete view of the universe. It has sent hundreds of thousands of images back to the Earth. Among its many discoveries, Hubble has revealed the age of the universe to be about 13 to 14 billion years. It completes an orbit around the Earth every 97 minutes (travelling at the rate of 8 km. per second).

Note: As an extension of this topic, the teacher may discuss asteroids and comets and encourage the pupils to find out more about these heavenly bodies.

Wind up: 5 min

• Conclude the lesson by asking relevant questions:
  a) What objects exist in the solar system?
  b) What do you know about the Sun?
  c) Name the eight planets in the correct order from the Sun.
  d) What is the difference between natural and artificial satellites? Give an example of each kind.
  e) What else would you like to know about the Hubble Telescope?

Note: The following website is highly recommended to enable the pupils to view multimedia presentations on the topic:
http://hubblesite.org/hubble_discoveries/

Lesson 2: 40 min

Introduction: 5 min

• Show the pupils a model of the solar system (the Sun and eight planets). You can use page 37 of the textbook as a guide. Don’t forget to revise the relative sizes of the Sun and the Earth. Represent the Sun with a football or basketball, and the Earth with a tennis ball. Use plasticine or play dough to make spheres, representing the other planets, bearing in mind the relative sizes of the planets.
Main teaching: 30 min
Ensure that the pupils appreciate that:

- The planets are far apart from each other.
- The planets do not collide because each one has its own path to travel along.
- Each planet has its own temperature, size, and number of moons.
- Begin the lesson by focusing on our home planet, the Earth. Together with the pupils’ input, put together a Planet Profile of the Earth.

The Earth

<table>
<thead>
<tr>
<th>Position in the solar system</th>
<th>Satellite</th>
<th>Special features</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third from the Sun</td>
<td>The Moon</td>
<td>The only planet to sustain life in the solar system</td>
<td>Atmosphere contains gases. Surface area is covered by land and water.</td>
</tr>
</tbody>
</table>

- Using this as a model, the pupils can compile their own planet profiles of the other seven planets.
- Ask the pupils to read the text on pages 37–41 carefully.
- Take them to the library and assist them in finding books on the solar system.
- Encourage them to find further information about the stars, moons, and the differences and similarities between a planet and a moon.
- If possible, show them a telescope. Show them a big picture of the Hubble Space Telescope.
- Show pictures of man-made satellites. Discuss: *What do these machines do, and how do they help us in our daily lives? How many man-made satellites are there in space?* Ask the class to research man-made satellites, and then produce a booklet. The booklet should include pictures relating to space, astronauts, satellites, and telescopes.

Wind up: 5 min
- Divide the class into pairs. Each pupil should conduct a short question and answer session with his/her partner on relevant topics. For example, which planet has the highest temperature? Why is the Moon not visible during the day, even though we know it is there? Why is the Sun a star? Is there life on the Moon? Assist them as necessary.

EXERCISE (page 42)

A 1. stars (example: Sun), planets (example: any of the eight planets), dwarf planet (example: Pluto; Eris and Ceres are some other dwarf planets present in the solar system) natural satellite (example: moon). Ensure that the names of the planets begin with capital letters.

2. Answers will vary. Earth has a moderate temperature allowing the survival of living organisms. It has water, air and seasons.

3. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune

4. Difference: A planet is an object that circles the Sun, while a moon is an object that circles a planet.
   
   Similarity: Both a moon and a planet have no light of their own, but reflect the Sun’s light.
B 1. Neptune
   2. Jupiter
   3. astronomers
   4. the Moon
   5. 24 hours
   6. 365¼ days
C Refer to this website for details:
   http://www.enchantedlearning.com/subjects/astronomy/planets/mercury

**ACTIVITY (page 42)**

1. This is a useful activity that will greatly help the pupils to understand the movements of the Earth.
2. This activity can be done either in the art lesson or as homework. The pupils should be provided with instructions to make the mobile.
3. Galileo Galilei (1564–1642) was an Italian scientist and astronomer. He improved upon the existing compass and telescope, making them more powerful. He believed that the Sun lies motionless at the centre of the solar system, while the Earth circles it. This was a new theory because, until then, people believed that it was the Sun that moved while the Earth remained motionless. Due to the improvements to the telescope, Galileo was able to discover Jupiter’s four largest moons. They are called the Galilean Satellites.

   The pupils can be provided with some basic information about him. They can then be asked to make a poster on Galileo’s achievements.
Unit 8

Topic: Wind and air

Teaching objectives:
• To explain the components of air
• To demonstrate that air occupies space
• To compare space and atmosphere
• To investigate the causes of wind
• To discuss the uses of compressed air

Key vocabulary: atmosphere, nitrogen, space, breeze, gale, compress, water vapour, carbon dioxide

Materials: a glass, a piece of paper towel, a sink or tub full of water

Lesson 1: 40 min

Introduction: 5 min
• Do a quick recap of the pupils’ existing knowledge. How do we know that there is air around us when we cannot see it? By the smoke coming out from a chimney, by the movement of clouds, flags, trees, kites. How can we tell that air circulates all the time? What does air contain? What is moving air called? What do we call a wind that blows very strongly?

Main teaching: 30 min
• Perform the following activity to demonstrate that air occupies space.
  a) Stuff the piece of paper towel in the bottom of the glass, so that it will not fall out when you flip it upside down.
  b) Ask the pupils whether or not they think you can plunge the glass all the way into the sink of water, without getting the paper towel wet.
  c) Hold the glass upside down and plunge it into the sink.
  d) Hold the glass under water for about 10 seconds and then slowly and steadily lift the glass up, making sure not to tilt it at all.
e) Pull out the dry piece of paper towel and show it to the pupils.

f) Have a class discussion on some possible reasons as to why the piece of paper towel remained dry. (The air filled the glass up and that is why water could not get in it. This proves that air occupies space.)

- Engage the class in a discussion about the differences between the Earth and the other planets. Why is Earth the only planet that has life on it? What do living things need to live? Our Earth is surrounded by a thick layer of air called the atmosphere which is full of gases. Do you remember the names of the gases? Which is the most important gas without which no living thing can live? Can you name the other gases that are present in the air? Write their responses on the board.

- Bring a mirror into the classroom. In turn, ask the pupils to breathe out onto it (alternatively, they could breathe out onto a window pane) and observe what happens. Then discuss with the class:
  What did you observe? Little drops of water formed on the mirror/pane.
  What does this experiment tell you about air? Water vapour is also present in the air.

- Divide the class into pairs. Ask the pupils to discuss, first with their partners and then with the class:
  Why is it necessary for astronauts to take an oxygen supply into space with them? Climbers often have to carry oxygen cylinders when they climb mountains that are over 8000 meters high. Why? (As we go higher and higher above the Earth, the air becomes thinner. After about 600 km, there is no air at all. This part, outside the atmosphere, is called space.)
  Ask the pupils to write the differences between atmosphere and space in their notebooks.

Wind up: 5 min
- Recap the salient features of the lesson.
  Air occupies space.
  Air is a mixture of different gases.
  The most important gas is oxygen.
  Air also contains water vapour.
  What about the air present in this classroom? Is it light and gentle or is it blowing strongly?
  How can we tell that air circulates all the time?

Lesson 2: 40 min

Introduction: 5 min
- Bring the following things into the classroom: a football, a small tyre from a toy, a balloon.
  Inflate the balloon in front of the pupils. When do you think the balloon will burst? What is inside the football and tyre?

Main teaching: 30 min
- Air can be squeezed into small places. When we inflate a balloon, we are forcing air into it. The air is squeezed inside and the balloon expands. It will eventually burst because the air is being squeezed into a very small area.
• Show the class the football and tyre. Both these contain compressed or squeezed air. Can you name other things that contain compressed air? Is compressed air useful? How?

• Discuss the diagram shown on page 44 of the textbook. When the Sun shines it warms the land. The land warms the air above. The warmed air rises. Colder air moves in to take its place. We call this moving air, wind. Warm air is lighter than cold air. When warm air rises, its place is taken by cold air. This happens all over the Earth. Can you tell why days are very hot and nights very cold in the desert? It is because the warm air rises and its place is taken by cold air.

• What happens to water when it is heated? Where does the smoke go when it comes out of a chimney? Why does smoke rise?

What happens to the air if we cut down trees?
Which elements are responsible for polluting the air?
In what ways is compressed air useful to us?
Talk about some ways of cleaning the air.

Wind up: 5 min

• Conclude the lesson by reiterating some key ideas:

Air is colourless, odourless and tasteless.
Air is matter and it takes up space.
Oxygen is the most important gas for all living things.
The atmosphere is made up of gases.
Moving air is wind.

EXERCISE (page 45)

A

<table>
<thead>
<tr>
<th>Atmosphere</th>
<th>Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>• has air and gases</td>
<td>• has no air and gases</td>
</tr>
<tr>
<td>• is able to maintain life on the Earth</td>
<td>• is not able to maintain life</td>
</tr>
<tr>
<td>• has winds and temperature creating rain, snowfall, clouds, etc.</td>
<td>• absence of wind and temperature</td>
</tr>
</tbody>
</table>

2. As there is no air in space, astronauts take an oxygen supply with them.

3. Answers will vary. Here are some examples: by the smoke rising from the chimneys; by the movement of flags, trees, kites, etc.

4. Air is made up of gases – oxygen, nitrogen, carbon dioxide, and water vapour.

5. Compressed air is air that is squeezed into a small space.

B

1. X
2. ✓
3. X
4. ✓
5. X
6. ✓
Unit 9

Topic: Circuits

Teaching objectives:
- To explain that a complete circuit is required for an electric device to work
- To help pupils to recognize a cell or battery as a source of energy i.e. a cell/battery provides an electric current that travels around a circuit
- To help pupils make and explain predictions about circuits, e.g. two connections are needed to light a bulb; there has to be a complete circuit
- To explain that a bulb lights because electricity travels around the circuit
- To explain in general terms materials do/do not conduct electricity; metals are good conductors of electricity and plastics are not

Key vocabulary: conductor, insulator, battery, flex, circuit, filament

Materials: different types of batteries, wire, bulb, tape (masking or electrical)

Lesson 1: 40 min

Introduction: 5 min
Find out what pupils already know about electricity.
Ask: What is electricity?
What is an electric current?
What is an electric circuit?

Main teaching: 30 min
- Remind them that the electric current provides energy to power all kinds of things, from video games to refrigerators.
- Act out an electric circuit. Ask the pupils to join you in forming a circle. Explain that you represent a battery and they represent a wire conductor. The circle represents a circuit. Give an object like
a ball or a book to pass around. Explain to the pupils that the ball represents electric current passing through the wire. *The flow of electricity through a conductor is called the electric current.*

- Explain to the pupils that as long as the circle remains intact and the electricity continues to flow, the circuit is closed. To show what happens when a circuit breaks, or opens, create a gap in the circle of pupils.
- Let the pupils sit in groups. Give them the materials listed above. Ask them to join the materials so that the bulb lights up.
- Lead a discussion: *From where does the bulb get the energy to light up? A battery has chemicals in it and can store energy. When a battery is connected to a bulb by two wires, it will light the bulb. Electricity that moves along a wire is called an electric current, and the path along which the electric current flows is called a circuit.*
- Discuss in detail what happens in a circuit before a bulb lights up. *The electric current flows out of the battery and along the wire which is known as flex. Observe the filament of the bulb carefully. The current goes through the filament in the bulb and then along the second wire. Then it goes back into the battery.*
- Ensure that pupils they realize that if there is a gap in the circuit, the electricity cannot jump across the gap. *There can be no gaps in a complete circuit.*
- Ask the pupils to open their textbooks at page 47, and copy the diagram of a complete circuit in their notebooks.
- Divide the class into pairs. Replace the bulb with a small buzzer. *What will happen if we use a large buzzer?* Let them discuss this with their partners. A large electrical appliance needs a larger amount of energy.

**Wind up: 5 min**
The pupils can explain the working of their circuit by answering the following questions:

a) Did you get the bulb to light up?

b) In what order did you connect the parts?

c) How did you know that electricity flowed?

d) Can you trace the path of the current in your circuit?

e) What would happen if the circuit was broken?

**Lesson 2: 40 min**

**Materials:** a plastic ruler, an iron nail, a paper clip, a pencil, a piece of wood, a sheet of paper, an eraser

**Introduction: 5 min**

- Use a bulb holder, two wires, and a cell to make a bulb light up. Cut one wire and see what happens. Join the wires again. Try different objects to complete the circuit. Make a chart to show which items conduct electricity.

**Main teaching: 30 min**

- Engage the class in a discussion on the properties of different materials (focusing on whether they allow electricity to pass through them or not). *Materials that allow an electric current to*
pass through them are called good conductors of electricity. Metals are good conductors of electric current. Materials like plastic, wood, and rubber that do not allow electricity to pass through them, are called insulators.

- Ask the pupils to draw a table with two columns in their notebooks, one column for conductors and the other for insulators. Then ask them to observe the test on each item, before completing the table. You can use any other materials, in addition to those mentioned in the list. (Refer to Activity 1 on this page for details.)

Wind up: 5 min
- Show the pupils plugs and sockets, bare wires and plastic-coated wires. Ask them to decide which material is a conductor, and which is an insulator.

Safety Note
Exploring electricity is safe as long as it is done with low-voltage batteries (such as a D-cell), and under adult supervision. Warn the pupils never to experiment with electricity from a wall outlet and never to use bare wires. Doing so can be fatal.

EXERCISE (pages 48–49)
1. a) circuit b) complete c) conductors d) insulators
2. The path along which an electric current flows is called a circuit.
3. Electricity that moves along wires is called an electric current.
4. Flex is coated with a thin layer of plastic because plastic is an insulator.
5. a) ✗ b) ✔ c) ✗ d) ✔ e) ✗

ACTIVITY (page 49)
1. Test as many materials as time permits. Use a table like the one shown here to record your result in your science journal. Write ‘yes’ or use a tick in the correct column to indicate if each material is a conductor or insulator.

To test whether a material is a conductor or insulator of electricity, touch it firmly with the test leads. If the light bulb glows, the material is a conductor. If the light bulb does not glow the material is an insulator. Try testing some objects that are made from more than one type of material, such as a pencil or a plastic-coated paperclip, and record your results.

<table>
<thead>
<tr>
<th>Material</th>
<th>Conductor</th>
<th>Insulator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

2. The pins and the copper wires inside the flex are conductors. The flex that is covered by rubber coating and the plug itself, are insulators.
Answers to Worksheet Unit 9

Unit 10
Topic: Fun with magnets

Teaching objectives:
• To introduce magnetism as a force
• To demonstrate the force and properties of a magnet
• To compare between magnetic and non-magnetic materials

Key vocabulary: magnet, magnetic material, magnetic field, magnetism

Lesson 1: 40 min

Introduction: 5 min
• Lead a discussion so that the pupils can recall what they already know about magnets.
  Bring a mixture of sand and iron filings, in a dish, and ask them if they know how to separate
  the iron filings from the sand.

Main teaching: 30 min
• Lay out different types of magnets, a pencil, some coins, some paper clips, a plastic spoon,
  some drawing pins, some erasers, and a rubber band.

  Arrange the pupils in small groups. Ask them to draw two columns in their notebooks, with the
  headings ‘Materials attracted by a magnet’ and ‘Materials not attracted by a magnet’, and then
  complete the table for the given materials.

• Recount the following legend to the class:
  A magnet is a naturally occurring material. Legend has it that magnetism was first discovered by an
  ancient shepherd, who was named Magnes, in the area of Magnesia. Once, while busy tending his
  sheep, he noticed that his stick’s iron tip was being pulled by some object in the ground. This object
was a large, black rock. This is when people discovered that some rocks would attract iron. And so, magnetism was discovered.

Activity:
Sprinkle some iron filings onto a piece of card. Place a bar magnet underneath, in the centre. Tap the paper gently and let the class observe what happens.

The area of invisible force around a magnet is called its magnetic field. A magnet has two ends called poles. The poles are where the magnetic force is strongest. All magnets have a south pole and a north pole.

Wind up: 5 min
• Recap the basic concepts taught in this lesson by asking questions:
  How many poles does a magnet have?
  Give a few examples of things around you in which magnets are found. (door stop, doors of kitchen cabinets, televisions, computers, washing machines, stereos, telephones, toys)

Lesson 2: 40 min
Material: an iron nail, a piece of copper wire, and a battery

Introduction: 5 min
• Do a recap of magnetic materials, by dividing the pupils into pairs and asking each pair to make a list of items that are attracted by magnets. Allocate them a set period of time to make the list. The pair that writes the greatest number of materials should present their list to the class.

Main teaching: 30 minutes
• Magnets were first used in compasses by the Chinese. The French and English also used compasses to navigate across the large oceans. These magnets floated in oil. Though magnets are naturally occurring materials, we can make temporary magnets by passing an electric current through a piece of iron. If a magnet is kept free then it always points North; this is why it is used in a compass to show direction.

Activity: Coil the copper wire around the iron nail. Attaching the battery, pass an electric current through. The iron nail will behave like a magnet. Large pieces of iron, magnetized in the same way, are used to separate iron and steel in a scrap yard.
• Ask the pupils to predict whether or not a magnet will exert a force on a paper clip, and why. Use this discussion as an opportunity to review what pupils know about magnets.
  You can show by a simple demonstration that the strength of the magnetic field decreases the further you move away from the magnet. Tie one end of a thread to a paper clip and tape the other end to the surface of a table. Hold a magnet above the paper clip. You can hold the clip up in the air (and keep the string taut) as long as the magnet is fairly close to the paper clip. If you move the magnet too far away from the clip, the strength of the magnetic field decreases, and the paper clip falls.
  Allow the pupils to try the same experiment.
• Ask them to estimate how far away they can move before the clip falls.
  How could we measure this systematically?
How strong is the magnet?
How far away will it work?

Can a small magnet attract a paper clip from across the room? From across your desk?
How can you find out how strong your magnet is?

Magnetic field
What are magnetic fields?
The area of invisible force around a magnet is called its magnetic field. The area around a magnet’s poles is where the magnetic field is the strongest.

Use an everyday example to explain this concept:
When you want to hold your friend’s hand, you need to stand near one another to be able to do so. You cannot hold hands if you are in separate rooms or far away from one another. Similarly, in order for any magnetic material to be attracted to a magnet, it has to be close to the magnetic field. A magnetic field covers the area in which the attraction of the magnet can be felt.

Wind up: 5 min
Conclude the topic by asking relevant questions:

a) What is a magnet?
b) What can a magnet do?
c) How are magnets used in daily life?
d) What is a magnetic field?
e) What do you know about the poles of a magnet?

EXERCISE (page 53)

1. a) Answers will vary.
   b) Magnets are useful to us because they are used in telephones, radios, stereos, computers, washing machines, etc.
   c) The pupils can search the Internet to find out that like poles on magnets keep the train floating above the tracks. Its top sped is about 280 km/h.

2. a) two
   b) far from
   c) some
   d) strongest

3. Answers will vary.

ACTIVITY (page 54)

1. The nail on the boat will be attracted to the magnet and make the boat move.

2. Give the pupils a piece of paper. Place a bar magnet into a locking plastic bag. Sprinkle some iron filings on the paper. The children will observe the pattern created by the iron filings. Explain that magnets have forces that will draw iron and steel objects towards them.

3. Answers will vary.
Unit 11

Topic: Energy

Teaching objectives:
• To identify the sources of energy
• To explore the two main sources of energy – potential and kinetic
• To explain changes in the forms of energy – it can be transferred but not destroyed

Key vocabulary: energy, potential energy, kinetic energy

Lesson 1: 40 min

Introduction: 5 min:
• What do you do during the day? Write their responses (walk, work, run, play, shout, sing, study, talk, etc.) on the board. How are you able to do all these things? It is because you are using energy. Where does your energy come from? (from food and drink) Energy from the Sun makes plants grow. Plants use the sunlight’s energy to help make their food. Even when we eat meat or drink milk, the energy we get came originally from the Sun.

Main teaching: 30 min
• Write on the board the following statement:
  * Energy is the power to do work.*

  Explain that energy makes changes possible. Look around you. Everything in the world is constantly moving and changing, including yourself. This is possible due to energy. When a cake is put in the oven, it is the heat’s energy that bakes it. When water is kept in the freezer, it is electrical energy that changes it into ice. Energy is needed for our bodies to grow and it allows our minds to think. Food provides us with the energy to do these tasks. When we have not eaten for a while and are hungry, we feel weak and tired. This is due to a lack of energy.

• **Forms of energy**
  Explain that energy is found in different forms, including light, heat, chemical and motion (movement). Remind them that the Sun is the biggest source of energy.
There are many forms of energy, but they can all be put into two categories: potential and kinetic.

Hold a tennis or cricket ball. The ball has potential energy right now. Potential energy is stored energy and is also called the energy of position.

Let go of the ball. The ball now has kinetic energy, which is the energy of motion or movement. So energy can change from one form to another.

Read pages 55 and 56 with the class, pausing to ask relevant questions. Discuss the illustration of the roller coaster. When the roller coaster is at the crest (top) of the slope, it has potential energy. When it begins to slide, it has kinetic energy.

Wind up: 5 min

Conclude the lesson by summarizing the key concepts discussed:

a) Energy is the ability to do work. We use energy in everything we do. We see energy working around us constantly. Humans, plants and animals grow, the waves in the sea ebb and flow, cars move on the road, and the wind blows. All of this happens due to energy.

b) Energy is of two types; potential energy and kinetic energy.

Lesson 2: 40 min

Introduction: 5 min

Remind the pupils of what they learned about energy, its forms and types.

Main teaching: 30 min

Read page 57 of the textbook.

Explain that energy can change from one form to another. When we use energy, it does not disappear. We change it from one form to another, e.g. stored energy in a torch’s batteries becomes light energy when the torch is turned on. Energy changes form but the total amount of energy in the universe remains the same.

You can draw the following to explain the concept:

Energy Transformations

- Chemical → Motion (Kinetic)
- Radiant → Chemical
- Electrical → Thermal
• Energy cannot be created or destroyed, but only changes from one kind to another.
• Energy can be found in a number of different forms. It can be chemical energy, electrical energy, heat (thermal energy), light (radiant energy) and mechanical energy. All these different types of energy can be divided into potential and kinetic energy.
• Energy can be transferred from one object to another. The Sun provides energy to the plant. With the help of sunlight, the plant produces energy. An insect eats the plant and the energy is transferred to the insect. The insect, in turn, is consumed by a frog. So the energy is transferred to the frog. Hence, the transfer of energy continues from one living thing to another. This is also an example of a food chain.

Wind up: 5 min
• Recap the salient points of the unit by putting the pupils in pairs, allowing them to discuss the questions, before answering.
  a) What is energy?
  b) Give any example of your own to show that energy can be changed from one form to another.
  c) Name the two main types of energy.
  d) Which statements are correct?
     Energy can be created.  
     Energy can be transferred.  (✔)
     Energy can be destroyed.
     Energy can change from one kind to another.  (✔)

EXERCISE (pages 58–59)

1. a) Energy is the power to do work.
   b) The energy in our food comes from the Sun.
   c) We use energy while working.
   d) Machines get energy from fuels like petrol, diesel, coal, or natural gas.
   e) Two examples of stored energy: the food we eat, and plants.

2. We use natural gas at home in our kitchens to cook food, and in heaters and geysers.

3.

<table>
<thead>
<tr>
<th>Energy user</th>
<th>Form of energy</th>
<th>Form of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. body</td>
<td>heat, chemical</td>
<td>move, run, think</td>
</tr>
<tr>
<td>b. plants</td>
<td>light</td>
<td>grow, produce oxygen</td>
</tr>
<tr>
<td>c. radio</td>
<td>electrical</td>
<td>produce sound</td>
</tr>
<tr>
<td>d. mill</td>
<td>mechanical</td>
<td>grind</td>
</tr>
</tbody>
</table>

4. The stretched rubber band has potential energy. As it is released, it moves with the help of kinetic energy.
**ACTIVITY (page 59)**

1. If you dropped the balls at the same time, the tennis ball should bounce off the basketball and fly high into the air. The two balls hit each other just after they hit the ground, the kinetic energy in the larger basketball is transferred to the smaller tennis ball, sending it high into the air.

   While you held the balls in the air before dropping them, they had another type of energy called potential energy. The balls gained this through the effort it took you to throw them up. It is interesting to note that energy is never lost, only transformed into other kinds of energy.

2. A steam engine needs steam to get it going. Coal is burned at a very high temperature. The heat produced is used to change water (also stored in the engine) into high pressure steam which pushes the train forward. The steam has potential energy which changes into kinetic energy as it pushes the train.

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**Unit 12**

**Topic: Force**

**Teaching objectives:**
- To explain effects of force on the movement, direction, speed, and shape of objects
- To explain that the force of gravity pulls everything down

**Key vocabulary:** friction, gravity, force

**Lesson: 40 min**

**Introduction: 5 min**
- Take the class into the playground. Divide the pupils into two groups. Give them a rope and tell them to have a ‘tug of war’. Using this as a demonstration, use the term *force*: the winning team has applied more *force* than the losing team.

**Main teaching: 30 min**
- Open and close the door in front of the class.
- Roll a ball on the floor. Ask the pupils to observe how the ball stops after covering a certain distance. *Why has the ball stopped? There is frictional force between the ground and the ball. The best example of frictional force is the brakes of a moving car.*
- *Can we distinguish between a push and a pull? How did I roll the ball? How did I stop it? Explain:* A power, called ‘force’, is used to make the ball move and stop. The same power was used in opening and closing the door.
- *Every time you move something, use your pencil, or walk, you are using force. Even when you do your homework, you exert a force on your pencil because you push or pull it across the paper. The wind and running water are natural forces.*
• If possible, ask one of the pupils to bring a bicycle or a toy vehicle to class. Ask him/her to turn it towards the right and then the left. What makes the bicycle change direction?

• Take a bat and a ball into class. Hand the bat to one child and the ball to another. Ask the rest of the class to observe them, and note how the direction of the ball changes when it hits the bat.

• Hold a rubber band. Ask the pupils to predict whether the rubber band can be stretched, twisted, or pulled. Demonstrate. Repeat this with some plasticine and with a stone. Each time, the pupils should be asked to predict whether it is possible to twist or change the shape of the item. Encourage the pupils to handle the objects and apply force to try to twist/stretch them.

• Explain that the force that makes things fall to the ground on the Earth is called gravity. The gravity of the Earth pulls us down and allows us to walk instead of floating in the air. Hold a ball or an apple poised in the air. Will this fall down or go up? It will always fall down when I let go of it, because the force of gravity is pulling it down.

Wind up: 5 min
• Summarize the main key concepts of the lesson:

A force can:
• change the shape and size of an object
• push or pull an object
• change the direction of an object
• twist an object
• slow down a moving object.

EXERCISE (page 62)

1. a) Force is a push or pull.
   b) Three different types of force are: frictional force, gravitational force and magnetic force.
   c) A force can cause objects to change shape, change the way they move, or cause an object to move in a new direction.
      Force can also make a moving object come to a stop. The speed of a moving object can increase or decrease depending upon the amount of force applied to it.
   d) Objects fall down because of the force of gravity.

2. drop, ran, pushed, picked, lifted, pulled

3. a) wind
   b) horse
   c) on the ground
Unit 13
Topic: Sounds

Teaching objectives:
• To introduce sound as a form of energy
• To relate sounds to their sense of hearing
• To introduce the idea that sounds travel away from a source, and gets fainter the further it travels
• To offer opportunities for pupils to relate understanding of sound and hearing to everyday experiences
• To explain that we use our sense of hearing for a range of purposes, including communication and pleasure as well as to recognize hazards and risks
• To describe different sounds using appropriate terms, e.g. high-pitched, low-pitched, soft, loud

Key vocabulary: sound waves, pitch

Lesson: 40 min

Introduction: 5 min
• Recall the pupils’ previous knowledge about how sound is produced. Demonstrate the vibration of a plastic ruler, a thin piece of metal, and a taut piece of string. *Things that vibrate quickly are sources of sound. Every time we make a sound by singing, speaking, or even whispering, we are creating vibrations. When something begins to vibrate, it pushes or pulls the air around it, creating different layers of air called sound waves.*

Main teaching: 30 min
• Lead a discussion on the variety of ways in which sounds are made. *Do sound waves travel in all directions? How do whales and dolphins call to each other under water? Can the sounds of footsteps be heard better if the ear is put to the ground? Ask them to put their ears on their desks and then tap their desks with their fingers. Next, ask them to put their ears against a water pipe when a distant tap has been turned on. Sound waves are vibrations that cannot be seen. They can travel in all directions. Sounds can travel through solids, water, and air.*
Later, you can do Activities 2 and 4 for further explanation.

Revise the use of sound:

- If possible, arrange to have a tape recorder in the classroom, prerecorded with some different sounds, e.g. a car starting, a flute being played, an aeroplane taking off, a chirping bird, a clock ticking, a dog barking, a clap of thunder. *Close your eyes and listen. When I call out your name, tell me what sound you can hear.* Make a list of the different sounds on the board. *Which sounds are loud and which soft?* Write L (loud) or S (soft) against each item on your list on the board.

- Ensure that they understand the term, pitch (the quality of a sound – low or high). A high pitch creates a shrill sound, while a low pitch creates a deep sound. Of the sounds we have heard, which were loud and which were soft?

- Soft sounds travel a shorter distance and loud sounds travel further. The greater the number of vibrations, the louder the sound; fewer vibrations produce softer sounds. Ensure that they appreciate that very loud sounds can damage their ear drums – of particular note with the increasing use of personal listening devices (e.g. mp3 players).

- Open your books at page 65. As you can see, a tight drum skin produces a higher pitch compared to a loose drum skin. If possible, provide a drum and two sticks to demonstrate the difference.

- Sounds carry information. *We speak to each other with the help of voices that produce sounds.* Animals too communicate by sound. *The ambulance’s siren warns the traffic to move out of the way.* *The birds’ chirp at dawn and at sunset creates sound.* *Music is sound and gives us pleasure.*

**Wind up: 5 min**

- Recap the salient features of the lesson.
  - Sounds can be loud or soft.
  - Sound is a form of energy.
  - Sound vibrations pass through the ear and reach the brain in the form of electric signals.
  - More vibrations produce louder sounds and fewer vibrations produce softer sounds.

**EXERCISE** *(page 65)*

1. a) X  
   b) ✓  
   c) X  
   d) X  
   e) X  
   f) ✓  
   g) X

**ACTIVITY** *(page 66)*

1. Can the sound of footsteps be heard better if the ear is put against the ground? Ask the children to put their ears against a water pipe when a distant tap is on.

2. Sounds will be heard better by listening with the help of thickly rolled paper, since the sound waves are not spreading, but are being channelled in one direction towards the ear.

3. Certain materials are able to control and suppress sound levels by absorbing sound waves. Thicker materials are better able to muffle sounds. E.g. a wool carpet is a sound insulator. Materials like wood and metal pick up sound vibration and are therefore, not good insulating materials.
Unit 14

Topic: Light and shadow

Teaching objectives:

• To explain that a shadow is cast when light has been blocked by an object
• To describe how and why a shadow changes during the course of the day
• To explain that light travels at a very high speed, much faster than sound

Key vocabulary: source, luminous, ray, intensity

Materials: a torch, a candle, a match box, a bulb, a sheet of tissue paper, a piece of wood, a piece of glass

Lesson: 40 min

Introduction: 5 min

• Recall the pupils’ previous knowledge by asking: What are the different sources of light? (The Sun is the greatest source.) How does light travel? Can light go round corners? (Light travels in straight lines called rays. It cannot bend.)

Main teaching: 30 min

• Draw two columns on the board, with the headings ‘luminous’ (objects that give out light) and ‘non-luminous’ (objects that do not give out light but are lit up by luminous objects). Ask the class for examples of objects for the two columns. You can add to their lists (e.g., luminous: Sun, stars, a firefly, a candle, a bulb, a TV set that is turned on; non-luminous: the moon, the planets).
• Demonstrate the following experiment using the materials listed above, leading the class towards understanding the terms transparent, translucent, and opaque. Shine the lighted torch on the tissue paper, the wood, and the glass. Which allows the light rays to pass through it and which blocks the rays of light?
• Ask the pupils to name a number of opaque objects (e.g. a brick wall, a tree, a house). Explain: When light rays reach an object, they are blocked by the object, creating a shadow. Are shadows always the same size?
• If possible, go out into the playground so that the pupils can draw out their shadows. Divide the class into pairs. One child from each pair will stand still, while the other draws the shadow with a piece of chalk. Later in the day, repeat the experiment, with the same pupils standing at the same spot. Let them observe the difference in the size of the shadow. When the source of light (in this case the Sun) is directly overhead, a small shadow is produced. When the Sun is low on the horizon, a long shadow is produced.

Using a torch and various objects, demonstrate how the size of a shadow depends on the object’s distance from the source of light.
• Have you experienced a thunderstorm? The thunder and lightning occur at the same time, but we see the flash of lightning in the sky few seconds before we hear the thunder. Why is this so? Because light
travels faster than sound. It takes just 8 minutes for the Sun’s light to travel 146 million km to reach the Earth.

• Show the class a burning candle and a lit bulb. Which one is shining more brightly? The brightness of light is called its intensity. The intensity of a bulb is greater than that of a candle.

Wind up: 5 min

• Ask relevant questions to summarize the lesson.

Give two examples each of transparent, translucent, and opaque objects.

What kind of objects give off their own light?

Which travels faster, sound or light?

How are shadows created?

EXERCISE (page 70)

1. a) true b) false c) true
d) false e) false

2. a) Luminous objects are those objects which give off their own light. Examples: the Sun, a street lamp, a torch, a TV set that is on.
b) Light travels in straight lines called rays.
c) Light travels faster than sound.
d) Shadows are longer in the morning, when the Sun is lower on the horizon, than at midday.
e) As the Sun is the biggest source of light, it gives off more energy in one second than the total energy ever used on the Earth.
f) Transparent materials are those materials through which light can pass easily, e.g., glass. Translucent materials are those materials through which only a little light can pass, e.g., tissue paper. Opaque objects do not allow light rays to pass through them, e.g., a book.

ACTIVITY (page 70)

1. The rays passing through glass or other liquids will be reflected. The pupils can see how the rays change direction, but remain straight. They will not pass through the mirror (they will be reflected), or the piece of wood.
Unit 1
The five senses

With the help of the given clues, solve the crossword puzzle.

Across

1. Tiny blood vessels present in the skin that give information about the objects that the body touches
2. A fleshy muscle in the mouth
3. It corrects the upside-down image that the eye receives

Down

4. Sound waves
5. They help keep the eye clean by protecting it from dust and dirt
6. The layer at the back surface of the eye ball on which light rays fall
Unit 2
Food chains

With the help of the given clues, solve the crossword puzzle.

Across
1. An animal that finds already dead animals to eat
2. Plants need this to produce their own food and energy
3. A zebra eats grass. A lion eats the zebra. What is this an example of?
4. An animal that eats other animals

Down
5. An animal that eats plants
6. An animal that eats both plants and animals
7. These make their own food and are at the start of food chains
Unit 4
What plants produce

A. Study the germination process shown in the picture below. Fill in the blanks using the words in the box.

When a seed is put into ____________, it needs enough ____________, ____________ and ____________, to help it grow into a new plant. Soon it begins to ____________. First the ____________ appears and begins to move slowly deeper into the soil. The ____________ begins to push up out of the soil. Finally, it begins to grow tiny ____________. The seed has ____________. 
Unit 5
Life cycle of plants

A. Write true or false next to each statement.

1. Flowers produce seeds in a fruit or seedpod. __________

2. The four main parts of a plant are carbon dioxide, oxygen, water and chlorophyll. __________

3. Plants are producers and make their own food. __________

4. Plants take in carbon dioxide through their roots. __________

5. Plants take in water and minerals through their leaves. __________

6. Photosynthesis is the process by which plants make food for themselves. __________

B. Use the words in the box to fill in the blanks.

chlorophyll energy roots oxygen grow alive

The stems and leaves of most plants are green. The green colour comes from a chemical called __________. This chemical uses the __________ from the Sun to make food. Leaves take in carbon dioxide and water and produce __________ which all living things need to stay alive. The process of photosynthesis helps the plant to __________ and remain __________.
Materials

Materials have different properties. Colour the pictures. Then choose two suitable words from the list below to describe each object.

<table>
<thead>
<tr>
<th>umbrella</th>
<th>cup</th>
</tr>
</thead>
<tbody>
<tr>
<td>bus</td>
<td>pillow</td>
</tr>
<tr>
<td>scarf</td>
<td>pan</td>
</tr>
<tr>
<td>desk</td>
<td>aloe vera</td>
</tr>
</tbody>
</table>

hard  opaque  strong  heavy  soft
magnetic  light  rough  transparent  flexible
transparent  shiny  waterproof  conductor
Unit 7
The solar system

A. Draw and label in the correct order the eight planets that make up the solar system.

B. Write any amazing or interesting facts about the solar system.

Did you know...
Unit 9
Circuits

With the help of the given clues, solve the crossword puzzle.

Down

1. Material that allows electricity to pass through it easily
2. The path along which the electric current flows
3. The tiny string for wire inside a bulb
4. Another name of a cell

Across

1. Electricity which comes to our home through thick wires
5. Material that does not allow electricity to pass through it
Unit 11
Energy

A. Look at the pictures below. Write ‘P’ if a picture shows potential energy. Write ‘K’ if it shows kinetic energy.

B. Solve this quiz by ticking the correct answers.

1. What has more potential energy?
   • The roller coaster on top of the crest.
   • The roller coaster sliding down.
   • They both have the same amount.

2. An apple hanging from a branch has
   • kinetic energy
   • light energy
   • potential energy

3. A moving object always has
   • potential energy
   • gravity
   • kinetic energy