

THIRD EDITION

NEW OXFORD PRIMARY SCIENCE

Teaching Guide

OXFORD
UNIVERSITY PRESS

LEVEL

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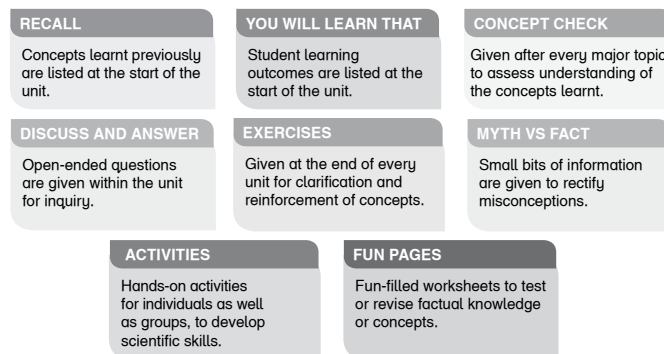


Contents

		Introduction	Page	iv
		Topic Progression Across NOPS Series	Page	vi
		Curriculum Map for Grade V	Page	viii
		Division of the Syllabus into Two Terms	Page	xi
Part 1		Ourselves		
Unit	1	The Brain and Nerves	Page	1
Unit	2	Microorganisms, Health, and Disease	Page	8
Part 2		Living Things		
Unit	3	Life Functions	Page	13
Unit	4	Classification of Living Things	Page	16
Unit	5	Plants	Page	21
Part 3		Materials and Matter		
Unit	6	Soil	Page	27
Unit	7	Matter and the Water Cycle	Page	30
Part 4		Forces, Energy, and Machines		
Unit	8	Forces in Action	Page	37
Unit	9	Electricity	Page	44
Unit	10	Magnets and Electromagnets	Page	49
Unit	11	Light	Page	54
Part 5		The Earth and the Atmosphere		
Unit	12	Air	Page	59
Unit	13	Environmental Pollution	Page	62
Part 6		The Sky and Space		
Unit	14	The Solar System	Page	65
		Answers	Page	69
		Sample Assessment Paper	Page	105

Introduction

This teaching guide consists of a scheme of work, worksheets, answers to questions in the book, sample assessment paper, and lesson plans. It is designed to support delivery of the National Curriculum effectively. It provides the teachers with teaching strategies to make learning student-centred, with simple and clear instructions for the teachers. The following key features of the book have been integrated into the lesson plans, making it easier for the teacher to teach the lessons:



The PDF version of this teaching guide (available online at OUP website) allows teachers to adapt and modify lessons to suit the diverse needs of their students. As a result, teachers can focus their efforts on maximising the learning of their students.

A progression map is given to enable department heads and coordinators to plan for the progression of students' learning.

Scheme of work

The division of the syllabus (units) into two terms has been provided. A detailed scheme of work has also been provided according to which the teachers can plan their lessons over the terms. The scheme of work is flexible and adaptable to teachers' needs and school requirements.

Progression chart

This shows how NOPS builds on students' prior knowledge and progresses the topics from basic to more complex across the series.

National Curriculum Alignment

Each teaching guide also includes curriculum maps for that grade. It shows where each SLO of the National Curriculum is covered in the NOPS series.

How to Use this Teaching Guide

Background information

Brief background information has been provided before the lesson plans. It outlines the scientific knowledge necessary to teach a particular unit.

Lesson plan

Teachers can use the provided lesson plans for each unit addressing the relevant learning outcomes as is or customise according to their class requirements. Lesson plans can be modified as per available resources.

- i. **Learning outcome:** Each lesson plan is according to the lesson outcomes which are closely related to the student learning objectives from the National Curriculum.
- ii. **Introduction:** Introduces the various techniques that are used in this teaching guide:
 - Questions can be asked to check background knowledge or misconceptions about the concept being taught. This teaching guide gives interesting ways to encourage brainstorming and asking questions.
 - For early years, pictures (flashcards) or videos can be shown to initiate introductory discussion.

- If resources are available, experiments or hands-on activities can be arranged. The teacher can ask questions before an experiment to elicit responses from students. After the results have been observed and recorded, ask what was done in the experiment and what happened. Do the results answer the questions posed at the start of the experiment? How do they explain what happened?

To focus on what the students need to learn by the end of the lesson.	Lesson Plan 2	Student Book Page 4
To assess background knowledge of students and develop their interest in the lesson being taught, different activities have been provided.	<p>Learning Outcome Students should be able to: explain the difference between living and non-living things.</p> <p>Introduction</p> <ul style="list-style-type: none"> Show pictures of a baby, a seed, and a kitten. Ask the students what these living things will grow up to be. (a child, a small plant, a cat) Pointing to a desk in the classroom, ask, "Is the desk a living thing?" Explain that it is not because it cannot breathe or grow and does not need food and water. Things which do not breathe, grow, move or eat are known as non-living things. <p>Main Teaching</p> <ul style="list-style-type: none"> Discuss the picture on page 4 of the Student Book. Ask the following questions: <ul style="list-style-type: none"> ➤ What are the children doing? ➤ Can you name all the living things in this picture? ➤ How many dogs are there in the picture? ➤ Can you see any non-living things in the picture? Name them. All living things grow. Ask the students if they have seen kittens or puppies. Explain that animals have young ones. Discuss their needs as living things. They need food and water. They also need air to breathe, and shelter to live. Point to a few things in the classroom, for example, a chair, a book, a school bag, and a water bottle. Ask what these things need. Explain that they do not need anything because they are non-living things. They do not grow and cannot move. They do not need food or water. 	Instructions for: how to use the student book as a resource for teaching, and for practical demonstrations, discussion questions, hands-on activities.
Teacher-led activity	<p>Guided Practice Help students to answer Question 3 on page 7.</p> <p>Independent Working Ask students to attempt Questions 1 and 2 on page 6.</p> <p>Wrap Up Hand out worksheet 2 to students.</p> <p>Homework/Going Further Ask the students to list down and draw in their notebooks and draw pictures of five living things and five non-living things.</p>	To conclude the lesson and summarise the learning of students.
Activity where students will work independently and apply their learning.		For reinforcement

- iii. **Main teaching:** After introducing the lesson, teachers can utilise the techniques suggested in the 'main teaching' section to lead the students through the lesson in detail. Use different techniques to make learning of the lesson as interesting for the students as possible. Demonstrations, hands-on activities, model-making, drawing diagrams, videos, field trips, reading, etc., can be used to teach the topic in detail.
- iv. **Guided practice:** Activities requiring teacher guidance have been provided in this section.
- v. **Independent working:** Suggestions on how to encourage students to work independently using the activities mentioned in the lesson plans.
- vi. **Wrap up:** Conclude the lesson and summarise the learning of students by using wrap activities given in the lesson plans.
- vii. **Worksheet:** Photocopiable worksheets have been provided with lesson plans, which can be used in the class or for homework.

Answers

Answers to all the questions given in exercises, fun pages, 'concept check', and 'discuss and answer' have been provided at the end of the lesson plans.

Assessment:

Sample Assessment Paper has been provided at the end of the teaching guide, based on the standard board format. The format of the sample paper can be used to design assessment papers.

Concept Check boxes given in the student book can be used for assessing learning during the class.

Topic Progression Across NOPS Series

Starter		Book 1		Book 2	
Unit	Ourselves	Unit	Ourselves	Unit	Ourselves
1	My Body	1	The Human Body - parts of the body and their functions - growth of living things	1	The Human Body - bones - muscles and joints - internal organs ((brain, heart, lungs, stomach) - sense organs
2	Healthy Habits	2	The Senses - senses and sense organs - movement	2	Health and Safety - looking after body - staying safe
		3	Healthy Habits - food for energy - health habits - illness		
Living Things		Living Things		Living Things	
3	Animals	4	Plants - plants and living things - parts of plants	3	Plants and Their Parts - types of plants - parts of plants - parts of a fruit - seeds
4	Plants	5	Animals and How They Live - basic characteristics of animals - animal food, importance of animals	4	Uses of Plants
5	Living and Non-Living Things			5	Animals - animals live in different places - special body parts - wild and domestic animals - animals and their young ones
Materials and Matter		Materials and Matter		Materials and Matter	
6	Materials	6	Materials and Object - shapes, size, texture and weight of objects - natural and man-made materials	6	Solids, Liquids, Gas - natural resources and man-made materials - solids, liquids, and gases - materials can change shape - more about rocks
				7	Measuring Instruments - measuring length - measuring weight - measuring time - measuring temperature - measuring liquids

Book 3		Book 4		Book 5	
Unit	Ourselves	Unit	Ourselves	Unit	Ourselves
1	The Human Body - brain - sense organs - skeletal system, muscular system, digestive system, circulatory system, respiratory system, nervous system, excretory system	1	The Human Body - cells - tissues - organs - skeletal system - muscular system	1	The Brain and Nerves - nervous system - sense organs
2	Health and Safety - exercise for body - balanced diet - sleep and rest - staying safe	2	Food and Balanced Diet - importance of food - food groups - food pyramid	2	Microorganisms, Health, and Disease - microorganisms - microorganisms and disease - keeping healthy
		3	Digestion - teeth and its type - taking care of teeth - digesting food - pancreas, liver, and gall bladder - eating habits		
Living Things		Living Things		Living Things	
3	Living on Earth - characteristics of living things - movement of animals and plants - growth - feeding - feeling - breathing - reproduction - habitats - ecosystems - extinct animals	4	Characteristics of Living Things - animal vs plant cells - characteristics of living things - dependency on each other - life cycles	3	Life Functions - movement - growth - food - respiration - sensitivity - reproduction
4	The Life Cycles of Animals - life cycle of fish, insect, birds	5	Environments and Food Chains - environment components - classification of animals and plants - herbivores, carnivores, omnivores - food chains	4	Classification of Living Things - animals: vertebrates and invertebrates - friends or enemy
5	The Life Cycles of Plants - flowers, fruits, and seeds - germination - vegetables - life cycle of plant			5	Plants - non-flowering plants - flowering plants - comparing a monocot and a dicot - germination
Materials and Matter		Materials and Matter		Materials and Matter	
6	Materials - types of materials - properties of materials - kinds of materials	6	Solids, Liquids, and Gas - matter and its forms - changes of state	6	Soil - what is soil made up of? - layers of the soil - types of soil
		7	The Study of Matter - introduction to chemistry - mixtures, solutions - methods of separation	7	Matter And the Water Cycle - solid, liquid, gas - comparing states of matter - changes of states - water cycle - reversible and irreversible changes

Starter		Book 1		Book 2	
	Forces, Energy, and Machines		Forces,energy, and Machines		Forces,energy, and Machines
7	Movement	7	Movement - introduction of movement - force is needed to move - use of machines to move	8	Electricity - mains electricity and batteries - batteries and cells
8	Sounds	8	Sounds - introduction to sound - loud and soft sound - different ways of producing sound	9	Light and Shadow - light is energy - sources of light - brigh and dim light - properties of light - what makes a shadow big or small - materials and light
9	Light and Colours	9	Light and Shadow - use of light - sources of light - bright and dim light		
The Earth and the Atmosphere		The Earth and the Atmosphere		The Earth and the Atmosphere	
10	The Earth and The Atmosphere	10	The Weather - types of weather - seasons	10	Water - importance of water - sources of water - uses of water - saving water
11	Air			11	The Environment - what environment is - protecting animals - three R's - looking after natural resources - deforestation
12	Water And Its Uses				
13	The Weather				
Sky and Space		Sky and Space		Sky and Space	
14	The Sky	11	The Earth, Sun,Moon, and Stars - shapes of earth - Sun - Earth travel round the Sun - Moon travel round the Earth	12	The Earth, Sun, Moon, and Stars - introduction to Earth and Sun - day and night - Moon its shape, life on Moon, and its rotation

Book 3		Book 4		Book 5	
Forces,energy, and Machines		Forces,energy, and Machines		Forces,energy, and Machines	
7	Force - introduction to force - kinds of force - friction - gravity	8	Heat - atoms - temperature - heat - thermometer	8	Forces In Action - measuring force - inertia - friction - ways to reduce friction - gravity - balanced and unbalanced forces - mass and weight - simple machines
8	Electricity - electric current - conductors and insulators - circuits - flow of current - complete circuit	9	Forces and Machines - speed - machines and types of machines	9	Electricity - atoms - electric charge - two types of electricity - electricity in nature - circuits and fuses
9	Simple Machines - work - tools or machines - transport	10	Circuit and Switches - complete and incomplete circuits - switches - series and parallel circuits - conductors and insulators	10	Magnets And Electromagnets - magnetic field - demagnetism - creating an electromagnet - electromagnets in use
10	Sound and Light - how is sound produced - how are sounds useful - loud or soft sound - sources of light - speed of light	11	Magnetism - what is a magnet? - magnetic materials - magnetic field - poles - making magnets	11	Light - pinhole camera - reflected light - shadows - eclipses
		12	Sound - sound waves - frequency - sound medium - noise, echoes		
The Earth and the Atmosphere		The Earth and the Atmosphere		The Earth and the Atmosphere	
11	The Earth - structure of Earth - how Earth was formed - rocks, minerals, soil	13	Movement of Earth - rotation - revolution - equator - seasons	12	Air - air has mass - the atmosphere - uses of air
				13	Environmental Pollution - biodegradable waste - non-biodegradable waste - causes of pollution - types of pollution - the three R's - environment watch
Sky and Space				Sky and Space	
12	The Earth - introduction to Solar system - objects in space - difference and similarities between a planet and a moon - satellites and space			14	Solar System - the solar system - space probes

Curriculum Map for Grade V

Knowledge Strands	Learning Units	SLOs (incl. Knowledge, Skills, Attitudes and STSE)	Covered in Unit no.
LIFE SCIENCE	Classification of Living Things	Define classification.	unit 4
		Explain the need and importance of Classification.	unit 4
		Differentiate between vertebrates and invertebrates according to key characteristics.	unit 4
		Identify vertebrates and invertebrates from their surroundings.	unit 4
		Classify vertebrates into mammals, reptiles, fish, birds and amphibians on the basis of their characteristics.	unit 4
		Identify key characteristics of worms and insects.	unit 4
		Compare flowering and non flowering plants.	unit 5
		Classify the flowering plants into two major groups and give examples of each group.	unit 5
		Compare the structure of a monocot and a dicot seed.	unit 5
		Compare the structure of a monocot and a dicot leaf in terms of its shape and venation.	unit 5
		Differentiate between the structure of monocot and dicot flower in terms of number of floral leaves.	unit 5
	Seeds: Structure and Germination	Compare the structure and function of French bean and Maize seed.	unit 5
		List the functions of cotyledons.	unit 5
		Identify the conditions necessary for germination.	unit 5
		Predict what would happen to plant, if conditions necessary for germination are not fulfilled; Conduct an investigation to assess your prediction.	unit 5
	Microorganisms	Define microorganisms.	unit 2
		Identify the main groups of microorganisms and give examples for each.	unit 2
		Describe the advantages and disadvantages of microorganisms in daily life.	unit 2
		Define infection.	unit 2
		Identify ways by which microorganisms can enter the human body.	unit 2
		Suggest ways to avoid infections.	unit 2
	Environmental pollution	Define pollution.	unit 13
		Describe different kinds of pollution.	unit 13
		Explain main causes of water, air and land pollution.	unit 13
		Explain the effects of water, air and land pollution on environment and suggest ways to reduce them.	unit 13
		Plan and conduct a campaign to bring awareness to a problem of environmental pollution in their surroundings.	unit 13
		Differentiate between biodegradable and non biodegradable materials.	unit 13
		Explain the impact of non-biodegradable materials on the environment.	unit 13
		Suggest ways to reduce the impact of non biodegradable materials.	unit 13

PHYSICAL SCIENCE	Matter and Changes in its States	Describe the properties of the three states of matter on the basis of arrangement of particles.	unit 7
		Demonstrate the arrangement of particles in the three states of matter through models.	unit 7
		Investigate the effect of heat on particle motion during a change in states.	unit 7
		Demonstrate and explain the processes that are involved in the change of states.	unit 7
		Describe the role of evaporation and condensation in the water cycle.	unit 7
		Identify and describe forms of moisture in the environment (e.g. dew, snow, fog, frost, rain).	
	Force and Mechanisms	Describe friction and its causes.	unit 8
		Explain the advantages and disadvantages of friction.	unit 8
		Suggest methods to reduce friction.	unit 8
		Identify what cyclists; swimmers and parachutists do to reduce friction.	unit 8
		Explain the gravitational force using different examples.	unit 8
		Distinguish between mass and weight.	unit 8
		Differentiate between balanced and unbalanced forces.	unit 8
		Describe the effects of balanced and unbalanced forces on the motion of an object.	unit 8
		Describe the term inertia.	unit 8
		Demonstrate how wedge and inclined plane are used to move the objects.	unit 8
		Compare the three kinds of levers using examples.	unit 8
		Describe how lever makes work easier by giving examples of its uses from daily life.	unit 8
	Properties and Behaviour of Light	Differentiate between luminous and non-luminous objects.	unit 11
		Identify and differentiate between transparent, opaque and translucent objects in their surroundings.	unit 11
		Investigate that light travels in a straight line.	unit 11
		Explain the formation of shadows and eclipses.	unit 11
		Predict the location, size and shape of a shadow from a light source relative to the position of objects.	unit 11
		Explain the scientific principle that works in a pinhole camera.	unit 11
		Identify different phases of moon.	unit 14
	Electricity and Magnetism	Describe flow of electric current in an electrical circuit.	unit 9
		Describe fuse and its importance in any electric circuit.	unit 9
Explain the phenomenon of lightening.		unit 9	
Explain the production of static electrical charges in some common materials.		unit 9	
Conduct an experiment to show the magnetic field of a bar magnet.		unit 10	
Make an electromagnet with the help of a cell, iron nail and wire and show its working.		unit 10	

		Explore different electromagnetic devices used in their daily life.	unit 10
		Describe the relationship between electricity and magnetism in an electromagnetic device.	unit 10
		Explain the earth's magnetic field and relate it with the use of a magnetic compass.	unit 10
		Make a magnetic compass and show it's working .	unit 10
	Soils	Describe the characteristics of soil.	unit 6
		Identify similarities and differences among the different types of soil.	unit 6
		Investigate and describe soil components.	unit 6
		Describe the effect of moisture on soil characteristics (e.g. how it hold together, texture, colour).	unit 6
		Investigate and describe how living things affect and are affected by soils.	unit 6
	EARTH & SPACE SCIENCE	Solar system	Differentiate between a star and a planet.
Explain that the Sun is a star.			unit 14
Describe the solar system and its planetary arrangement showing position of Earth in our solar system.			unit 14
Explain the relative size of the planets and their distance from the sun using a model.			unit 14
Compare the sizes of Earth, sun and moon.			unit 14
Investigate the moons of different planets of the solar system.			unit 14

Scheme of Work

1 st Term	2 nd Term
Unit 1: The Brain and Nerves	Unit 4: Classification of Living Things
Unit 2: Microorganisms, Health, and Disease	Unit 5: Plants
Unit 3: Life Functions	Unit 7: Matter and the Water Cycle
Unit 6: Soil	Unit 10: Magnets and Electromagnets
Unit 8: Forces in Action	Unit 11: Light
Unit 9: Electricity	Unit 13: Environmental Pollution
Unit 12: Air	Unit 14: The Solar System

Unit	Lesson plan number	Topic wise allocations of periods	Learning outcome
1 The Brain and Nerves	Lesson 1	1 period	The brain, nerves, and sense organs form the nervous system.
	Lesson 2	1 period	The nervous system controls all actions and movements.
2 Microorganisms, Health, and Disease	Lesson 1	2 periods	A balanced diet is necessary for good health.
	Lesson 2	1 period	There are ways to preserve food to keep it free of germs.
	Lesson 3	2 periods	Diseases are spread in a number of ways, but can also be controlled.
3 Life Functions	Lesson 1	1 period	Certain functions are common to all living things, but they are performed in a variety of ways.
	Lesson 2	1 period	All living things move, grow, feed, breathe, feel, reproduce, and produce waste matter.
4 Classification of Living Things	Lesson 1	1 period	There are five kingdoms of living things.
	Lesson 2	1 period	There are five classifications of vertebrates
	Lesson 3	1 period	There are more invertebrates than vertebrates on Earth. They are classified according to how their
5 Plants	Lesson 1	1 period	Seeds need the right conditions to germinate.
	Lesson 2	2 periods	Monocotyledonous and dicotyledonous plants can be distinguished by their characteristics.
	Lesson 3	1 period	Plants can be divided into flowering and non-flowering plants.
6 Soil	Lesson 1	1 period	Soil is made of water, air, minerals, and organic matter.
	Lesson 2	2 periods	Moisture has different effects on different types of soil.
7 Matter and the Water Cycle	Lesson 1	2 periods	Particles are arranged differently in the three different states of matter and heat has an effect on the movement of particles in matter.
	Lesson 2	2 periods	Changes of the state of matter can be physical or chemical; reversible or irreversible.
	Lesson 3	1 period	Evaporation and condensation are key parts of the water cycle and evaporation and condensation lead to the formation of rain, dew, fog, mist, frost, hail, and snow.

8 Forces in Action	Lesson 1	1 period	A force is a push or a pull; it can start a body moving, stop it from moving, and change its speed and its direction of motion and force is exerted by muscles, machines, magnets, gravity, and in other ways.
	Lesson 2	1 period	Friction and gravity are forces.
	Lesson 3	2 period	Forces can be balanced or unbalanced. Simple machines help us to do work.
	Lesson 4	2 period	Simple machines help us to do work.
9 Electricity	Lesson 1	2 periods	All matter is made of atoms; atoms contain protons, neutrons and electrons and the movement of electrons creates electricity.
	Lesson 2	2 periods	There are two forms of electricity: current and static.
	Lesson 3	1 period	Fuses are safety measures to prevent too much current from flowing and lightning is electricity.
10 Magnets and Electromagnets	Lesson 1	2 periods	A magnetic field is invisible but we can make it visible with a bar magnet and iron filings.
	Lesson 2	1 period	Magnetic compasses help us to navigate using the Earth's magnetic field.
	Lesson 3	2 periods	An electromagnet can be switched on and off and we can make a simple electromagnet.
11 Light	Lesson 1	2 periods	Some objects are luminous, they produce light. A pinhole camera uses light to form an image.
	Lesson 2	2 periods	Materials are opaque, translucent, or transparent and shadows depend on the intensity of light, the size of the object and their distances.
	Lesson 3	1 period	Eclipses can be solar or lunar; they can be partial or total.
12 Air	Lesson 1	2 periods	The layer of air surrounding the Earth is called the atmosphere. Air contains many gases. Oxygen is used for breathing and burning.
	Lesson 2	1 period	Air has weight, occupies space, and exerts pressure. Moving air is used as a source of energy.
13 Environmental Pollution	Lesson 1	2 periods	Pollution negatively affects our environment and causes major problems. There are different types of pollution which have different causes and effects.
	Lesson 2	1 period	Some materials are biodegradable and are recycled by nature.
14 The Solar System	Lesson 1	2 periods	The Sun is a star; it provides heat and light and is necessary for life on Earth. The eight planets in our solar system orbit the Sun.
	Lesson 2	2 periods	The Moon is a natural satellite of the Earth. Other planets have Moons too.

Unit 1: The Brain and Nerves

This chapter covers the basic knowledge about the brain as the control centre of the body and the nervous system consisting of brain, nerves, and sense organs which controls all actions and movements of the body. Students will learn about the parts of the brain and their functions.

Lesson Plan 1

Student Book Pages 2–5

Learning Outcome

Students should be able to:

explain that the brain, nerves, and sense organs together form the nervous system.

Introduction

Show the students a sheep's brain.

- Ask students to visualise the human brain.
- Discuss how the brain might feel to the touch.

Main Teaching

- Ask the students to feel their skull. Explain that the brain and the spinal cord are protected by bones: the brain by the bones of the skull, and the spinal cord by a set of ring-shaped bones called vertebrae.
- Arrange the students in groups of four and give each group a word search to solve.
- Ask them to look at the picture on page 2, and answer the following questions:
Q1. What would you do if you saw a bus coming towards you?
Q2. How can the ears tell the difference between the sound of a human voice and that of a car?

Write pupils' responses on the board.

- Explain that they could not solve the word search without a brain. Explain that the brain acts as the body's control centre and coordinates the body's activities. The brain, with the help of the nervous system, detects the world around us.
- Explain that the brain looks like a large, pinkish-grey walnut show them a walnut. However, the brain feels soft and sticky to touch. Point out that the brain has many more folds than a walnut.
- Write the word 'Brain' on the board and draw lines coming out of this word to form a word web. Write on it the following points:
 - It is the main organ of the nervous system.
 - Its main parts are the cerebrum, cerebellum, and medulla or brain stem.
 - Each part of the brain has a specific function.
- Discuss in detail the different functions of different parts of the brain. Ask a student to put on a bath cap that is marked with the different parts of the brain and then explain the importance of the different parts to our body.

- Explain how scientists discovered the above fact, when they found that people who had injured one side of the brain lost control of parts of the body, on the opposite side.
- Compare the brain to a computer. Just as the computer sends information through electronic circuits, the brain sends signals through the nerves to the rest of the body. Nerves are made up of nerve cells and are of two kinds: sensory nerves and motor nerves. The nervous system is made of nerve cells called neurons. About 100 billion nerve cells make up the brain and all the nerve cells are interconnected. Show a slide or image of neuron.
- Ask the students to look at the picture on page 4. Discuss the nervous system and its importance. The brain, spinal cord, and nerves form a very efficient communication network. This network is known as the nervous system. It controls all actions and movement.

Guided Practice

- Ask the students to match the name with the functions. Use the activity cards at the end of this unit.
- Help the students to identify the various parts of the nervous system. Ask them to look at the diagram on page 3 of the Student Book for help.

Independent Working

Attempt the Fill in the blanks activity on page 5.

Wrap Up

Using different colours of modelling dough, create a model of the brain. Be sure to include the three parts of the brain:

- cerebrum
- medulla or brain stem
- cerebellum

Homework/Going Further

- Help the students to sketch an outline of the shape of the brain in their notebook and name the three different parts of the brain.
- Ask them to note down the different functions of each section.

Lesson Plan 2

Student Book Pages 6–7

Learning Outcome

Students should be able to:

explain that the nervous system controls all actions and movements.

Introduction

Ask the Students to draw an outline of their hand in their notebook and on each finger write down the five senses and related sense organs.

Encourage the students to display their work to the other students and discuss the five senses one by one.

Main Teaching

- Call up students one by one and blindfold them for the following activities. Choose materials that are safe to touch, taste, and smell.
 - Touch a cup of ice or warm water.
 - Smell a mango, perfume, or an onion.
 - Taste a sweet or a lemon.
 - Hear the sounds of a bell and a whistle.
- Take away the blindfold. Ask them how they were able to identify the objects when they could not see them. Explain that when they described the object that they could not see, the brain enabled them to recognise, remember, and speak. When they touched an object, the brain sent signals informing them whether the object was hot or cold. The brain is the organ that is responsible for our:
 - five senses
 - thoughts
 - movements and actions (voluntary and involuntary)
 - feelings
 - memories
- Explain that brain is the main organ of the body but it cannot do the job alone. The nervous system connects the messages from the brain to the rest of the body so we can do action such as walk, talk, think, feel, and breathe. The nervous system is the information highway that controls everything we do and the brain is the ‘boss’ of the body. The human brain is the organ whose working makes us different from other living organisms.
- Show the students models or diagrams of the skin, the eye, and the ear. Discuss their structures and functions. Explain that these organs are called sensory organs because they enable us to sense changes in our surroundings. For example, when we touch a hot object, we immediately pull our hands away. Explain that this is a reflex action. State that a reflex action is an involuntary, automatic, and nearly instantaneous response to a change in surroundings that we do not think about. We are born with reflex actions – we do not learn them. Reflex actions are automatic and are controlled by neurones (nerve cells) in the spinal cord.
- Write Reflex Action on the board and give students an opportunity to describe situations when their senses helped them stay safe.
- Ask one of the students to draw a picture of a nerve on the board and explain the different types, i.e. Sensory nerve and Motor nerve. Explain how impulses travel through the two types of nerve.
- Discuss Leonardo da Vinci and his achievements listed on page 7.

Guided Practice

Divide the students into groups of four and ask them to identify each of the senses and demonstrate how each of the senses helps us to recognise, describe, and safely use a variety of materials. (See Student Book page 6. For example:

- when an object comes close to your eye, you blink quickly.
- if you accidentally sit on a pin, you jump up. When you touch a hot object, your hand is withdrawn quickly.

Direct students to make a chart to describe the above examples.

Independent Working

Ask the students to write answers in their notebooks for Questions 1-3 on page 7.

Wrap Up

The pupils should now, either independently or in pairs, be able to discuss and solve Questions 2 and 3 of the exercise on page 8.

Homework/Going Further

Neuroscience is the scientific study of the nervous system. Encourage the pupils to search the Internet to find the names of notable neuroscientists. You, as a teacher, can also discover more about this specialised branch of biology in order to help you discuss this topic confidently.

Word Puzzle:

Search up, down, forward, AND backward to find the hidden words.

Hidden words to find: SOLVE, NOSE, BRAIN, EYE, EAR, THINK, TASTE, SKIN, TOUCH, NERVES, SMELL, WATCH, CATCH, NERVOUS, IMAGINE

A	M	T	E	N	I	G	A	M	I	I	T	Z
D	S	E	V	R	E	N	O	S	E	H	G	F
N	C	B	N	J	I	L	L	E	M	S	J	L
I	N	N	E	R	V	O	U	S	R	K	K	M
A	R	G	T	H	C	U	O	T	H	I	N	K
R	A	E	G	Y	J	I	M	L	C	N	Q	Z
B	P	O	Y	Q	I	L	E	Q	T	W	S	F
Q	S	O	L	V	E	N	Y	T	A	U	I	G
K	A	S	T	A	S	T	E	R	C	D	K	S
O	Y	T	E	U	V	B	W	A	T	C	H	W

Activity Cards: functions of different parts of the brain

<p>It enables you to touch and feel the texture of things. It also enables you to remember things.</p>	<p>It controls involuntary actions such as breathing, digesting, and the beating of the heart muscle. When the rest of the brain goes to sleep, this part keeps working.</p>
<p>cerebrum</p>	<p>medulla or brain stem</p>
<p>Its function is to control the balance and movement of the muscles and joints. It helps you to run, walk, jump, and do many other physical activities in which the muscles are involved.</p>	<p>cerebellum</p>
<p>do exercise</p>	<p>digest food</p>
<p>choose a colour</p>	<p>recognise a sound</p>
<p>bend down</p>	<p>memorise</p>

Worksheet 1-1

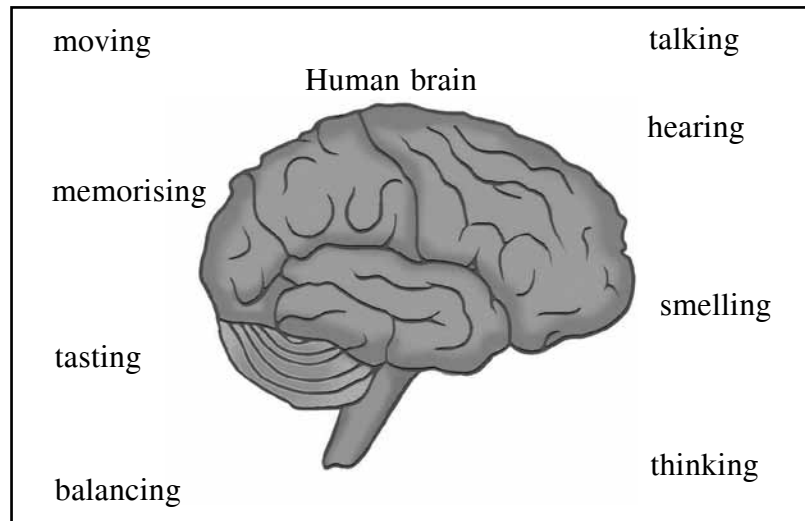
Q1. Circle the letter by the correct answer.

1. Which one of the following is not a function of the skull?
 - a. It protects the brain from injury.
 - b. It provides structural shape and design for the head and face.
 - c. It connects the spinal cord to the nerve cells in the brain.
2. The three basic parts of the nervous system are:
 - a. brain, heart, nerves.
 - b. brain, spinal cord, nerves.
 - c. brain, arteries, stomach.
3. Ahmed hurt his finger. Which part of the nervous system is responsible for transmitting information to the brain about Ahmed's injury?
 - a. nerves
 - b. brain stem
 - c. spinal cord
4. Which of the following is not a function of the spinal cord?
 - a. It controls body functions by sending and receiving messages to and from the brain.
 - b. It helps keep our body straight and upright.
 - c. It helps connect the various organs of the body to the brain.
5. Without the nervous system, we would not be able to:
 - a. taste
 - b. smell
 - c. both of the above

Q2. Define a reflex action.

Worksheet 1-2

Q1. Draw lines to show which part of the brain is responsible for the following functions:



Q2. Write down the names of the five senses and the sense organs related to them.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

Q3. Draw a labelled diagram of a human eye.

Unit 2: Microorganisms, Health, and Disease

Students have the prior knowledge of the components of food i.e. like proteins, carbohydrates, fats, vitamins, and minerals needed by the body. They will further learn about the importance of balanced diet for good health and different ways to preserve food to keep it free of germs. Students will review the healthy habits and learn that some diseases that are caused harmful by microorganisms.

Lesson Plan 1

Student Book Page 11

Learning Outcome

Students should be able to:

explain why a balanced diet is necessary for good health.

Introduction

- Ask the students to look at the Concept Check exercise on page 11 of the Student Book and unscramble the letters to find the answers.
- Ask them to check their lunch boxes and identify which food groups their lunch items belong to.

Main Teaching

- Ask the students to read about carbohydrates, proteins, and vitamins on page 11 of the Student Book. Discuss the role of each nutrient in staying healthy.
- Write the words Balanced Diet on the board and encourage students to add the names of any two foods they like; remember, more than one student may like the same food(s). Discuss whether their choices reflect a balanced diet. Discuss the importance of a balanced diet.
- If our bodies are human machines, then food is our fuel. How well we eat affects how well our bodies work, and how long we live. It is especially important that we eat healthily as children, as we are still growing and developing; if not given proper nutrients, a young plant grows up to be a weak, sickly plant.
- A healthy diet is called a balanced diet as it consists of different types of foods in the amounts required to stay healthy.
- Eating properly and regularly is really important; what we eat and drink now affects our future health.

Guided Practice

The pupils should now be able to discuss and solve Questions 2 and 3 of the exercise on page 8.

Independent Working

Ask the students to design a healthy platter for class lunch, which includes something from each of the 5 food groups. Make sure to include enough fruit and vegetables, as well as carbohydrates, but do not include too many fatty dairy products, fats, or sugars. Think about how you will get your proteins too. Display students' work in the classroom for the next discussion.

Wrap Up

A chart of a food pyramid should be displayed to help students discover the correct proportions of each type of nutrient. Ask students to design some posters to warn people about the dangers of eating too much sugar, not exercising, and poor food hygiene. Display the posters in the classroom.

Homework/Going Further

Collect five pictures of unhealthy people from magazines/newspapers/the internet and make a booklet. Suggest reasons for their poor health.

Lesson Plan 2

Student Book Pages 12–14

Learning Outcomes

Students should be able to:

- explain how diseases are spread.
- identify ways in which the spread of disease can be controlled.

Introduction

Place a small amount of baby powder in the palm of your hand and pretend to sneeze by blowing on it. Students can see where the baby powder spreads; help them realise the importance of covering their mouths when they sneeze. Then ask your students what happens when they sneeze. Show them the ‘germs’ (baby powder) in your hand.

Main Teaching

- Read aloud about microorganisms and diseases on student book page 14. Discuss communicable diseases and non-communicable diseases.
- Talk about the different types of vitamins, their sources, and their importance to humans.
- Discuss the ways in which diseases are spread. For example, some diseases can be passed on through infected food and water.
- Describe how, when harmful microorganisms enter the body, they reproduce rapidly. They feed on the body cells and produce poisonous waste substances, causing infection.
- Use charts to show how various diseases are spread. For example, you could show how malaria is spread by drawing pictures and writing labels for: mosquito eggs, larvae breeding in stagnant water, adults flying off, female mosquito biting a person, the person developing malarial fever.
- Show news items from newspapers, magazines or the internet about cholera and/or typhoid, and explain that these diseases are spread through infected food and water. Educate students to avoid consuming food and water that has been left in the open for some time, as bacteria and fungi can land on it and quickly breed in the food.
- Ask the students if they have ever been absent due to illness and listen to their ideas about the causes and symptoms of their illnesses.
- Show tetra packs, tin cans, and other food packaging. Look at the lists of contents and point out the word ‘preservative(s)’ and give a brief explanation. Discuss the importance of food packaging.

Guided Practice

Slice an apple, and blanch it to kill any germs that may be on it already. Before students have washed their hands, let each handle a small slice of apple. Then ask them to wash their hands using the proper technique and handle another slice of apple. Put each slice in a separate, labelled plastic bag. After about five days, have students observe and draw both slices in their science notebooks.

Ask students to write observations addressing the following points:

- Is there any difference between the slices?
- What are the reasons for the differences?

Independent Working

Draw charts to show how various diseases are spread. Students can display their posters in the school's corridors.

Wrap Up

- Show a photograph of Louis Pasteur and discuss his achievements.
- Discuss Questions 5-7 on page 20.

Homework/Going Further

Make an eye-catching poster about Healthy Eating Habits.

Lesson Plan 3

Student Book Pages 15–17

Learning Outcome

Students should be able to:

describe different ways to preserve food to keep it free from germs.

Introduction

Put some glitter on two students' hands. Ask those students to shake hands with other students, who should then shake hands with other students, and so on. After everyone has shaken hands with at least two people, ask all students to check if they have glitter on their hands. Discuss how shaking hands can spread germs and brainstorm ways to avoid germs and the spread of germs.

Repeat the activity, only this time ask the students whose hands have glitter on them to wash their hands before they shake hands with other students. Ask the students again if they have glitter on their hands. Ask them what could be the reason for the different result.

Main Teaching

- Handwashing activity: <https://www.youtube.com/watch?v=IisgnbMfKvI> Show this video in the lesson and discuss the importance of washing hands. Demonstrate the hand washing method and ask all the students to observe and practise it.
- Explain that many diseases are caused by very tiny organisms called microorganisms, or germs. A microorganism is so small that it can only be seen with the help of a microscope. Show the students a slide of fungi/bacteria. Therefore, they are called microscopic organisms. They are found everywhere. They can cause diseases in plants and animals.

- Explain the different types of microorganisms like virus, bacteria, and fungi. Differentiate between the terms unicellular and multicellular with examples.
- Discuss some useful and harmful microorganisms.

Guided Practice

Make groups of four students and give to each group the following: a microscope lens, a piece of rotten fruit, yeast, and a piece of bread with fungus growing on it. Ask them to study the items through the lens and write the characteristics of each in their notebooks.

Independent Working

Ask your students to design a tissue box display (diorama) that reminds people to wash their hands. Their designs could address the following questions:

- Why should people wash their hands?
- When should people wash their hands?
- How should people wash their hands?

Students can display their projects outside the school toilets.

Wrap Up

Ask students to answer Questions 3 and 4 on pages 18-19.

Homework/Going Further

- Take a rotten fruit. Insert a toothpick into the rotten part and then insert the same end into a fresh fruit. Put the fruit aside for a few days.
- Repeat the same with another rotten fruit, only this time wash the toothpick well with handwash liquid before inserting it into the fresh fruit. Write your observations on a sheet of coloured paper and glue it in your notebook.
- Direct the students to research and create a table of diseases caused by viruses, bacteria, fungi, and protozoa, in living things.

Worksheet 2-1

Q1. Complete the following table:

Microorganisms	Disease
Bacteria	
	Influenza , chickenpox, cold, measles, mumps, hepatitis.
Protozoa	
	Ringworm and athlete's foot

Q2. Give reasons why:

a. eating too many sweets should be avoided.

b. we should drink two glasses of milk daily.

Q3. Say whether each sentence is true or false.

a. Mosquito bite can spread diseases. _____

b. Deficiency diseases cannot be prevented by eating relevant foods. _____

c. Cholera and typhoid are spread through infected food and water. _____

d. Communicable or infectious diseases do not spread from person to person.

e. To pasteurize milk it is first heated to 10°C and then cooled quickly.

Unit 3: Life Functions

This topic is about functions that are common to all living things are performed in a variety of ways by all living things.

Lesson Plan 1

Student Book Pages 22–24

Learning Outcome

Students should be able to:

explain that certain functions are common to all living things, but they are performed in a variety of ways.

Introduction

Ask each student to name one living thing and one non-living thing. List all their contributions on a large sheet of paper or on the board, under the column headings Living and Non-living

Main Teaching

- Ask the students to give definitions of *living* and *non-living*. Remember that the difference between non-living and dead can be confusing to some children.
- Display a variety of pictures of living and non-living things in the classroom. Draw a table on the board and ask students to place the pictures in the correct columns
- Read the text on pages 22 and 23. Invite students to talk to a partner to ask and answer questions about what they can see in the illustrations.
- Ask questions about key details from the text such as:
 - In what ways are you the same as a cat?
 - What do living things need to survive?
 - How many senses do we have?

Guided Practice

Draw two big circles on the board, and label one Living Things and the other Non-living Things. Surround each big circle with 4 small circles connected to it by lines. Explain that you will be listing the characteristics of living and non-living things. In the smaller circles surrounding the large Living Things circle, write characteristics such as, something that eats, drinks, grows, or changes, and can make other things like itself. In the small circles surrounding the large Non-living Things circle, list characteristics such as, does not eat, does not drink, does not grow, and cannot make other things like itself.

Discuss the differences between the two webs.

Independent Working

At the bottom of each web chart, write the word Examples. Ask student volunteers to list out at least 5 living and 5 non-living things.

Wrap Up

Ask students to write the names of 5 living things and 5 non-living things in their notebooks.

Homework/Going Further

Instruct students to complete Activity 1 on page 33.

Lesson Plan 2

Student Book Pages 25–30

Learning Outcome

Students should be able to:

explain that all living things move, grow, feed, breathe, feel, reproduce, and produce waste matter.

Introduction

Show the students a ball and ask the following questions:

- Does it need food?
- Does it breathe?
- Does it grow?
- Does it reproduce?
- Does it move by itself?

Main Teaching

- Discuss the different characteristics of living organisms one by one.
- Discuss growth in living things.
- Discuss how movement in living and non-living things differs.

Guided Practice

Divide the students into 4 groups. Place pictures of living and non-living things on the table in front of each group.

Draw the following table on the board and ask students to consider the items shown in pictures and answer the questions with a yes or no.

Does it breathe?	Does it grow?	Does it reproduce?	Does it move by itself?	Does it need food?

Independent Working

Ask the students to write the names of five animals and their young ones in their notebooks.

Wrap Up

Students should exchange their answers with other groups.

Homework/Going Further

Ask students to sow a seed and record its growth.

Worksheet 3-1

Q1. Use the words given below to fill in the blanks in the sentences.

eggs, body surface, vibrations, hairy, scent

- a. Snakes have a special organ in the head which reacts to _____ and helps the snake to trail its prey.
- b. Spiders have _____ legs.
- c. A fish feels _____ in the water.
- d. Birds, reptiles, and insects lay _____ from which babies hatch.
- e. Animals such as earthworms and frogs breathe through their moist _____ when they are in water.

Q2. Draw a line connecting each picture below to one of the two words.

living things

non-living things



Q3. Give reasons why:

- a. a cat is alive.

- b. a pencil is not alive.

Q4. List down the characteristics of living things:

- a. _____ b. _____
c. _____ d. _____
e. _____

Unit 4: Classification of Living Things

Students will learn the classification of living things into vertebrates, invertebrates, insects and worms. They will learn about the biodiversity and animals' world.

Lesson Plan 1

Student Book Page 34

Learning Outcome

Students should be able to:
list the five kingdoms of living things.

Introduction

Show pictures of some living things such as a cat, a lizard, a small plant, seashells, a fish, a bee, a spider, a crocodile, etc. Hold up each picture and ask students to identify each and give a few of its characteristics; write these on the board.

Stop after about a dozen examples, and explain that you have a long list of living organisms. Ask the students to help *classify* them into groups.

Main Teaching

- Explain the term classify (sort into groups of things that are alike) and its importance. It helps to make the study of things more systematic and organised, and therefore easier.
- Explain that living organisms have specific characteristics that allow their classification into specific groups.
- Discuss how we can learn the basic characteristics of all members of a group by examining only one member.
- Ask students to read page 34 of the Student Book and then discuss the content.
- Write the names of the five kingdoms on the board and draw a flow chart to explain how to classify animals, giving two examples of each.
- Explain the terms vertebrate and invertebrate. Instruct students to take any one of the pictures they studied earlier (you should have collected them and stored them in a box!) and classify the organism shown.
- Discuss the terms cold blooded and warm blooded; give examples.
- Show pictures of animals which have backbones, for example, cat, catfish, frog, snake, and which do not have a backbone, for example, earthworm, mosquito, butterfly, spider.

Guided Practice

Choose a student and instruct them to think about a specific animal and its characteristics. When they are ready, they announce 'I'm thinking of an animal.'

The other students can then ask yes-no questions about the animal's characteristics in an effort to guess its identity.

Students use the classification properties used in previous games (lays eggs, has feathers, etc) or just ask, e.g. 'Is it an amphibian?', and then use even more specific characteristics, such as colour, size, how it moves, what it eats, where it lives, how it grows, etc., to identify the animal.

When the students have enough information, they can try to guess the animal's identity. The maximum number of questions that can be asked is 20. The student who asks the final question must make the guess.

In the next round, the winner gets the opportunity to think of an animal and answer the questions.

Independent Working

Ask students to complete the table on page 36.

Wrap Up

Pair up students and quiz them about the characteristics of different animals.

Homework/Going Further

Students should complete Activity 1 on page 42.

Lesson Plan 2

Student Book Pages 35–36

Learning Outcome

Students should be able to:
identify the five classes of vertebrates.

Introduction

Write on the board: 'Which class do I belong to? Divide the students into groups of three. Give each group a box containing pictures of living organisms with a backbone. Tell the students to look at the pictures and then work together to determine what class the organism belongs to.

After 5 minutes, ask the students to return to their desks and present their observations.

Main Teaching

- Write the names of the five classes (mammals, fish, birds, amphibians, reptiles) on the board and revise the importance of classification.
- Ask students to read through the table on pages 35 - 36.
- Discuss the main features of each class and show pictures of animals belonging to them.
- Ask groups to sort pictures of different animals and classify them into different classes.
 - mammals - bear, rabbit, cheetah
 - fish- salmon, shark, goldfish
 - birds - parrot, cockerel, duck
 - amphibians- salamander, newt, frog
 - reptiles- snake, lizard, alligator

Guided Practice

Help students to attempt Activity 4 on page 42.

Independent Working

After groups have sorted their pictures into classes (mammals, fish, birds, amphibians, reptiles) come back together as a whole group to share the correct answers.

Wrap Up

Show the students pictures of different animals (or write their names on the board) and ask them to classify them according to the way they move.

- flying
- creeping
- swimming
- running

Homework/Going Further

Encourage students to make a bird feeder. This will provide a great way for them to observe the diversity of bird life in their own gardens.

Lesson Plan 3

Student Book Pages 37-38

Learning Outcomes

Students should be able to:

- explain that there are more invertebrates than vertebrates on the Earth.
- explain how invertebrates are classified according to how their bodies are structured.

Introduction

Bring to the lesson a cockroach, a spider, an earthworm, a snail, a honey bee, or other invertebrates in separate jars so students can see them. Show that these organisms are without backbones.

Main Teaching

- Revise the meanings of the two terms, vertebrate and invertebrate, and then ask students to guess which group is more numerous.
- State that there are more invertebrates than vertebrates on Earth. Detail how invertebrates are classified according to the structure of their bodies.
- Explain that some invertebrates are harmful such as the mosquito, and others are helpful such as the honey bee. Collect students' opinions about harmful invertebrates and helpful invertebrates.
- Show the class an earthworm and discuss its importance for the fertility of the soil.
- Show a picture of a honey bee and explain how honey is made.
- Discuss social insects that live together in groups called colonies. Students may be surprised to learn that a single colony can contain many hundreds.

Guided Practice

Show pictures of invertebrates such as a spider, snail, mosquito, earthworm, fly, and honeybee. Ask students to help identify each of them and write their characteristics on the board.

Independent Working

Ask students to answer Question 6 on page 41.

Wrap Up

Discuss the importance of insects for the pollination of plants.

Homework/Going Further

Ask students to complete Activity 2 on page 42.

Worksheet 4-1

Q1. Write names of two animals in each column:

Mammal	Amphibian	Reptile	Bird	Fish

Q2. Draw a line connecting each picture below to one of the two words.

vertebrate

invertebrate



Q3. Give three characteristics of each of the following classes:

Mammal	Amphibian	Reptile	Bird	Fish

Q4. Why is the spider not an insect?

Q5. What are the 5 animal kingdoms?

Unit 5: Plants

Pupils will explore the classification of plants into flowering and non-flowering plants. They will learn about monocotyledonous and dicotyledonous plants and their characteristics. Students will learn about the right conditions required for seed germination.

Lesson Plan 1

Student Book Pages 43–44

Learning Outcomes

Students should be able to:

- explain that plants can be divided into flowering and non-flowering plants.
- explain that flowering plants can be divided into groups (classes) according to their seed structure.

Introduction

Bring a bunch of spring onions with roots attached to class, and show pupils what roots look like.

Main Teaching

- Ask pupils to describe plants they have previously observed in their daily life. Lead them with questions such as:
 - Where can the plants be found?
 - How would you describe the plants?
- Green plants use energy from the Sun to produce their own food. They are the beginning of most food chains. Green plants need soil to grow in, so soil is very important to most living things on Earth. Some people eat animals that eat plants. Often, the materials we need to make our clothing come from plants.
- Plants have roots, stems, and leaves. Flowering plants produce flowers. Non-flowering plants do not produce flowers. The roots of a plant help to hold a plant firmly in the soil. They also absorb water for the plant.
- Discuss the flowering plants called angiosperms and non-flowering plants called gymnosperms. Show pictures of a spruce tree and a pine tree and explain that their seeds are not enclosed in fruits or flowers, which is why they are called naked seed plants (gymnosperms).
- Show pictures of a mango tree and a papaya tree and explain that the seeds of flowering plants are enclosed in fruits or flowers and are called angiosperms.

Guided Practice

If possible, take pupils into the school garden to study the plants. Point out the different types of plant, like big and smaller plants and those with a soft stem or a hard stem. Look out for plants growing in unusual places such as between cracks in the ground or on the wall or roof.

Ask pupils to identify and record the different plants in their notebooks.

Independent Working

Give each student a small booklet and ask them to draw a simple plant on the first page and identify the functions of each of its parts.

Wrap Up

Give pupils time to read about the Environment Watch on page 47 of the Student Book and discuss the main points with them.

Homework/Going Further

Instruct the students to add to their plant booklet pictures of at least five flowering plants and five non-flowering plants with their names and any other useful information about it, for example, if it is a source of food or other useful material.

Lesson Plan 2

Student Book Pages 44–46

Learning Outcome

Students should be able to:

explain how monocotyledonous and dicotyledonous plants can be distinguished by their characteristics.

Introduction

Bring to the lesson monocot and dicot seeds of different plants and ask students to observe the differences. Encourage them to note observations such as seed colour, weight, size, and structure in their plant booklets.

Main Teaching

- Introduce the idea that flowering plants are further divided into two major groups according to whether they have one or two cotyledons.
- A cotyledon is a small leaf present inside the seed.
- Those with one cotyledon are called **monocot**, and those with two are called **dicot**.
- Soak a few seeds in water and open them to show the different parts of the seeds.
- Discuss the circulation of food by phloem bundles and the circulation of water through the xylem bundles inside a plant body. Show the leaves of monocot and dicot plants and ask students to discuss the differences.
- Show the flowers of monocot and dicot plants and discuss the differences between them
- Ask students to study the roots of monocot and dicot plants.
- Divide students into pairs and give each pair a magnifying glass and a monocot and a dicot seed. Ask them to identify the different parts of the seeds.

Guided Practice

Help students to answer Question 2 on page 49.

Independent Working

Give pupils time to draw the internal structure of a monocot and a dicot seed in their plant booklets. If possible, take the pupils into the school garden and collect leaves of dicot and monocot plants to glue and label in their plant booklets. Display the booklets in the classroom.

Wrap Up

Discuss the Concept Check on page 47.

Homework/Going Further

Ask students to sow a bean seed in a glass jar and note down different stages of its development in their plant booklet in preparation for the next class discussion.

Lesson Plan 3

Student Book Pages 47–48

Learning Outcome

Students should be able to:

identify the conditions that seeds need in order to germinate.

Introduction

Encourage the students to share their observations of the seeds growing in their jar.

Main teaching

- Explain that the germination of a seed means the beginning of the growth of a seed into a plant.
- Ask students about the conditions required for germination (soil, water, air) and list them on the board. Discuss the fact that different plants need different conditions for germination.
- Draw on the board the different stages of the germination of a seed and explain each stage.
- Encourage students to participate in the Discuss and Answer activity on page 48.

Guided Practice

Give students activity cards with the different stages of germination written on them. Help them to arrange cards in the correct order.

Independent Working

Ask students to read the text on page 48 and answer Question 4 on page 50.

Wrap Up

Discuss Question 5 on page 51.

Homework/Going Further

Ask students to draw the stages of germination in their plant booklets.

Cards: stages of germination

<p>Germination of seed</p>	<p>The shoot grows upwards.</p>
<p>The root begins to grow downwards.</p>	<p>Eventually, buds appear and blossom into flowers.</p>
<p>The stem grows stronger and more leaves appear.</p>	<p>The seed leaves become soft and open.</p>
<p>The seed is buried in the soil. The seed coat becomes soft.</p>	<p>Leaves appear on the shoot.</p>

Worksheet 5-1

Q1. List two differences between gymnosperms and angiosperms.

Gymnosperms	Angiosperms

Q2. Draw a labelled diagram of the internal structures of a monocot and a dicot seed.

Q3. Draw a labelled diagram of the internal structures of a monocot and a dicot stem.

Q4. Draw labelled diagrams of monocot and dicot flowers.

Worksheet 5-2

Q1. Draw labelled diagrams of monocot and dicot roots.

Q2. Write the letters in the correct order to show the stages of germination in a bean plant.

- a. Buds appear and these blossom into flowers which produce seeds.
- b. The seed leaves become soft and open.
- c. Leaves appear on the shoot. These will enable the plant to produce and store food for energy.
- d. The stem grows stronger and more leaves appear.
- e. The seed is buried in the soil. It gets warmth and water. The seed coat becomes soft.
- f. The root begins to grow downwards, spreading to find water.
- g. The shoot grows upwards, reaching for air and the warmth of sunlight.

Correct order: _____

Q3. Write the characteristics of the following:

- a. Leaf _____

- b. Roots _____

- c. Flower _____

- d. Stem _____

Q4. What are xylem and phloem?

Unit 6: Soil

The students will learn about the composition of soil and different layers of soil. They will discover the effect of moisture on different types of soil.

Lesson Plan 1

Student Book Pages 54–55

Learning Outcomes

Students should be able to:

- explain that soil is made up of water, air, minerals, and organic matter.
- explain that there are different layers of soil.

Introduction

Bring a bag of layered soil and some clay pots to the class. Begin by asking students to discuss the importance of soil. Encourage students to write their points on the board to share their ideas.

Main Teaching

- Explain in detail that soil is the upper layer of the Earth's surface. It is made up of broken down rock combined with a mixture of living organisms, like bacteria and fungi, and non-living organic materials. These non-living organic materials can include air, water, decayed leaves, and dead animals.
- In order to help students make sense of soil profiles, invite students to dig through the bags of soil from top to bottom. Ask students to describe differences in colour, texture, and various components (small stones, organic matter, sand, clay). Ask students to note down their observations.
- Explain that soil is especially important to humans and other animals that eat plants that grow in soil.
- Ask them to examine a sample of soil through a magnifying glass. Take a small amount of the soil sample and place it on a sheet of paper. Spread it out and examine it closely through the magnifying glass.
- Explain that soil is home to many small organisms, such as insects and bacteria. Soil helps to filter and clean water.
- Discuss how soil is needed for plants to grow and that it holds them in the ground.
- Put 3-4 spoonfuls of soil in a beaker of water and stir it well. Leave it undisturbed for a time and then examine the layers of soil that form.
- Divide the pupils into groups. Ask them to read page 55 and discuss the content.

Guided Practice

Help the students complete Concept Check exercise on page 56

Independent Working

Instruct the pupils to draw (and colour) a labelled diagram of a soil profile.

Wrap Up

Discuss Question 4 on page 59 and note students' responses on the board.

Homework/Going Further

Ask students to do Activity 2 on page 59 and draw pictures of their research.

Lesson Plan 2

Student Book Pages 56–57

Learning Outcome

Students should be able to:

explain how moisture has different effects on different types of soil.

Introduction

Invite students to study bags A, B, and C containing three different types of soil. Ask them to feel the different types of soil and compare the colours.

Main Teaching

- Take a small amount of each sample. Put it on a sheet of newspaper. Spread it out so they can examine it closely through the magnifying glass.
- Ask them to press the soil between their forefingers and thumb to feel the texture. Ask students to pair with a partner and discuss their findings and ideas. Teachers should then involve the entire class in a detailed discussion.
- Talk about the three different types of soil and their characteristics.
- Show students a collection of rocks and explain that they are made up of soil particles.
- Perform Activity 1 on page 59.

Guided Practice

After all the samples have been examined, ask for feedback. Draw three columns on the board with the headings A, B, and C; ask students to draw same in their notebooks. Then share students' observations and write them on the board under the appropriate letter headings.

Independent Working

Give the pupils time to complete Question 1 on page 69.

Wrap Up

Discuss the Environment Watch on page 57 and show pictures or a video of this disaster. Ask for students' responses to Questions 1 and 2 on page 58.

Homework/Going Further

Visit a local nursery; ask for a sample of the soil in which the plants grow and note down its characteristics.

Worksheet 6-1

Q1. Identify the types of soil.

- a. _____: Due to its smaller particles, it can retain more water than sand.
- b. _____: The spaces between the particles are very tiny.
- c. _____: The particles do not stick together when wet.

Q2. Complete these sentences.

- a. _____ soil can become as hard as stone when dry.
- b. _____ soil dries out quickly after rainfall.
- c. A cactus would do well in _____ soil.

Q3. Label the following soil profile:



Unit 7: Matter and the Water Cycle

This topic links the concept of the arrangement of particles in the three different states of matter and the effect that heat has on the movement of particles in matter. They will differentiate the changes of the state of matter that can be physical or chemical; reversible or irreversible.

The learners will understand about evaporation and condensation are key parts of the water cycle which lead to the formation of rain, dew, fog, mist, frost, hail, and snow.

Lesson Plan 1

Student Book Pages 60–63

Learning Outcomes

Students should be able to:

- explain that particles are arranged differently in the three different states of matter.
- describe the effect that heat has on the movement of particles in matter.

Introduction

Display a collection of different materials. Ask the pupils to classify them as solid, liquid, or gas. The materials could include a pencil, oil, water, a nail, a stone, tissue paper, an inflated balloon, and a fizzy drink. Invite a volunteer to blow up a balloon and ask students:

- What is inside this balloon?
- What are the bubbles in fizzy drinks?

Main Teaching

- Divide pupils into groups. Give each group a syringe (without a needle!), sand, and some water. Ask them to put sand into the syringe. Press the plunger. Ask if it is easy to compress sand or not.
- Do the same with water and air.
- Discuss the characteristics of solids, liquids and gases.
- Explain the terms:
 - a) mass
 - b) volume
 - c) definite volume
 - d) definite shape
- Ask the pupils to recall the properties of liquids. Make sure the fact that a liquid takes the shape of its container is understood.
- Ask students to close their eyes and then open a bottle of perfume. Explain how gases spread.
- Divide the students into three groups and ask the groups to pretend that they are the particles of matter and role-play to show the arrangement of the particles in solids, liquids, and gases. Instruct them to change their movement when told that the heat is increased or decreased. Later, get feedback about each group movements from observers.
- Ask students to read page 62 and discuss the connection between the arrangements of the particles in solids, liquids, and gases and their properties. Follow up by asking questions about

the distance, movement, and arrangement of particles in the three states of matter.

- Explain these terms with the help of a demonstration
 - a) melting: show melting of ice and a candle
 - b) freezing: show ice
 - c) condensation: show droplets on the outside of a glass of cold water
 - d) evaporation: show vapour rising from a cup of tea
 - e) sublimation: show heating of naphthalene balls in a test tube

Guided Practice

Ask students to read page 63 and draw (a) a particles model and (b) a change of energy model, for the following:

- when a solid is heated,
- when a gas is cooled,
- when a liquid is heated,
- when a liquid is cooled.

Independent Working

Ask students to attempt Question 5 on page 68.

Wrap Up

Recap the key concepts taught in the lesson by discussing Questions 1 and 2 on page 66.

Homework/Going Further

Ask students to draw labelled diagrams of changes of state in their notebooks.

Lesson Plan 2

Student Book Page 64

Learning Outcomes

Students should be able to:

explain that evaporation and condensation are key parts of the water cycle and they lead to the formation of rain, dew, fog, mist, frost, hail, and snow.

Introduction

Demonstrate Activity 2 on page 68. Display a chart of the water cycle.

Main Teaching

- Show a video of the water cycle: <https://www.youtube.com/watch?v=TWb4KIM2vts>
- Explain that the term ‘cycle’ means that a series of events is repeated many times, always in the same order.
- Explain each stage of the water cycle.
- Ask students to read the text on page 64 and discuss the five stages of the water cycle.
- Divide the pupils into groups and give each group a transparent bowl. Ask the group members to sit around the bowl. Pour some warm water into each bowl and cover the bowl with a sheet

of cling film and put two or three ice cubes in the centre of the cling film. Leave it for some time in direct sunlight.

- Invite a representative from each group to share with the whole class what they observed in this activity.
- Have one student per group fill a paper cup with water and draw a line on it to mark the water level. Write the name of the group on each cup of water and place them outside in direct sunlight. Students should check the water level line each day and record their daily observations.

Guided Practice

Ask the students to work in pairs to solve the crossword on page 69.

Independent Working

Students should attempt part IV of question 4 on page 67.

Wrap Up

Role-play the different parts of the water cycle.

Homework/Going Further

Ask students to build a water cycle model and monitor it for a 2-week period. This should help them to understand how water changes state as it moves through the cycle.

Lesson Plan 3

Student Book Pages 65

Learning Outcomes

Students should be able to:

explain that changes in the state of matter can be physical or chemical, reversible or irreversible.

Introduction

Take three boxes. Label them as Solid, Liquid, and Gas. Put out a collection of pictures of solids, liquids, and gases. Ask each pupil to select one picture. Call the pupils in turn to place their picture in the relevant box and ask them to give the reason for their decision.

Main Teaching

- Explain the reversible and irreversible changes of matter by sharing some examples of changes taking place in their environment.
- Ask the students to read the text on page 65.
- Dry a wet handkerchief in the air and explain this is evaporation and emphasise that energy is being absorbed by water. Explain that it is a reversible change because we can make the handkerchief wet again.
- Put some ice on a student's palm and explain this process is called melting. Emphasise that energy is being absorbed by the ice and that this is a reversible change.
- Show the students a boiled egg and a raw egg and use them to explain an irreversible change.
- Invite students to take part in the Discuss and Answer activity on page 65.

- Discuss the Concept Check on page 64.

Guided Practice

Help the students to define the terms reversible and irreversible in their notebooks. Ask them to give three examples of each.

Independent Working

Ask students to answer Question 3 on page 67.

Wrap Up

Ask the pupils to think of situations in daily life where these changes regularly take place.

Homework/Going Further





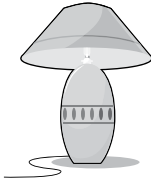



Answer Question 4 parts i and ii on page 67.

Worksheet 7-1

Q1. Fill in the blanks.

- Evaporation changes water from a _____ to a _____.
- _____ is water that falls to the Earth as rain or snow.
- When a solid changes into a gas without becoming a liquid first, the process is called _____.
- _____ changes produce a completely new material.
- When water vapour reaches the colder, upper layers of the atmosphere, it _____ to form droplets.

Q2. Identify the solids, liquids, and gases in each image.

	_____ _____ _____ _____		_____ _____ _____ _____
	_____ _____ _____ _____		_____ _____ _____ _____
	_____ _____ _____ _____		_____ _____ _____ _____
	_____ _____ _____ _____		_____ _____ _____ _____

Worksheet 7-2

Q1. Complete the following table:

State	Gas	Liquid	Solid
Examples			
Spacing between particles			
Compressibility			
Movement of particles			
Forces between particles			

Q2. Use your understanding of how particles behave to explain:

- Why liquid cooking oil flows. _____
- Why a piece of rock has a fixed shape. _____
- Why nitrogen gas fills its whole container. _____

Q3. Write the correct word next to each of the definitions below. Remember not all words will be used.

boil compressed condensation
 evaporation freeze gas
 heat liquid melting
 move solid vibration

- a state of matter where the particles do not touch each other _____.
- when a gas is cooled to form a liquid _____.
- the movement of particles in a solid _____.
- the change from a solid to a liquid _____.
- the change from a liquid into a gas _____.
- The particles in liquids and gases do this. _____.
- the state of matter that can be compressed _____.
- A _____ has a definite shape. It does not take the shape of its container. It also has a definite volume because it can be measured.
- A _____ does not have a definite shape. It takes the shape of its container. It does have a definite volume because it can be measured.
- A _____ does not have a definite shape. It sometimes takes the shape of its container and sometimes flies freely around you.

Worksheet 7-3

Q1. Join each box on the right to one or more of the words on the left to make short sentences about solids, liquids, and gases. Write the sentences on the lines below.

change size

change shape

keep the same size

keep the same shape

gases

liquids

solids

- a. _____ b. _____ c. _____
d. _____ e. _____ f. _____

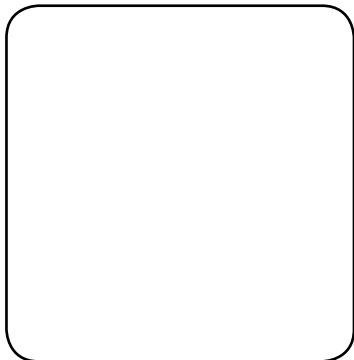
Q2. What is the water cycle?

Q3. What would happen if water could evaporate but not condense?

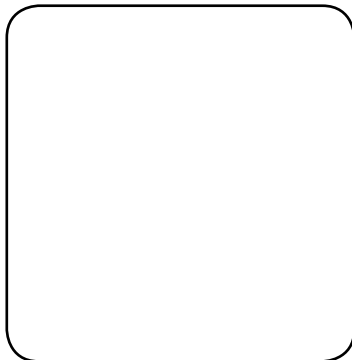
Q4. Write down in the correct order the 5 stages in the water cycle.

Q5. Draw the arrangements of particles in the boxes.

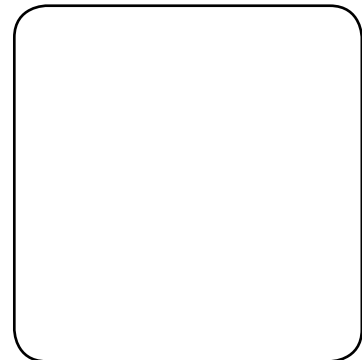
gas



liquid



solid



Unit 8: Forces in Action

This topic is about the force and its types. Students will understand that force is exerted by muscles, machines, magnets, and gravity. They will explore how machines help us to do work. Students will differentiate the term mass and weight, balanced or unbalanced forces.

Lesson Plan 1

Student Book Pages 70–71

Learning Outcomes

Students should be able to:

- explain that a force is a push or a pull; it can start a body moving, stop it from moving, and change its speed and direction of motion.
- explain that force can be exerted by muscles, machines, magnets, gravity, and in certain other ways.

Introduction

Ask students to think for few minutes about the Discuss and Answer activity on page 71. Allow them to discuss their ideas with their peers.

Main Teaching

- Give the pupils some play dough, a rubber band, and a sponge, and ask them what they could do to change the shape of these things. Pupils should come up with words such as squeeze, twist, squash, stretch, press, etc. Explain that a single word for all of these actions is force.
- Investigate different kinds of forces used to move objects or hold them in place:
 - Put down a football and state how it will stay there unless someone kicks it. Invite a student to kick the ball.
 - Explain how various forces (such as magnetic, mechanical, wind induced, and gravitational) can act directly or from a distance to cause objects to move.
- Students are to explore the different types of forces in separate hubs in the classroom. In each hub, a different type of force is to be discussed and experienced, such as wind from a fan, magnetic force from a magnet, sand pushing and pulling.
- Demonstrate and describe the effect of increasing and decreasing the amount of force applied to an object.
- Ask the pupils to give examples of some actions from daily life where they apply push, pull, or twist to perform a task. Note their responses on the board.
- Introduce the spring balance and the unit used for measuring force. Demonstrate the use of the spring balance.
- Tie a bundle of books to the spring balance and ask a student to lift it vertically upwards. Measure the mass of the bundle by reading the scale on the spring balance.
- Explain the term inertia.

Guided Practice

Help students to attempt Question 2 on page 78.

Independent Working

Divide students into groups and ask them to read and perform Activities 1 and 2 on page 80. Write observations of these activities on a postcard and pretend to post it to another group and ask that group to comment on your post.

Wrap Up

Show pictures of forces acting on objects and ask students to identify them.

Homework/Going Further

Ask students to complete Question 3 on page 78.

Lesson Plan 2

Student Book Pages 72–74

Learning Outcome

Students should be able to:

explain that friction and gravity are forces.

Introduction

Ask students to rub their hands together and then place them on their cheeks. Explain that their hands are warm because of friction.

Main Teaching

- On the board, write ‘Motion stops because’ and draw a circle around the words.
- Elicit students’ responses and write them as ‘branches’ of the web.
- Focus student responses by providing prompts such as: What would make a car stop? Or a football? Or a plane?
- Explain that the web they have created shows examples of forces that may slow down, stop, or make it hard for an object to move due to friction.
- Discuss ways to reduce friction.
- Introduce the term air resistance for example when an aeroplane flies through the air, air particles hit it. This makes it more difficult for the aeroplane to move.
- Draw or show pictures of streamlined cars and aeroplanes and explain that streamlined shapes reduce air resistance.
- Explain that when the wind is blowing really hard, it is difficult to walk into the wind. Ask a volunteer to demonstrate folding him/herself up and hunching down to move forward.

Guided Practice

Ask the pupils to work in pairs. Discuss the advantages and disadvantages of friction. Then ask student pairs to suggest some ways to reduce friction.

Independent Working

Give students some marbles and ask them to push a marble across both, a rug and a glass surface. Ask students to use their index finger to push a tennis ball and a football across a table that is covered with a towel.

Note down students' responses to these questions.

- Will the marble go faster over the rug or over the glass surface?
- Do you think it is easier to push a ball when the table is not covered?

Wrap Up

Ask students to discuss their findings with each other.

Homework/Going Further

Students should list in their notebooks the advantages and disadvantages of friction and some ways to reduce it. Encourage students to illustrate their notes.

Lesson Plan 3

Student Book Pages 74–75

Learning Outcomes

Students should be able to:

explain that forces can be balanced or unbalanced.

Introduction

Tell the students that you are going to drop a sheet of paper and a ping-pong ball at the same time and ask them to predict which will hit the ground first. (The ball)

Next, crumple the sheet of paper into a ball and repeat the activity. (They should both hit the ground at the same time.)

Explain that while weight does not affect the rate at which objects fall, shape certainly does.

Main Teaching

- Explain the term gravity and use the example of a parachute which falls due to gravity.
- Ask students to read page 75 and discuss how mass and weight are different.
- Relate the story of Isaac Newton's discovery of the existence of gravitational force.
- Take students' responses about how different life would be if there was no gravity.
- Discuss weightlessness on the Moon.

Guided Practice

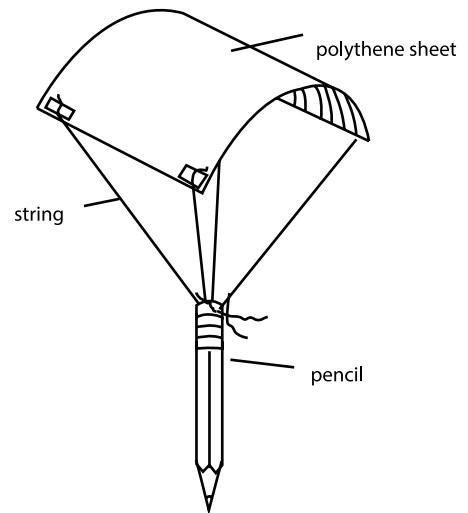
Help students to attempt Question 1 on page 78 and 106.

Independent Working

Demonstrate how to make a parachute. Cut a 10cm square sheet of polythene. Cut 4 pieces of string, each 20 cm long. Tie the strings to the corners of the sheet. Attach a pencil to the strings. Stand on a balcony, gently drop the parachute, and watch it fall. Now, divide students into groups and brainstorm their ideas on another way to design a parachute. Remember that the best way for students to learn is to try things for themselves, so pose the challenge and let them experiment.

Wrap Up

Discuss the results and observations of their investigation. Ask students to comment on the other groups' parachute designs.



Homework/Going Further

Ask students to watch a swimming competition on the internet and write about how swimmers reduce friction.

Lesson Plan 3

Student Book Pages 76–77

Learning Outcomes

Students should be able to:
explain how simple machines help us to do work.

Introduction

Try to cut an apple using a ruler while students observe. Next, cut the apple using a knife. Take students' responses about why there was a difference in the ease of cutting the apple.

Main Teaching

- Prepare a lever by balancing a metre rod at its centre of gravity, C, on a wooden wedge. Hang a weight of 100g from one end of the ruler. Now hang a load of 50g on the other side of C at a point where the rod is again balanced.
- Write the word Machines on the board and invite each student to write the name of one machine under the heading.
- Write the word Simple next to Machine and surprise students by explaining that most machines are a combination of two or more simple machines.
- Divide students into groups to rotate through stations displaying different simple machines to explore their types and uses. Discuss the three types of lever and show how effort, fulcrum, and load are at different positions.

Guided Practice

Help students to add labels to complete the Concept Check activity on page 77.

Independent Working

Challenge groups of students to create their own simple machines, such as a wheelbarrow or a pulley, etc. Provide a variety of materials for students to use or ask them to bring in items from home. Encourage students to design simple machines and brainstorm ways to improve their efficiency. Allow each group to talk to the class about their favourite simple machine.

Wrap Up

Take students' responses to Question 3 and 4 on pages 78-79.

Homework/Going Further

Ask students to attempt Question 5 on page 79.

Worksheet 8-1

Q1. What is the reading on the spring balance?

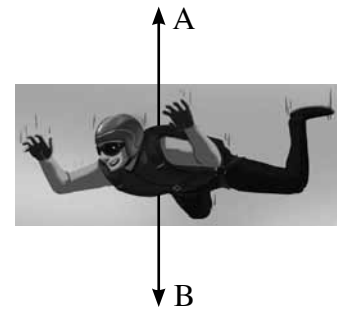


Q2. Give the name and symbol of the units that are used to measure force.

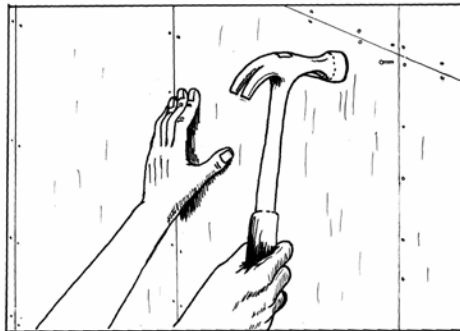
Q3. A skydiver jumps from a plane and falls through the air.

a. What is the name we give to force A?

b. What is the name we give to force B?

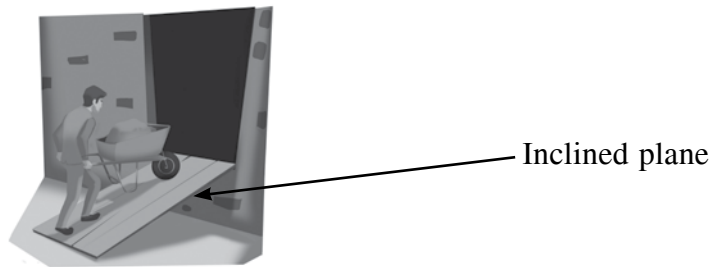


Q4. How is a nail driven into a wall?



Worksheet 8-2

Q1. What is an inclined plane used for?



Q2. Look at the picture of a moving car:

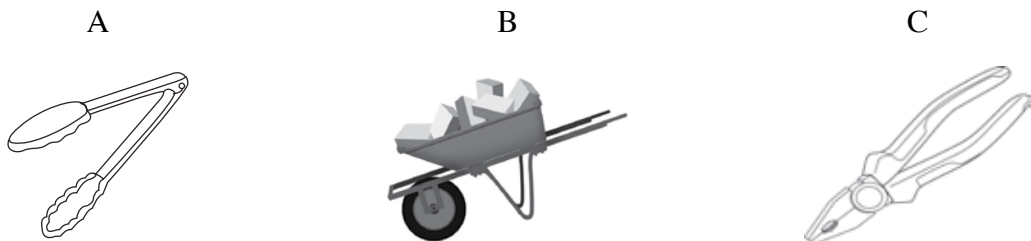


- What is the name we give to force A? _____
- What is the name we give to force B? _____

Q3. Complete the table:

Parts	The 1 st group of levers	The 2 nd group of levers	The 3 rd group of levers
Effort			
Pivot			
Load			
Examples			

Q4. a. Label the effort, pivot, and load in each of the diagrams below.



b. Identify the type of lever.

- _____
- _____
- _____

Unit 9: Electricity

The students will learn about the movement of electrons create that electricity and there are two forms of electricity: current and static. They will learn about the fuses and that lightning is electricity.

Lesson Plan 1

Student Book Pages 81–82

Learning Outcomes

Students should be able to:

- explain that all matter is made of atoms.
- explain that atoms contain protons, neutrons, and electrons.
- explain that the movement of electrons creates electricity.

Introduction

Show some battery toys and explain what the toy can do when batteries are inserted, and what happens when it has no batteries. Ask the pupils to find + and – signs on the batteries and ask them what they think they mean. Ask where they have seen these + and – signs before.

Main Teaching

- Ask students to read the text on page 81 and locate the electrons, protons, and neutrons in an atom.
- Explain that many items in the classroom, such as the lights and computers, work using electricity. Some of them get their electricity from batteries while others are plugged into the mains electricity supply.
- Show models or diagrams of different atoms and explain the importance of electrons.
- Put a metal object on the table and ask each student to rub their feet on a rug while reaching towards the metal object. A spark will move through the air or students will feel a shock as they touch the metal. Explain that the spark is due to the flow of charge.
- Switch the lights and fan on and then off to introduce the term electricity
- Point out items in the classroom that use electricity and ask pupils how they work.
- Explain that electricity is what makes electrons move. The electrons move through wires called conductors and produce the power for work. When no electrons are moving, there is no power. The electrons need to be able to flow through the wires to reach the bulb and fan.
- Show a copper wire and ask students to discuss the Do You Remember activity on page 81.
- Perform Activity 2 on page 87.

Guided Practice

- Perform Activity 4 on page 89.
- Help the students to make a list of Do's and Don'ts around electricity.

Independent Working

Ask the pupils to draw a diagram of an atom and label the parts.

Wrap Up

Take students' comments on Question 3 on page 86 and discuss.

Homework/Going Further

Ask students to solve the Concept Check on page 82.

Lesson Plan 2

Student Book Pages 82–83

Learning Outcome

Students should be able to:
explain that there are two forms of electricity: current and static.

Introduction

Select a volunteer to come to the front of the classroom. Rub a balloon on the volunteer's hair, lifting the balloon occasionally. Keep doing this until the student's hair sticks up all over. Ask students to suggest why the hair reacted to the balloon in this way.

Main Teaching

- Explain that one type of electricity is called static electricity.
 - It does not move, but is attracted to and repelled by the static electricity in other objects.
 - The attraction and repulsion properties of static electricity are not the same properties that magnets possess.
 - Static electricity can best be produced on cool, dry days.
- Demonstrate that like charges repel by doing the following: Tie two inflated balloons to the ends of a stick with strings. Charge them by rubbing them on a piece of woollen fabric. Make sure the charged sides are facing each other. Because both balloons have the same charge, they will swing away from each other.
- Putting an object such as a hand between the balloons will cause the balloons to swing in towards the hand because it has an opposite charge. Removing the hand will force the balloons apart once again.
- Students should draw this demonstration as a labelled diagram in their science notebooks.
- State that the other type of electricity is called current electricity.

Guided Practice

Ask students to take out their plastic rulers and charge them by rubbing them against some woollen fabric. Lower the charged ruler a towards a small pile of tissue paper.

Observe and record what happens to the paper.

Independent Working

Ask small groups of students to brainstorm examples of static electricity in everyday life. Share examples with the whole class. Some examples:

- hair sticking up after jumping on a trampoline;
- combing or brushing clean, dry hair;
- being 'shocked' by someone.

Wrap Up

Engage students in a discussion of Question 1 on page 85.

Homework/Going Further

Ask students to recreate the demonstration of the two balloons on a stick by charging their balloons with the same source and then placing them near each other on a flat surface such as a table. Explore how like charges repel while unlike charges attract each other. They should note down any observations in their notebooks.

Lesson Plan 3

Student Book Page 84

Learning Outcomes

Students should be able to:

- explain that fuses are safety measures to prevent too much current from flowing.
- identify lightning as a form of electricity.

Introduction

Show the students the individual components of a circuit, (such as wire, battery, and bulb), and attach them to each other to make a circuit.

Main Teaching

- Explain that lightning is caused by the movement of positive and negative charges towards one another. During a storm the particles in a cloud become statically charged due to wind blowing them around in the cloud.
- Lightning strikes can happen within a cloud, between two clouds, or between a cloud and the ground. The stronger source of static electricity moves towards the weaker source, causing the flash that we see as lightning.
- On a large scale, the discharge of static electricity is seen as lightning and heard as thunder. On a small scale, it is seen as little sparks and heard as a crackling sound. Both are evidence of energy being released.
- Show the students a circuit and explain the importance of the fuse in the circuit.
- Remove the fuse from an appliance and explain that the fuse is a safety measure which protects the appliance and its wiring. A fuse contains a small wire which will melt if due to error too much current flows. This breaks the circuit and protects the appliance.
- Show different devices that contain fuses.

Guided Practice

Help students to complete Activity 3 on page 87.

Independent Working

Ask students to answer Question 2 on page 85 and Question 4 on page 86.

Wrap Up

Ask students to attempt question 5 on page 86 in their notebooks.

Homework/Going Further

Ask students to research Thomas Edison and write notes in their notebooks about his achievements.

Worksheet 9-1

Q1. Circle the electrical objects:

A



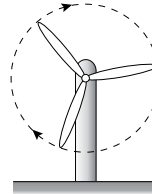
B



C



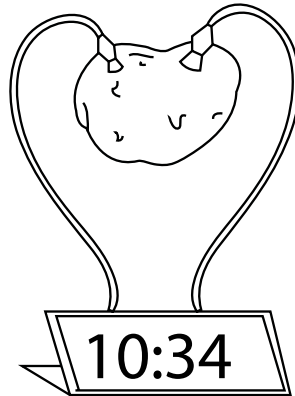
D



E



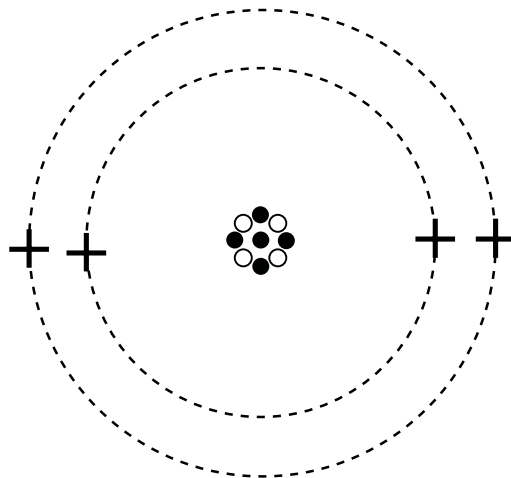
Q2. This potato clock does not use batteries – it uses a potato instead.



What is the use of potato?

Q3 Count the number of electron, proton, and neutron in the given atom:

- neutron
- proton
- + electron



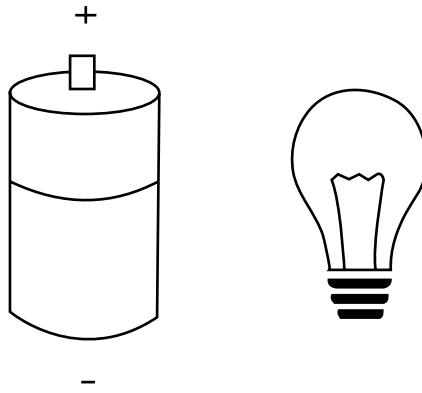
Electron _____

Proton _____

Neutron _____

Worksheet 9-2

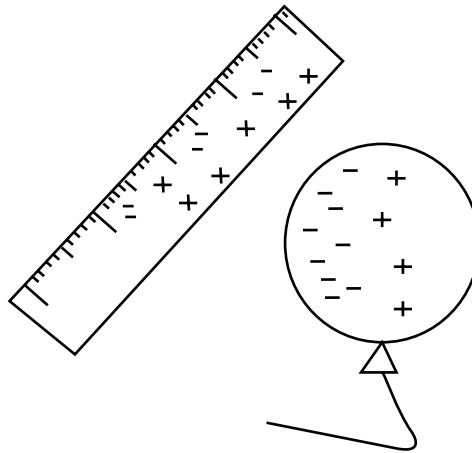
Q1. Look at the given diagram of a battery and a light bulb:



Connect these two devices together as to light the bulb.

Name the object you will use. _____

Q2. Why are charges on the balloon and ruler arranged as shown?



Q3. What are fuses? Why are they important?

Unit 10: Magnets and Electromagnets

The chapter is about the magnetic field (which is invisible but we can make it visible with a bar magnet and iron filings) and an electromagnet (which can be switched on and off).

The interesting part of this topic is how to make a simple electromagnet. Students will also learn that the Earth has a magnetic field and magnetic compasses help us to navigate using the Earth's magnetic field.

Lesson Plan 1

Student Book Page 89

Learning Outcomes

Students should be able to:

- explain that a magnetic field is invisible.
- describe how we can make it visible with a bar magnet and iron filings.

Introduction

Place a magnet beneath a sheet of paper and place a needle on top of the paper. Demonstrate that when the magnet is moved around underneath, the needle will move too.

Main Teaching

- Show different-shaped magnets and explain that the north and south poles of a magnet can be determined by comparing them to the Earth's magnetic field.
- Use a magnet to identify magnetic and non-magnetic materials.
- Attach one magnet to a toy car. Hold the other magnet behind the car, about 2 to 3 inches away and show that the car can be made to move with the help of magnetic force.
- Explain that opposite poles attract, while similar poles repel each other, and show that that the toy car can be made to move forward or backward by bringing similar and opposite poles closer to the magnet attached to it.
- Give two magnets to each student and ask them to feel the attractive and repulsive magnetic forces.
- Spread some iron filings on a sheet of paper and place a magnet under it, in the centre. Bring up students one by one, so they can observe a magnetic force field on the paper.

Guided Practice

Make groups of 4 students. Provide materials and ask them to explore some magnetic and non-magnetic materials.

Materials to explore: a sheet of paper, cardboard, plastic ruler, glass jar, pencil, tin can, and a spoon. Students should record their findings in their notebooks.

Independent Working

Ask pupils to write in their notebooks the answer for Concept Check on page 90.

Wrap Up

Ask students to comment on the Discuss and Answer activity on page 91.

Homework/Going Further

Ask the pupils to draw different-shaped magnets and label their north and south poles.

Lesson Plan 2

Student Book Page 90

Learning Outcome

Students should be able to:

explain that magnetic compasses enable us to navigate using the Earth's magnetic field.

Introduction

Ask students to work in pairs and provide each pair with a magnetic compass to examine. Now give each pair a bar magnet and ask them to bring the magnetic compass near the magnet. Ask them to observe how the compass behaves when it is brought closer to the bar magnet.

Main Teaching

- Explain the terms magnetised and demagnetised.
- Demonstrate the methods of de-magnetisation:
 - a) dropping repeatedly
 - b) heating
 - c) hammering
 - d) storing close to each other when not in use
- Demonstrate how a compass works by asking students to hold the magnet so that the disc of the compass is horizontal and the N-S markings are facing up. Next, demonstrate how to align the line marked N (for north) on the glass/plastic top with the arrow inside the compass.
- Talk about how compasses are used to find directions.

Guided practice

Ask students to use a compass to draw lines showing magnetic forces on a sheet of paper.

Place a magnet in the middle of the paper and trace its outline. Next, place the compass at one of the marked poles of the traced outline. Make a dot on the paper, showing the direction in which the compass arrow is pointing.

Next, move the compass so that the base of the arrow is at the dot just made. Make another dot where the tip of the arrow is pointing. Continue till you reach the other end of the magnet outline.

When you connect the dots, the line represents a single magnetic field line!

Continue in this way, each time starting at a different spot, until you have drawn as many lines as you can for both ends of the magnet.

This is a highly accurate representation of magnetic field lines.

Independent Working

Show students how to magnetise a needle and how to make a floating needle compass. Students should be instructed to handle the needle carefully.

Wrap Up

Discuss the importance of the compass for navigation in the days before GPS device.

Homework/Going Further

Ask the students to search the internet to find five uses of magnets.

Lesson Plan 3

Student Book Pages 91–92

Learning Outcomes

Students should be able to:

- explain that an electromagnet can be switched on and off.
- make a simple electromagnet.

Introduction

Ask students to study the diagrams on page 92 and read the text.

Main Teaching

- Ask students to read the text on page 91.
- Demonstrate how to wind the wire around the nail, leaving room at each end.
- Explain how to make a closed circuit by attaching the free ends of the wire to the battery.
- Explain that the strength of an electromagnet can be increased by increasing the current in the coil.
- Discuss the uses of electromagnets.
- Compare permanent magnets and electromagnets through hands-on experience by building an electromagnet and a motor.

Guided Practice

Divide the pupils into groups of three or four. Give them the materials needed to make an electromagnet. The materials are: large nail/rod, battery and holder, and a long wire. Provide them with instructions.

Independent Working

Using the magnets they have made, students should take turns to pick up small pins and paper clips. Ask them to record how many they pick up. Every student needs to draw a diagram of their completed electromagnet in their science journal. Underneath this diagram they should record the number of pins and paper clips it picked up. They should also be given the opportunity to design different experiments using the electromagnet that they have made.

Wrap Up

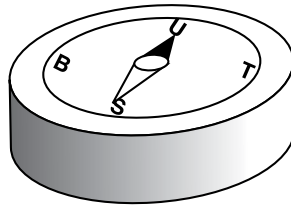
Discuss the answers to Question 4 on page 94.

Homework/Going Further

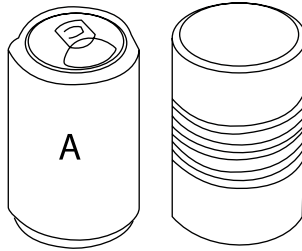
Ask students to complete Activity 2 on page.95.

Worksheet 10-1

Q1. What is the name of the following device?



Q2. The drawing shows an aluminium can (A) and an iron can (B).



a. Which cans will be picked up by a magnet? Give reason.

b. Which can will not be picked up by a magnet? Give reason.

Q3. In the centre of the Earth, there is a large amount of magnetic iron.

a. What do we call the effect that the Earth has which makes a compass work?

b. What are the four cardinal points of the earth? Draw



Worksheet 10-2

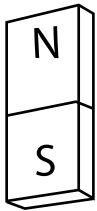
Q1. Look at the figure:



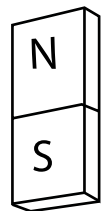
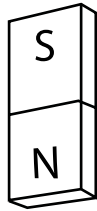
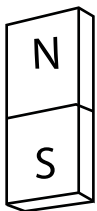
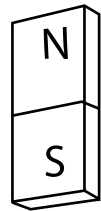
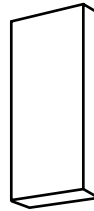
a. Explain how a heavy scrap of iron is picked up by an electromagnet?

b. Why is it possible to use an electromagnet to separate magnetic materials from non-magnetic materials?

Q2. For each diagram, write either 'attract' or 'repel' and draw arrows to show the magnetic forces.



iron



Unit 11: Light

The pupils will discover how the pinhole camera uses light to form an image and how materials are either opaque, translucent, or transparent.

They will know that shadows depend on the intensity of light and the size of the object, and distances. Students will differentiate that eclipses can be solar or lunar and can be partial or total.

Lesson Plan 1

Student Book Pages 96–97

Learning Outcomes

Students should be able to:

- explain that some objects are luminous and produce light.
- describe how a pinhole camera uses light to form an image.

Introduction

Darken the room and ask students if they can read a book when there is no light in the room.

Listen to students' responses and reasons.

Main Teaching

- Turn on a torch and shine its light on a mirror. The mirror becomes bright. Explain that the mirror does not shine with its own light.
- Using a torch, demonstrate that we can see things because light is reflected from them. Both light and our eyes work together to enable us to see. Some materials reflect light better than others.
- Shine the light of a torch on a book. It becomes bright. Explain that the book is bright because the light from the torch is reaching the book.
- Light the candle and explain that the candle produces its own light.
- Give examples from the classroom and explain that the Sun, a lighted bulb, and a lighted candle are all luminous objects because they produce their own light.
- Explain that the things which do not emit light are called non-luminous objects and these objects can only be seen when light falling on them is reflected back and enters our eyes.
- A book, a piece of chalk, and a wall are examples of non-luminous objects.
- Explain that light travels in straight lines. When light hits an object, it is bounced back and enters our eyes. This is how we see the object.
- Explain how the pinhole camera works.

Guided Practice

Help students to follow the instructions on page 105 of the Student Book to construct a pinhole camera.

Independent Working

Perform Activity 2 on page 105 to show that light travels in straight lines.

Wrap Up

Discuss how some objects, like the Moon, look luminous but actually they are not. They look bright because they reflect light falling on them.

Homework/Going Further

Ask students to identify some luminous and non-luminous objects used in daily life and make a table of their findings in their notebooks.

Lesson Plan 2

Student Book Pages 97–99

Learning Outcomes

Students should be able to:

- explain that materials are either opaque, translucent, or transparent.
- explain that shadows depend on the intensity of light, the size of the object, and distances.

Introduction

Ask a student to turn on a torch and hold it. Instruct the others to look at the torch and ask what they observe. Explain that the bulb is emitting light, so the bulb is a luminous object and the glass cover of the torch is transparent.

Cover the glass with a tissue and ask if there is any change in the torch light. Explain that as the light passes only partially through the tissue, the tissue is translucent.

Now cover the glass with a piece of cardboard and explain that no light can be seen. Explain that the light is totally blocked because the cardboard is opaque.

Main Teaching

- Explain that objects through which you can see clearly are called transparent, e.g., window glass, thin plastic sheet, etc. Light can pass completely through transparent objects.
- Non-transparent objects are called opaque. Light cannot pass through them. For example, wood, walls, books, metals, etc. are all opaque objects.
- Materials through which light can pass partially are called translucent. Examples of translucent objects include wax paper and frosted glass.
- Light travels in straight lines. When light reaches an object, it can travel through the object if the object is transparent. It can be reflected from a shiny object, or absorbed if the object is opaque. Shadows are produced when light hits an opaque object through which the light beams cannot pass. When an object blocks the light's path, a darkness appears on the other side of the object. This darkness is called a shadow.
- Discuss how the Sun is a very big and important source of light. Provide students with the opportunity to go outside and observe what happens when the Sun shines on them. Ask them to observe and discuss how their bodies can be used to create shadows.

Guided Practice

Divide the students into groups of 3. Give each group three items: a glass, some wax paper, and a book. Ask each group in turn to hold their objects in front of a lit bulb to check if they can see the light through them. Sum up their observations to reach conclusions.

Independent Working

Ask the students to identify a few more examples of opaque, translucent, and transparent objects, for example, bottle, water, glass, tissue paper, wooden scale, book, air, cloth, thick plastic, file cover.

Wrap Up

Ask students to discuss the Concept Check on page 98.

Homework/Going Further

Set up a light source and check the shadows of 4 objects of differing size and shapes. Check what happens to the shadows when the brightness of the light source is changed. Note down the results in science notebooks, along with an explanation of the results.

Lesson Plan 3

Student Book Pages 100–101

Learning Outcome

Students should be able to:

explain that eclipses can be solar or lunar; they can be partial or total.

Introduction

A ping pong ball, 2 sharp pencils, and a tennis ball are required for this activity. The ping pong ball, which represents the Moon, and the tennis ball, which represents the Sun, should each be stuck on top of a pencil. The Sun should be held at arm's length and the Moon should be passed back and forth in front of it. Students should close one eye when doing this and try it with the Moon held at different distances between their eye and the Sun.

Main Teaching

- The solar system consists of the Sun and a collection of objects, including planets, their moons, and asteroids, which are held in orbit around the Sun by its gravitational pull on them.
- Differentiate between a solar and a lunar eclipse. Explain that a solar eclipse occurs when the Moon comes between the Sun and the Earth: the Moon is opaque and blocks out the light of the Sun. A lunar eclipse occurs when the Earth comes directly between the Sun and the Moon: the shadow of the Earth falls on the Moon.
- Use a torch and balls to explain solar and lunar eclipses.

Guided Practice

Encourage students to discuss and answer the questions on page 102.

Independent Working

Answer Question 6 to summarise the topic.

Wrap Up

Discuss the achievements of Ibn al Haytham.

Homework/Going Further

Introduce the concept of a shadow puppet show and ask students to search the internet to find out how puppeteers use shadow figures and dialogue to tell a story.

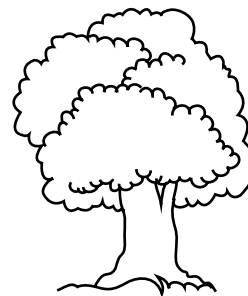
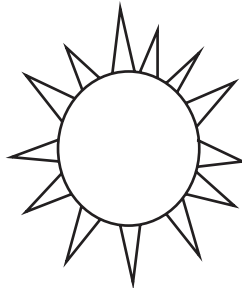
Worksheet 11-1

Q1. In the space below, draw a diagram to show how light is reflected from a mirror:

Q2. Give two examples of each of the following

- a. opaque materials: _____
- b. luminous materials: _____
- c. non-luminous materials: _____
- d. translucent materials: _____
- e. transparent materials: _____

Q3. Draw arrows to show how the light from the Sun travels to the eye.



Worksheet 11-2

Q1. Why is the Moon seen to shine at night though it is a non-luminous object?

Q2. Which three things are required for formation of a shadow?

Q3. Why is a shadow not formed in the dark?

Unit 12: Air

This topic will help students to explore the layers of air surrounding the Earth is called the atmosphere and air contains many gases. The students will understand oxygen is used for breathing and burning and moving air is used as a source of energy.

Lesson Plan 1

Student Book Pages 107–109

Learning Outcomes

Students should be able to:

- explain that the layer of air surrounding the Earth is called the atmosphere.
- explain that air contains many gases.
- explain that oxygen is needed for breathing and burning.

Introduction

Squeeze an empty bottle suddenly in the classroom. Students will jump as the air rushes out of the bottle towards them. Ask the students if the bottle is really empty, and if not, what is coming out of the bottle. The students should tell you that the bottle was full of air. Show the students that the air flows back into the bottle the second you stop squeezing it.

Main Teaching

- To demonstrate that air has weight, ask the students to predict which is heavier, an inflated balloon or an empty balloon.
- Demonstrate using a balance scale that two empty balloons are the same weight.
- Show a chart or a model to explain the layers of the atmosphere.
- Discuss the importance of the ozone layer. Explain how the Sun's ultraviolet radiation can cause skin cancer, cataracts (clouding of the lens of the eye), damage to crops, and other problems.
- Draw a pie chart on the board and discuss the percentages of different gases present in the atmosphere around the Earth.
- Explain the importance of different gases in our everyday life.
- Perform Activity 1 on page 116 to explain the properties of air.

Guided Practice

Discuss Questions 1 and 2 on page 113.

Independent Working

Write down the uses of the different gases in the air.

Wrap Up

Encourage students to comment on the Discuss and Answer on page 110.

Homework/Going Further

Students should attempt Question 9 on page 115.

Lesson Plan 2

Student Book Pages 110–112

Learning Outcomes

Students should be able to:

- explain that air has weight, occupies space, and exerts pressure.
- describe how moving air is used as a source of energy.

Introduction

Make a paper plane and demonstrate that air is required to fly it.

Main Teaching

- Ask students to read page 111 carefully and study the pictures.
- Differentiate between wind and air and discuss the importance of air in our lives.
- We use air to perform many everyday activities.
- Invite a student to blow up a balloon and explain that air is used to inflate rubber tyres and other objects.
- Burn a candle and explain that the oxygen present in the air is needed for burning.

Guided Practice

Ask the students to work in small groups to answer Questions 4 and 5 on page 114 in their notebooks.

Independent Working

Ask the pupils to list things that they can think of or see in the room that are full of air. Ask them if they have ever felt the force or pressure of air. Discuss experiences they have had blowing up balloon, beach balls, or bicycle tyres.

Wrap Up

Discuss some activities that need moving air (wind), for example, flying a kite, drying wet clothes, producing electricity, etc. The wind is also a common source of energy.

Homework/Going Further

Ask the students to attempt Questions 7 and 8 on page 114.

Worksheet 12-1

Q1. Which component of the air supports burning?

Q2. What is the atmosphere?

Q3. Describe the different layers of the atmosphere.

Q4. Fill in the blanks:

- a. The layer of gas in the atmosphere that blocks the Sun's ultraviolet rays is known as the _____ layer.
- b. Burning needs _____ present in the air.
- c. Clouds are formed in the _____ layer of the atmosphere.
- d. Planes fly in the _____ layer of the atmosphere.

Q5. What is the importance of the ozone layer?

Unit 13: Environmental Pollution

This unit focuses on the pollution affecting our environment and causing major problems. Explain to the students there are different types of pollution which have different causes, and effects. Discuss how some materials are biodegradable and are recycled by nature while many waste materials are non-biodegradable. They will learn the ways to reduce waste and pollution.

Lesson Plan 1

Student Book Pages 117–118

Learning Outcomes

Students should be able to:

- explain how pollution negatively affects our environment and causes major problems.
- identify different types of pollution and their causes and effects.

Introduction

Ask about their favourites playgrounds. Ask them what makes it their favourite: tailor questions to elicit responses of clean, safe, green, fresh air, etc

Main Teaching

- Ask students to look at the pictures on page 117 and discuss them with a partner. Write the definition of pollution on the board and explain that it is the contamination of air, water, or soil by substances that are harmful to living organisms.
- Stress how the environment cannot survive without clean air, water, and land. Also emphasise how it is up to the community to keep the environment free of pollution.

Guided Practice

Ask students to complete Activity 3 on page 125.

Independent Working

Ask students to make posters to inform others about the dangers of pollution. Display them around the school.

Wrap Up

Ask students to suggest ways to help stop pollution.

Homework/Going Further

Students should plan and carry out an experiment on the sustainability of an environment.

Lesson Plan 2

Student Book Pages 118–122

Learning Outcomes

Students should be able to:

identify some materials that are biodegradable and are recycled by nature.

Introduction

Show illustrations of different kinds of pollution: land, water, and air. Let the students identify the problems shown in the pictures.

Main Teaching

- Discuss how the pollutants that affect our rivers and oceans come from many different sources. One of the main causes of pollution is waste substances that flow into storm drains.
- Talk about how the water that comes from human activities, such as cleaning the car or watering the garden, runs off into streams and rivers, and contains many contaminants that cause pollution.
- Discuss the effect of pollutants on soil.
- Perform Activity 4 on page 125 to demonstrate air pollution.

Guided Practice

Pour some tap water into 3 separate, clean, clear glasses, A, B, and C. Observe the water through a magnifying lens. Students should record their observations in the first section in their notebooks.

To create ‘polluted water,’ add the oil to the water in glass A, the washing-up liquid to glass B, and the soil to glass C. Students should use the magnifying glass to study the results and write their observations in their notebooks. Ask them to stir the water with a spoon to create movement in the ‘polluted’ water and observe what happens to the water. Filter the polluted water through a coffee filter into a clean glass. Repeat for each of the glasses. Record observations as above.

Independent Working

Ask students to answer Question 4 on page 124.

Wrap Up

Ask students for ideas about ways to reduce pollution.

Homework/Going Further

Ask students to research different aspects of environmental health and use the information to prepare a school presentation.

Worksheet 13-1

Q1. Draw two objects which are biodegradable and two which are non-biodegradable:

Q2. Connect the effect with the type of pollution:

noise pollution

affects water life.

water pollution

causes desertification.

land pollution

causes hearing problems.

air pollution

spoils the atmosphere

Q3. List three causes of air pollution.

Q4. Explain the term biodegradable.

Unit 14: The Solar System

This unit will help reinforce information about on solar system, there are eight planets in our solar system which orbit the Sun which is a star which provides heat and light necessary for life on Earth. They will learn that the Moon is a natural satellite of the Earth and the other planets have Moons too.

Lesson Plan 1

Student Book Pages 127–130

Learning Outcomes

Students should be able to:

- explain that the Sun is a star; it provides heat and light and is necessary for life on Earth.
- name the eight planets in our solar system.

Introduction

Show students a chart of the solar system. Tell students the common mnemonic used to remember the correct order of the planets:

My Very Excellent Mother Just Served Us Nachos.

Point out the word which represents each planet. Point out that the only two planets that begin with the same letter (M) are Mercury and Mars. The word My stands for Mercury, which should be easy to remember because Mercury begins with M and ends with Y, which are the two letters in the word My.

Main Teaching

- Identify different features of the solar system such as the Sun, the Moon, the planets, comets, and asteroids.
- Ask each student to choose one solar system feature to research. Work with students as they choose their topics to be sure that each feature, including the eight planets, is chosen. Guide them about sources of information, such as books, the internet, magazines, newspapers, etc.
- Show a video about the solar system: <https://study.com/academy/lesson/solar-system-overview.html>
- Explain the difference between stars, planets, and moons: a star is a huge, luminous, spherical celestial body composed of gas that is usually seen from the Earth as a point of light in the night sky; a planet is a celestial body moving in an elliptical orbit round a star.
- Explain that a satellite is a celestial or man-made body orbiting the Earth or another planet.
- Discuss the information about the planets given in the table on page 129.

Guided Practice

Divide students into groups to discuss and answer the questions on page 128.

Independent Working

Divide students into groups of 9. Tell students they will be creating a human representation of the solar system. Ask them to work together as a group to decide:

- what aspects they want to include.

- how they will represent these aspects.
- what role each person will play.

Wrap Up

Discuss Questions 1, 2, and 3 on page 132.

Homework/Going Further

Ask students to use the internet and traditional sources to find information about the solar system. Ask them to identify keywords that would apply to their solar system topic.

Lesson Plan 2

Student Book Pages 130–131

Learning Outcomes

Students should be able to:

- explain that the Moon is a natural satellite of the Earth.
- identify other planets that have moons.

Introduction

Demonstrate Activity 2 on page 135

Main Teaching

- Discuss the term moon and explain that different planets have different numbers of moons.
- Explain that the Moon is a natural satellite of the Earth and it orbits the Earth. Discuss the characteristics of a satellite.
- Explain the term asteroid.
- Perform Activity 3 on page 136.
- Explain the term space probe and discuss how some countries send probes into space. These probes travel very fast in space. Some fly past the planets, others orbit or land on them, but they do not carry astronauts.
- Space probes send back pictures and other information to Earth.

Guided Practice

Guide the students to show the different phases of the Moon using a torch and a ball.

Independent Working

Students should draw the different phases of the Moon in their notebooks.

Wrap Up

Discuss the Concept Check on page 131.

Homework/Going Further

Students should attempt Questions 4 and 5 on page 133.

Worksheet 14

Q1. Complete the following sentences.

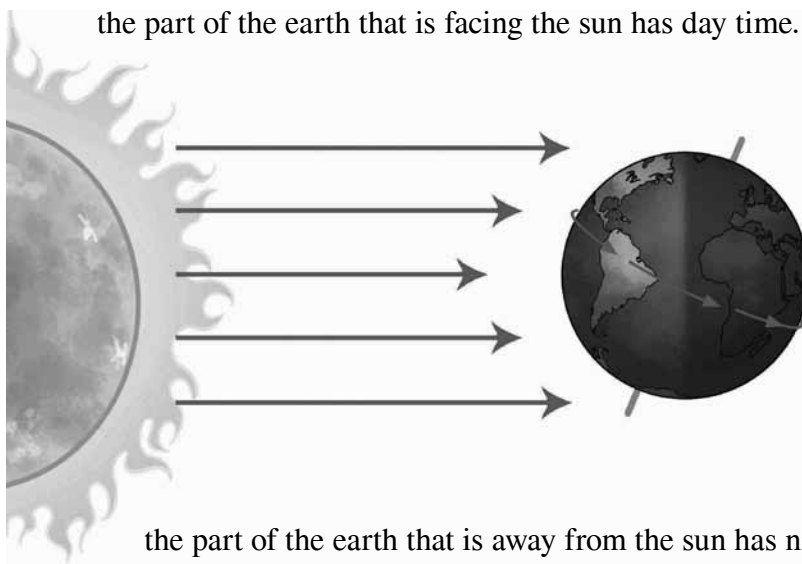
- a. The Earth takes _____ hours to turn once on its axis while the Earth takes _____ days to go round the Sun.
- b. A _____ is a celestial or man-made body orbiting the Earth or another planet.
- c. The _____ is the centre of our solar system.
- d. A planet is a celestial body moving in an elliptical orbit round a _____.
- e. The Sun and the eight planets revolving around it form the _____.

Q2. Put these in order of size: Sun, Moon, Earth.

Q3. What are the different movements of the Earth?

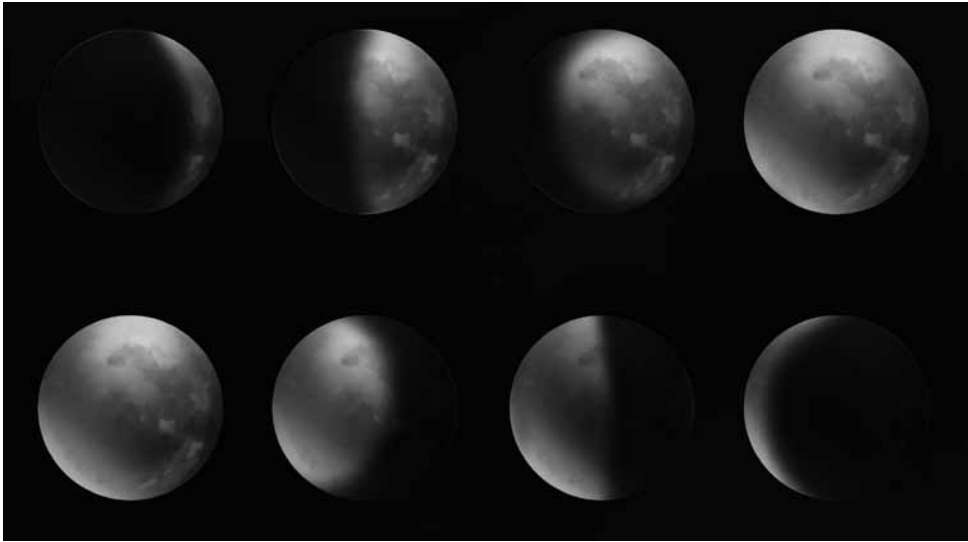
Q4. Name the planets in the correct order from the Sun.

Q5. Match the sentences with the label positions.



Worksheet

Q1. Put the following phases of the Moon in the right order, starting with a new moon.



The correct order is: _____

Answers

Unit 1 The Brain and Nerves

Concept Check

Use the correct word to complete these sentences.

1. The nerves that transmit signals from the brain to the muscles and glands are called **motor** nerves.
2. The nerves that transmit signals from the sense organs to the brain are called **sensory** nerves.

Discuss and Answer

Can you think of a few more examples of reflex actions?

Students will try to think of a number of reflex actions such as blinking if something comes towards their face.

Concept Check

Fill in the blanks to complete these sentences.

1. The cerebrum controls **thinking, reading, and reasoning**.
2. The cerebellum controls **movement and balance**.
3. The medulla controls **breathing, memory, and heart beats**.

Concept Check

Answer these questions.

1. How are you able to hear sounds?
The outer ear directs sound to a thin membrane—the eardrum. Sound vibrations pass on to the inner ear, where the nerves carry the message to the brain.
2. How does the tongue detect different tastes?
The taste buds on your tongue are sensitive to chemicals in food. They send signals to the brain. The tongue detects different tastes: sweet, sour, salty, bitter, and umami*.
3. What happens to the cells on the surface of the skin?
The skin has thousands of receptor cells. These receptors send information to the brain about things we touch. For each type of sensation, we have different receptor cells. The skin enables you to feel heat, cold, pain, pressure, and touch.

Exercises

1. Choose the correct answer.
 - i. Which organ works with the nervous system and the sense organs to detect the world around us? **b. brain**
 - ii. Which of the following does the brain need in order to function properly? **d. all of these**
 - iii. What does the medulla control? **d. involuntary actions**
 - iv. What is the name of the top layer of skin? **d. epidermis**

- v. Brain cells are different from other cells of the body because they do not **b. re-grow**.
2. Match the definition in Column A with the correct term in Column B.
- nerves which cause movement in muscles **a. motor nerves**
 - the part of the brain which controls breathing **b. medulla**
 - the nerve which carries messages from the eye to the brain **c. optic nerve**
 - the coloured part of the eye **d. iris**
 - the part of the eye on which the lens focuses **e. retina**
3. Fill in the blanks.
- The outer ear directs sounds to the **eardrum**.
 - Smells are **chemicals** in the air.
 - The **taste buds** on your tongue are sensitive to chemicals in food.
 - The **brain stem/medulla** connects the brain to the spinal cord.
 - The **pupil** is the part through which light enters the eye.
 - The brain is part of the **nervous** system.
 - Nerves** are like telephone wires and link all parts of the body to the brain.
 - The three main parts of the brain are: **medulla, cerebellum, and cerebrum**.
 - The nerve cells need a continuous supply of **oxygen**.
4. On this outline drawing of the brain, colour the three areas and label the following:
Answer given in book.
5. Which area of the brain will be the most active when you perform the following tasks and actions?

Students may think of some plausible additional or alternative to the suggestions given below.

E.g. walking: cerebellum (co-ordination, movement, balance), cerebrum (voluntary movement)

- remembering to buy your friend a present for his/her birthday **Cerebrum (motivation, memory)**
- copying a picture from a book **Cerebrum (attention, voluntary movement, touch, awareness of space, sight); Cerebellum (co-ordination, movement, balance)**
- understanding different words **Cerebrum (memory, language, reading)**
- doing well in your tests **Cerebrum (academic skills, memory, language, reading)**
- controlling your tears when you are sad **Cerebellum (co-ordination) Cerebrum (emotion)**
- feeling bored and fed up **Cerebrum (controlling attention)**
- concentrating on a particular subject **Cerebrum (controlling attention)**
- dancing **Cerebellum (co-ordination, movement, balance)**
- feeling pain in your elbow **Cerebrum (touch) Medulla (nervous system)**
- talking to your friend **Cerebrum (language) Cerebellum (movement)**
- coughing **Medulla (nervous system, involuntary action)**
- blinking **Medulla (nervous system, involuntary action)**

Think of other actions and make a list. Ask a friend to tell you which parts of the brain are used. At the same time, you can work on the list your friend has made. **Students will need to think about the actions and the parts of the brain used to do them. They may pick up on different aspects of the action and the associated part of the brain –discussion should be encouraged.**

6. Tell your teacher in your own words:
 - i. about any one of your sense organs and how it works.
 - ii. about how your nervous system works.

Students will use their own words.

7. Answer these questions.
 - i. Name the different kinds of nerves in the body. **The two kinds of nerves mentioned are motor nerves and sensory nerves.**
 - ii. What is the function of the sensory nerves? **The sensory nerves carry signals between the sense organs and the brain (directly or via the nerves on each side of the spinal cord).**
 - iii. What is a reflex action? Which part of the nervous system controls reflex actions? **A reflex action is an automatic action. They are controlled by the spinal cord.**
 - iv. How does the eye see things? **Light enters the eye through the pupil in the centre of the iris. The lens focuses the image on the retina. The optic nerve carries the message to the brain which interprets what we are seeing.**
 - v. Name the parts of the brain. What is the function of each part? **The parts of the brain are the cerebrum, the medulla (or brain stem), and the cerebellum. The cerebrum controls voluntary actions like thinking, feeling, decision making, reading, seeing, differentiating between senses, remembering. The medulla controls involuntary actions such as most bodily functions (breathing, digesting, organ function). It keeps working when we are asleep. The cerebellum controls balance and movement of our muscles and joints, helping us to do the physical actions that involve our muscles.**
 - vi. When you feel dizzy and faint, you fall down. Can you think why? It is the body's way of helping you. How is this fall going to help? **Fainting is caused by a temporary reduction in the blood flow to the brain. When you collapse to the ground, your head and heart are on the same level. This means your heart doesn't have to work as hard to push blood up to your brain.**
 - vii. How does the nose detect smells? **Smells (chemicals in the air) dissolve on the moist lining of the nostrils. The nerves carry a message to the brain and you can detect the smell.**
 - viii. If you touch a hot plate, what makes you take your hand away? How does the message get to the brain? **Tiny sensors in your skin sense the heat nearby. A message is flashed by the nerves to the spinal cord and to your muscles, and you pull your hand away.**

Unit 2 Microorganisms, Health, and Disease

Concept Check

What do these food items contain? Unscramble the letters to find the answers.

PROTEIN CARBOHYDRATE VITAMINS

These foods contain **protein**. They build you up without making you fat.

These foods contain **carbohydrates**, fibres, and a little protein. They give you energy.

These foods contain **vitamins**, minerals, and fibre. They help to keep you healthy.

Concept Check

Answer these questions:

1. Why should we wash fruits and vegetables before eating them? **We should wash fruits and vegetables before we eat them to remove any dirt, germs, or pesticides.**
2. Which creatures carry germs on their feet and like to land on food? **Flies.**

Concept Check

Answer these questions:

1. What are the methods used to preserve food. **Methods used to preserve food are: freezing, sterilizing, adding preservatives, or sealing in airtight containers. Milk can be preserved for a while by pasteurisation.**
2. What should we always do before handling or eating food? **We should always wash our hands thoroughly before eating or handling food.**

Exercises

1. Choose the correct answer.
 - i. Which of the following are ways to keep food free from germs? **d. all of these**
 - ii. What do flies put on food so they can eat it? **c. saliva**
 - iii. Bacteria are used to prepare **a. yoghurt**
 - iv. Which type of germ causes pneumonia? **b. bacteria**
 - v. Milk is pasteurised at a temperature of: **c. 60°C**
2. Fill in the blanks.
 - i. Foods packed in a factory contain **chemical preservatives**.
 - ii. Milk can be preserved by a process called **pasteurisation**.
 - iii. Living things which are made of one cell are called **unicellular** organisms.
 - iv. A useful type of **bacteria** is used in making yoghurt.
 - v. A mushroom is an example of an edible **fungus**.
3. Mark these sentences with ✓ or ✗.
 - i. Infections cannot be caused by small worms. ✗
 - ii. Germs are killed by pasteurization. ✓
 - iii. Influenza is caused by a virus. ✓
 - iv. All kinds of bacteria are harmful. ✗
 - v. The body gets vitamin D from sunlight. ✓
4. Study the table of seven of the world's deadliest diseases.

- i. In your notebook, draw a graph to show the number of deaths per disease. How will you organise the material?
- ii. What do you know about these diseases? Do you know which ones are preventable by vaccination? Have you had any vaccinations?

Students may need the teacher's guidance to set up the graph and discuss the material. They will need to conduct research to answer ii.

5. Find the odd one out. Give a reason for your selections.

- i. **vitamin S – this is not a vitamin**
- ii. **protein – not a microorganism; an element of food needed by the body**
- iii. **tortoise – a reptile; not an insect**
- iv. **headache – an ailment but not a disease**

6. Think about it!

- i. Is your environment clean? In your notebook, make a list of ten places around your school or your home. Talk about whether they are clean or dirty. How can they be kept clean?
- ii. Where do the waste products from your house go? Find out where the rubbish goes and what happens to it.

Students will need to think and state their own views on this key issue.

7. Answer these questions.

- i. How are germs kept out of tinned foods? **Air (and the germs in it) is removed during the canning process.**
- ii. What is pasteurisation? **The process of heating milk to 60 degrees C to destroy the germs in it and make it last for longer.**
- iii. What are the main kinds of microorganisms? **The main kinds of microorganisms are bacteria, fungi, protozoa, and viruses.**
- iv. In what ways are diseases spread from person to person? **Diseases are passed from person to person through the air or through direct contact or bodily fluids, such as blood.**
- v. How can we stop diseases from spreading? **To control the spread of diseases we have to:**
 - **ventilate the house well, to allow fresh air to circulate.**
 - **air clothes and bedding in fresh air and sunlight.**
 - **keep water and food well covered and clean.**
 - **boil milk to kill the germs it contains.**
 - **keep the surroundings clean by using disinfectants.**
 - **sneeze into a handkerchief, a tissue, or the crook of your elbow.**
 - **if you are sick do not share your personal things.**
 - **get ourselves vaccinated.**

- vi. Define the following terms:
- microorganism - **living things which are too small to be seen with the naked eye; they can be only seen through a microscope**
 - microscopic - **so small that it is only visible with the help of a microscope**
- vii. Name any three places where you can find bacteria. **Students can list any three surfaces or places exposed to the air, in water, in soil, in or on our body.**
- viii. How are fungi useful for human beings? Give two examples. **Some fungi can be eaten. Fungi help to decompose biodegradable litter and make soil fertile. Fungi, in the form of yeast, are used in food production and in the production of antibiotics.**
- ix. List six ways in which microorganisms can enter your body. **Microorganisms can enter the body through cuts, through the nose and mouth when you breathe, eat or drink. They can also enter through direct contact. They can enter through insect bites or burrowing worms. Students may give specific examples or list general ways, like those given here.**
8. Tell your teacher in your own words:
- about a time when you were ill. What caused your illness and how did you get better?
 - how diseases can be communicated and spread.

Students are to their own words.

Fun page

1. **Students will use their own words to make up their own acrostic using one of the titles given below. Remember that each line needs to be about the subject of the acrostic.**

• CEREBRUM • CEREBELLUM • MEDULLA • NERVOUS SYSTEM • EARDRUM
• REFLEX ACTION

2. **Contagion! Students should be given the opportunity to play this game.**

Do you know how quickly an epidemic can spread? Play this game to find out. One person stands at the front of the class. No running. The teacher starts a countdown of twenty seconds. The student has to mime being sick and then touch two people. Those two people have to mime being sick and touch two other people.

Those people then mime being sick and touch two other people. If you are touched by someone you must mime being sick and touch two people. You must not touch more than two people.

If you can play this game in a large auditorium with a lot of people, you will be able to see the spread move through the crowd very quickly. This is the same way that disease spreads!

Remember to always wash your hands!

3. **Students to make a poster to remind people to wash their hands before eating and after using the bathroom.**

Unit 3 Life Functions

Concept Check

Fill in the blanks to complete the sentences.

1. All living things grow when they are **young**.

2. Growth slows down and stops at some stage in **adulthood**.
3. All living things move. Movement is called **locomotion**; it uses up energy.

Concept Check

All living things need energy. How do the following living things get their energy?

- a. antlion – **through food (by eating ants)**
- b. rafflesia – **gets its energy by living off the food made by other plants (it is a parasite)**
- c. apple tree – **through photosynthesis**
- d. shark – **through its food**

Concept Check

All living things need oxygen. What body part (A) do the living things (B) use for respiration?

nose/nostrils - rat, gills - trout, spiracles - cricket, stomata - oak tree, moist body surface - tadpoles, nostrils - frog on a log

Discuss and Answer

Students should discuss the facts and the questions. Look at the facts given above and on page 28 about sensitivity in living things. Discuss them. Which facts did you already know? Which ones did you not know before? Do you know about any other creatures with special body parts they use to sense or feel things?

Concept Check

1. All living things perform certain functions. What are the seven functions you have learned about in this unit? **All living things move, grow, take in food, respire, produce waste, have sensitivity, reproduce.**

2. Complete these sentences.

Most mammals give birth to **live young**. Some mammals produce only baby at a time while others produce **many**.

Discuss and Answer

1. Fishes have nostrils but do not breathe through these. Can you explain why? **They breathe through gills. They live in water, which contains oxygen, and gills allow them to get the oxygen out of the water.**
2. You now know that all babies look like their parents. Do you have similarities with your parents? Can you share a few of them? **Pupils will share a few of their physical characteristics.**

Exercises

1. Choose the correct answer.
 - i. What does locomotion use up? **a. energy**
 - ii. Which of these functions is performed by all living things? **b. respiration**
 - iii. Which of the following is a waste product which humans exhale? **d. carbon dioxide**
 - iv. Fishes have a sixth sense, what is it? **c. a line along its body that allows the fish to feel vibrations in the water**
 - v. A fly tastes with its **c. feet**.

2. Match the definition in Column A with the correct term in Column B.
 - i. the ability of living things to move from one place to another **c. locomotion**
 - ii. the ability of living things to feel things around them **d. sensitivity**
 - iii. the process by which living things take in oxygen, and give out carbon dioxide **b. respiration**
 - iv. the process by which living things continue to extend their species **a. reproduction**
3. Fill in the blanks.
 - i. Plants make their own food by a process called **photosynthesis**.
 - ii. Plants and animals take in oxygen and give out carbon dioxide. This process is called **respiration**.
 - iii. Animals can move from place to place. This movement is called **locomotion**.
 - iv. Rafflesia is a **parasite**.
 - v. Insects breathe through **spiracles**.
 - vi. A snake's tongue picks up **chemical particles** from the air and ground.
 - vii. Fish breathe through their **gills**.
4. Name the living thing.
 - i. It can produce up to 32 babies at one time. **mice**
 - ii. It has eight legs and builds a web. **spider**
 - iii. It flies about at night; it has good hearing. **bat**
 - iv. It breathes through moist skin. **earthworms/frogs**
 - v. It breathes through stomata. **plants**
5. Answer these questions. **Students should use the learning from this unit and put the answers to the following questions into their own words.**
 - i. What is one important thing that plants can do but animals cannot? **Plants can make their own food.**
 - ii. Why do animals move from place to place? **Animals move from place to place to find food and water, or to avoid danger.**
 - iii. How does a mosquito feed? **A mosquito feeds through a sharp, needle-like mouthpart.**
 - iv. Give an example of a plant that does not make food by photosynthesis. How does it get energy?

Some plants do not make their own food. They can be carnivores (example: pitcher plant, venus flytrap) or parasites (example: rafflesia) or decomposers (example: mushrooms).

- v. What is taking in and giving out air called? **Taking in and giving out air is called respiration. Do all animals do this in the same way? What about plants? Students should be able to use their own words to explain how different animals respire. They should also be able to give a simple explanation of respiration in plants.**
- vi. Why do animals need to be able to sense danger? Describe a few examples of how animals can tell if there is danger nearby. **Students should be able to use their own words to explain how different animals sense danger.**

vii. What are antennae? Which animals have them, and what are they used for? **Students should be able to use their own words to describe antennae and what they are used for.**

viii. Explain how animal movements are different from those of plants. **Students should be able to use their own words to explain how animal and plants movements are different.**

6. Write about it.

Choose one animal and one plant. Write a paragraph about each. Describe how they sense the world around them. Draw pictures too. Students will use their own words.

7. Mark these sentences with ✓ or ✗.

i. The hummingbird hovers while it feeds. ✓

ii. Fish do not chew food. ✓

iii. Animals take in carbon dioxide and give out oxygen while breathing. ✗

iv. The lateral line can be found in some plants. ✗

v. Plants reproduce by producing seeds or spores. ✓

8. Think about it!

i. Do all small animals move in the same way? How do animals without legs (a worm, a slug, snail, leech, snake) move along the ground? Find some small creatures and watch them move. Make a chart to show how each one moves. Do they leave a trail?

Students will conduct the experiment and use their own words to discuss movement and fill in a chart.

ii. Does a cat have antennae? What senses does it have? Take a good look at a cat's head and see if you can find any unusual hairs. Then work out why you think a cat has whiskers! **Use close up images (or a video) of a cat's head to look at the whiskers.**

These are highly sensitive and allow cats to detect approaching danger.

9. Tell your teacher in your own words:

i. about the functions common to all living things.

ii. about some plants that do not make their food by photosynthesis.

Students will use their own words.

Unit 4: Classification of Living Things

Discuss and Answer

Why do we need to classify things? What are some of the ways in which we can classify animals according to where they live and what they eat? **Students should be encouraged to discuss these questions. You could collect some ideas on the board.**

Concept Check

- Place the following creatures in the correct column. Add at least three more examples of your own to each column. **Students will need to think of three examples of their own to add to each column. Discuss their choices.**

Vertebrates	Invertebrates
lizard, frog, whale, parrot, cat, goldfish	spider, worm, beetle, cockroach, snail, slug

Exercises

- Choose the correct answer.
 - Which of these is not one of the five kingdoms? **d. insects (they are part of the animal kingdom)**
 - What do vertebrates have that invertebrates do not? **c. backbone**
 - Which of these is an insect? **d. cockroach**
 - Which of these do insects have? **d. all of the above**
 - What do we call insects which destroy plants? **d. pests**
- Put these in order. (You may want to discuss the answers!) **Students should be encouraged to discuss the options. They may disagree depending on which species they have seen or heard of. They could conduct some research to find out more about the sizes, sounds and textures of these small creatures. They will find out more about how varied different kinds of the same species can be. Some suggested orders are given here.**
 - Which is biggest? Which is smallest? **e. butterfly a. grasshopper c. cockroach d. fly b. ant**
 - Which is longest? Which is shortest? **c. bootlace worm a. earthworm b. hookworm c. nematode**
 - Which is quietest? Which is noisiest? **e. beetle d. mosquito c. fly b. bee a. cricket**
 - Which is softest? Which is hardest? **d. butterfly b. dragonfly e. ant a. ladybird c. beetle**
- Answer these questions.
 - What do you understand by classification and why do you think it is important? **Students should show understanding that it is easier to discuss animals in groups and using shared features enables us to group animals. They should also understand that there are many different kinds of each type of creature – can they find out the names of three different kinds of ant, beetle or bee?**
 - Name two mammals that live in the water. **Some suggestions: dolphin, whale, manatee, and dugong. The following semiaquatic mammals spend much of their lives in water but also spend time on land: seal, sea lion, walrus, hippopotamus, otter.**
 - Name five invertebrates that could be living in a garden. **Some suggestions: earthworm, spider, beetle, butterfly, fly, moth, dragonfly, slug, snail, ladybird, bee, centipede, grasshopper, cricket, ant, wasp, etc.**

- iv. Name three invertebrates that live in the sea. **Some suggestions: crab, worm, sea slug, sea spider, anemone, coral, sea cucumber, starfish, sea urchin, jellyfish, oyster, clam, scallop, octopus, squid, cuttlefish, etc.**
 - v. Name three invertebrates that have more than three pairs of legs. **Some suggestions: spiders, crabs, ticks, centipedes, scorpions, etc.**
 - vi. What kind of insects live in a colony or group? Why is living like this useful to them? **Bees, ants and termites live in colonies. They share the work by having specific jobs to do, including defending their queen (which lays eggs).**
 - vii. Which insect is a pest? Are there any in your house? **Some suggestions: flies, mosquitoes, cockroaches, mites, fleas, lice, some kinds of beetles, etc.**
 - viii. What are antennae? What are they used for? **Antennae or feelers are sensitive, long parts that stick out from the head of an insect. They are used for smelling and feeling.**
 - ix. Do all insects fly? Can you name some that do not? **Most insects have wings. Many kinds of ants do not have wings.**
 - x. Name some small creatures which are not insects. Say why they are not insects. **Students can name any small creatures which are not insects. They need to identify the features that they have or do not have which are different to the features insects have.**
4. Fill in the blanks using words from the box.
 - i. Most insects have **wings** attached to them that help them to fly.
 - ii. A **colony** is a large group of insects living together.
 - iii. Some worms live in other creatures; they are **parasites**.
 - iv. Flies and mosquitoes can cause **diseases**.
 - v. Worms have long, tube-like **bodies**.
 5. Think about it!
 - i. Some people think that spiders are insects which they are not. Explain how they are different from insects. **Encourage the students to compare a spider to the list of features shared by insects. Spiders are arachnids: they have two segments to their bodies, they do not have antennae, and they have four pairs of legs.**
 - ii. Are insects useful, or do they cause destruction? In what ways are they useful, and to whom? **Students will use their own words and give examples to support their views. Some insects are pests but most of them have important roles to play. Students should gain an understanding of some of these.**
 6. Tell your teacher in your own words:
 - i. about the main difference between vertebrates and invertebrates. **Students will use their own words.**
 - ii. about the invertebrates that live in your house; where they live and what they do. **Students will use their own words.**
 - iii. Which of the following are insects? Talk about each one, in turn, and tell your teacher where and when you last saw one of them. **Insects:** cockroach wasp dragonfly bee fly

mosquito ladybird, **Not insects:** slug, snail, millipede, spider, **Students will use their own words.**

Unit 5 Plants

Concept Check

Summarise the characteristics of monocot and dicot plants under the correct headings.

Parts of the plant	Dicot	Monocot
flower	petals in multiples of three	petals in sets divisible by four or five
seed	has two seed leaves	has only one seed leaf (or cotyledon)
leaf	net-like veins, criss-crossing all over the leaf	parallel veins, running in straight lines
roots	taproots	fibrous roots
stem	vascular bundles are arranged in rings	vascular bundles are scattered throughout the stem

Discuss and Answer

Make a list of the conditions most seeds need in order to germinate. **Students should be able to list the right conditions needed for a seed to grow. The soil should be rich and fertile. There should be plenty of fresh air, and enough sunlight and warmth, and of course, water.** What would happen to a seed that did not have one of the things it needs? Talk about each of the required conditions in turn. Make predictions about what would happen in each case. How could you test your predictions? **Students should make their own predictions and then devise and conduct experiments to test them.**

Exercises

- Choose the correct answer.
 - On the basis of their seed structure, how many groups are flowering plants divided into? **b. two**
 - Which one of these is an example of a dicot plant? **b. gram**
 - Which one of these is an example of a monocot plant? **b. wheat**
 - Which one of these grows as the first leaves of a new plant when the seed germinates? **c. cotyledon**
 - If a flower has 21 petals, what kind of flower is it? **b. monocot**
- Match the definition in Column A with the correct term in Column B.

Column A	Column B
i. a group of plants having only one seed leaf	f. monocot
ii. the protective outer covering of a seed	e. seed coat
iii. a group of plants having naked seeds	a. gymnosperm
iv. a group of plants having seeds enclosed in a fruit	b. angiosperm
v. a leaf-like structure found inside a seed	c. cotyledons
vi. transport tubes in plants	d. xylem and phloem

3. Answer the following questions.
- i. Which one of these is the correct choice for a dicot?
two cotyledons net-like veins taproot
 - ii. Which one of the following is the correct choice for a monocot?
one cotyledon parallel veins fibrous
 - iii. Define the following terms.
 - a. seed coat **The seed coat is the outer covering of the seed that protects its internal structure from injury and drying out.**
 - b. cotyledon **The cotyledon is the plant's food supply. It surrounds the growing embryo and provides food for it. Cotyledons are leaf-like structures. Cotyledons are also called seed leaves.**
 - c. embryo **This is another word for the baby plant.**
 - d. angiosperm **Plants in which the seeds are enclosed in fruits or flowers are called angiosperms.**
 - e. gymnosperm **Plants in which the seeds are not enclosed in fruits or flowers are called naked seed plants or gymnosperms.**
 - iv. Below are the diagrams of the internal structure of different stems. Which diagram shows the stem of a monocot and which shows the stem of a dicot? Write a reason for your identification.

dicot – The vascular bundles are arranged in a ring.

monocot – The vascular bundles are scattered through the stem.
 - v. Which of these is a leaf of a dicot plant and which is a leaf of a monocot plant? Give reasons for your choice.

The leaves of a monocot plant have parallel veins, running in straight lines.

The leaves of a dicot plant have net-like veins, criss-crossing all over the leaf.
4. The following statements are about the growth of a seed into a plant. Put them in the correct order.
- v. The seed is buried in the soil. The seed coat becomes soft.
 - vii. The seed leaves become soft and open.
 - ii. The root begins to grow downwards.
 - i. The shoot grows upwards.
 - vi. Leaves appear on the shoot.
 - iv. The stem grows stronger and more leaves appear.
 - iii. Eventually, buds appear and blossom into flowers.

5. Solve the crossword puzzle with the help of the given clues.

				(P ₁)	A	R	A	L	L	E	L
				H							
	(X ₃)			L							
(G ₂)	Y	M	N	O	S	P	E	R	(M ₄)	S	
	L			E					O		
	E			M					N		
	(M)					(D ₆)	I	C	O	T	
				(S ₅)					C		
				(E ₇)	M	B	R	Y	O		
				E					T		
				D							
				S							

Fun pages

1. Work with a friend and complete this word search.

(B)	(E)	(N)	U	T	R	I	T	I	O	N	P	(S)	E	E	D	S	J	X	(L)	D	C	U
T	R	G	W	I	M	W	J	A	T	M	O	S	P	H	E	R	E	F	O	S	C	V
Q	O	E	G	W	(R)	K	(S)	(O)	X	Y	G	E	N	(N)	O	S	E	U	C	B	H	(P)
(S)	(W)	(N)	A	S	G	E	I	T	Y	G	R	E	N	(C)	T	U	X	N	O	(E)	A	H
E	A	(R)	G	T	I	(S)	S	J	O	F	X	W	A	A	(Y)	Z	B	C	M	A	(P)	O
N	S	E	(S)	S	H	U	K	P	P	M	M	S	N	R	O	C	C	T	O	(R)	A	T
S	T	P	E	(E)	(E)	N	S	I	I	L	A	U	R	B	U	F	(N)	I	T	M	R	O
I	(E)	R	I	X	L	L	(F)	(S)	N	R	K	T	U	O	N	(M)	O	O	I	W	A	S
T	J	O	B	H	A	I	O	E	O	(F)	A	Y	A	N	(G)	O	S	N	O	E	S	Y
I	(G)	D	A	A	H	G	O	R	U	E	M	T	M	D	B	V	T	A	(N)	A	I	N
V	R	U	(B)	L	N	H	(D)	O	M	E	Z	P	I	I	Z	E	R	(G)	(G)	N	T	T
I	O	C	A	(E)	(I)	T	T	P	N	(L)	J	K	K	O	S	M	I	I	R	(S)	(E)	H
T	W	T	(T)	A	S	T	E	(S)	I	G	H	T	(S)	X	N	E	L	L	O	M	W	E
(Y)	T	I	D	(L)	A	T	E	R	A	L	(E)	Y	E	I	T	N	(S)	L	W	E	R	S
M	(H)	O	(E)	X	C	R	E	T	E	Y	R	G	Z	D	X	(T)	H	(S)	T	L	R	I
M	J	(N)	(A)	D	U	L	T	P	(H)	E	A	R	E	(E)	R	E	D	L	(H)	(L)	B	(S)

2. Crack the code to work out what this sentence says. Then use the code to make up your own sentences.

ORGANIC FARMING IS BETTER FOR THE ENVIRONMENT

3. Find thirteen animals hiding in these sentences.

Examples: Ali's **beard** is going grey. bear

The baker gave Maha a big **oat** cake. goat

- Ali **selfishly** kept the biggest mango for himself. **fish**
- The man sold some sugar **beet**, **lettuces**, and peas. **beetle**

- iii. **Jacob ran** away from the dark house. **cobra**
- iv. The man fainted due to a lack of **oxygen**. **fox**
- v. The fat **man ate** eleven **bowls** of curry. **manatee (and owl)**
- vi. Please watch the show **or** move away! **worm**
- vii. In the hall **a man** was laughing loudly. **llama**
- viii. His **mother** works in this building. **moth**
- ix. **How long** is a foot ruler? **owl**
- x. He was **wanted** by the new headmaster. **swan**

Unit 6 Soil

Concept Check

Fill in the gaps using the words given in the box:

1. The surface layer of the Earth is called **topsoil** .
2. The layers under the surface are called **subsoil**.
3. Under the layers of subsoil are layers of **rock**.
4. **Wind** and **water** break down rocks into **pebbles, sand, gravel, and mud**.
5. Small animals improve the fertility of soil by moving through it. This introduces **air** into the soil. They also leave their waste in the soil. This puts **nutrients** into the soil.

Discuss and Answer

What does soil feel like? What different kinds of soil have you felt? Describe how they felt.

Students will use their own words to describe different kinds of soil.

Exercises

1. Choose the correct answer.
 - i. Which type of soil feels sticky when wet? **c. clay**
 - ii. The texture of soil depends on **d. the size of its particles**.
 - iii. Which one of the following soils has the largest grains and feels rough? **c. sand**
 - iv. What is sediment? **d. small pieces of rock and soil that are carried along and deposited by rivers**
 - v. The best soil for growing a plant is **b. silt**.
2. Write T by the statements which are true and F by those which are false.
 - i. The topsoil contains solid rocks. **F**
 - ii. The second layer of the soil is known as the bedrock. **F**
 - iii. The texture of silt is smooth and silky. **T**
 - iv. Living organisms destroy the soil's quality. **F**
 - v. Silt is the best soil for growing plants. **F**
 - vi. Only insects make their home in the soil. **F**

3. Fill in the blanks.
- The layer of the soil which contains most humus is known as **topsoil**.
 - The soil which is composed of medium-sized particles and feels smooth is called **silt**.
 - The layer of the soil which is below the topsoil is known as the **subsoil**.
 - The soil which contains the largest particles and feels rough when rubbed is called **sand**.
 - The soil which can be moulded into different shapes and can maintain these shapes after drying, is known as **clay**.
 - The soil which sticks together when wet, but does not hold its shape after drying, is known as **silt**.
 - Soil supports plants by holding their **roots** firmly.
4. Answer these questions.
- What is soil and what is it composed of? **Soil is the material that covers the Earth's surface. It is made up of four things: water, air, particles of minerals, and organic matter (dead plants and animals).**
 - Name the layers of soil in the sequence in which they are present on land. **Topsoil, subsoil, rock, bedrock.**
 - Write two ways in which soil is important for living things. **Soil is important for living things because they use it as their supply of nutrients and place of shelter. All the plants that we eat grow in soil.**
 - How do small animals improve the soil? **Small animals, such as earthworms, millipedes, beetles, ants, and slugs, help to aerate (bring air into) the soil, while their waste enriches the soil.**

Unit 7 Matter and the Water Cycle

Concept Check

- What happens to water if you i. freeze it? ii. boil it? **It becomes ice when frozen and steam when heated.**
- What happens to ice if you heat it gently? **If you heat ice gently, it begins to melt and changes state turning from a solid (ice) to a liquid (water).**

Discuss and Answer

What other examples of chemical and physical changes can you name? **Ask students their ideas.**

Exercises

- Choose the correct answer.
 - Butter going soft on a hot day is an example of **a. melting**.
 - Which of these is not an example of matter? **d. sound**
 - Which of these is an example of a physical change? **a. tearing of paper**
 - Chemical changes are **c. irreversible**.
 - Clouds are formed by **b. water vapour condensing**.

2. Fill in the blanks.
- Anything which has mass and occupies space is called **matter**.
 - The amount of matter in an object is called its **mass**.
 - Solids have a **definite** shape.
 - The three-dimensional space occupied by an object is called its **volume**.
 - Liquids do not have a definite **shape**, but they have a definite **volume**.
 - Particles of solids are usually arranged in a **regular** pattern.
 - On absorbing heat, a solid changes into a gas. This process is known as **sublimation**.
 - Upon cooling, a gas changes into liquid. This process is known as **condensation**.
 - A change of state is also known as a **physical** change.
 - Ice is the **solid** state of water.
3. Match the definition in Column A with the correct term in Column B.

Column A	Column B
i. the three-dimensional space occupied by an object	f. volume
ii. the amount of matter in an object	e. mass
iii. the state of matter which has definite shape and volume	g. solid
iv. the state of matter which has definite volume but no definite shape	h. liquid
v. the state of matter which does not have definite shape or definite volume	a. gas
vi. the change of state in which a solid changes into a liquid	b. melting
vii. the change of state in which a liquid changes into a solid	c. freezing
viii. the change of state in which a liquid changes into a gas	d. evaporation

4. Answer these questions.
- Which one of the following correctly describes the behaviour of particles in solids?
b. are tightly packed and vibrate about a fixed position
 - What do you understand by physical change? Give three examples of physical changes taking place in your environment. **Physical changes are also called reversible changes. These do not produce any new substances and they are not permanent changes. Students can give any plausible examples, including that of heating or cooling water.**
 - Draw diagrams to show the arrangement of particles in a solid, a liquid, and a gas.
Answer in the book
 - How is water recycled in the water cycle?
Answer in the book

Fun page

1. Wiggle

Write the missing letters to complete these words.

EAr**th**w**O**rm t**A**p**E**w**O**rm s**O**il b**E**dr**O**ck t**O**p**s****O**il n**U**tr**I**Ents

2. Water crossword!

DOWN

1. Lighter than fog, this is when clouds form very close to the ground and the air is full of tiny droplets of water vapour. **MIST**
2. When water vapour condenses into droplets of water you can see on the ground and other surfaces after a cold night. **DEW**
3. Water falling from clouds in the sky. **RAIN**
4. When warm air contains lots of water vapour it feels sticky and **HUMID**
5. Thick cloud that has formed very close to the ground. **FOG**

ACROSS

1. Soft ice crystals that fall from the sky. **SNOW**
2. When the temperature drops below 0oC and freezes the water vapour that is covering the ground and other surfaces. **FROST**
4. Hard crystals, like stones, made of ice that fall from the sky when it is cold. **HAIL**
5. The opposite of hot. **COLD**

Unit 8 Forces in Action

Discuss and Answer

Which of these materials will change their shape if you apply force to them by pressing or pulling them with your fingers?

sponge ~~brick~~ Plasticine ~~hard plastic box~~ dough ~~metal block~~ clay ~~rock~~ rubber band

If students can handle some of these materials while discussing them, it will help to develop and reinforce their learning and understanding.

Concept Check

Complete these sentences, using what you have just learned about friction.

Friction slows down, stops, or makes it hard for an object to move. Friction produces **heat**. Rough surfaces have more **friction**. When we apply the brakes on a vehicle, **friction** is the force which slows the vehicle. If a surface is made **smooth** and rounded, we say that it is streamlined.

Lubricants such as oil and grease can reduce friction.

Discuss and Answer

Look at these pictures. How has swimmer A reduced friction? If A and B had a race, who would win? Why?

Students should discuss the features which make A more streamlined and B less streamlined. Swimmer A has better posture in the water – creating a smooth line through the water.

Swimmer A's cap and fitted swimwear also make him more streamlined. The stronger swimmer would win a race!

Discuss and Answer

Can you remember the six kinds of simple machine and examples of them? Try to come up with at least two examples of each kind of simple machine.

The discussion should jog the students' memories and the examples they come up with could be noted down on the board and referred to again during the remainder of the unit. The six kinds of simple machine are: inclined plane, lever, wheel and axle, wedge, pulley, and screw.

Concept Check

Label the load, effort, and pivot on this pair of scissors.

Students should be able to attempt this themselves.

Exercises

1. Choose the correct answer.
 - i. Which of these is NOT a natural force? **c. a machine**
 - ii. Forces can be measured by using an instrument called a **b. spring balance.**
 - iii. Which of these is a way to reduce friction? **d. all of them**
 - iv. The force that holds planets in their orbits is called **a. gravity.**
 - v. Which of the following is not a simple machine? **c. wheelbarrow**
2. Match the definition in Column A with the correct term in Column B.

Column A	Column B
i. the amount of matter in an object	b. mass
ii. the amount of gravitational force acting on objects on the Earth	c. weight
iii. the force which opposes motion or movement, and produces heat	d. friction
iv. a push or pull exerted by an object on another object	a. force

3. Fill in the blanks.
 - i. A force is **push** or **pull** between two objects.
 - ii. The instrument used to measure force is called a **spring balance.**
 - iii. The unit of force is the **newton (N).**
 - iv. The force which stops or slows down a moving object is called **friction.**
 - v. All matter on our planet exerts an invisible force of attraction on other matter which is called **gravity.**
 - vi. Gravity always attracts things towards each other, but it never **repels** them.
 - vii. The measure of the amount of matter in an object is called **mass.**
 - viii. Weight is the amount of **gravitational force** exerted by the Earth on objects on its surface.
 - ix. **Sir Isaac Newton** was a scientist who discovered the force of gravity.
 - x. Friction creates **heat**, which becomes a problem in machines.

4. Mark these sentences with ✓ or ✗.
- i. Frictional force stops or slows down moving objects. ✓
 - ii. The unit of force is the kilogram. ✗
 - iii. The unit of weight is called the newton. ✗
 - iv. Mass is the distance of an object from the Earth. ✗
 - v. Rough surfaces increase friction. ✓
 - vi. An astronaut's body mass on the Moon will remain the same as on Earth. ✓

5. Answer these questions.

- i. Compare weight and mass with the help of a table of comparison.

Weight	Mass
is a force, the amount of gravitational force acting on an object	is a measure of how much matter an object contains
measured in newtons	measured in kilograms
The weight of an object depends on where it is.	The mass of an object stays the same, no matter where it is.

ii. Define the following with examples.

- a. force **A force is a pull or a push. Forces are acting on everything around you all the time.**
- b. gravity **is the force which pulls things towards each other or the centre of the Earth.**

iii. Which of these involve forces and which do not?

- a. opening a door ✓
- b. turning a key in the lock ✓
- c. smelling food cooking ✗
- d. looking at a picture ✗
- e. hitting a key on the computer keyboard ✓

iv. What keeps the Earth in its orbit as it goes round the Sun? **Gravity**

v. Explain why the weight of a person or object decreases on the Moon. **On the Moon, which is smaller than the Earth, the weight would decrease because the pull of gravity is weaker there than on Earth.**

vi. What is the relationship between surface type and the amount of friction? **Smooth and rounded (streamlined) surfaces help in reducing friction.**

vii. a. State any two situations where friction can be helpful. **It is helpful to us in many ways.**

- 1. **The friction between your shoes and the ground stops you from slipping.**
- 2. **Frictional force helps cars to move forward without slipping on the roads.**
- 3. **Friction helps you to write!**

- b. State any two situations where friction can be a problem. How can these problems be solved?
1. **Friction can create problems when moving objects.**
 2. **Friction creates heat, which can become a problem when working with machines.**
 3. **Friction also tends to wear away things, causing damage. By lubricating, smoothing or polishing surfaces, friction is decreased.**

Unit 9 Electricity

Concept Check

Use these words to complete the sentences below.

Atoms are so tiny that they are **invisible** to the naked eye.

They are composed of **subatomic particles** called **protons**, **neutrons**, and **electrons**.

Discuss and Answer

After reading the above section again, close your books and take it in turns with a classmate to explain to each other the two kinds of electricity. Help each other to make your explanations clear and accurate.

Students should complete the activity in pairs. Get some volunteers to share their clear and accurate explanations with the whole class.

Concept Check

Complete the sentences using these words: A proton, A neutron, An electron

1. **An electron** has a negative charge
2. **A proton** has a positive charge.
3. **A neutron** has no charge.

Discuss and Answer

Talk about all the parts of the circuit above and what each of them does. **Students should discuss the circuits and become familiar with all the parts and their functions. They could cover the image and quiz each other to test their learning.**

Exercises

1. Choose the correct answer.
 - i. Which of these correctly defines electric current? **c. the flow of electrons in an object**
 - ii. When an object gains electrons, it **b. is negatively charged.**
 - iii. An object becomes charged when **a. it loses or gains electrons.**
 - iv. If a material is negatively charged, it will **b. attract a positively charged object.**
 - v. Lightning is an example of **b. static electricity.**
2. Fill in the blanks.
 - i. The flow of electrons in matter is called **current.**

- ii. The build-up of an electric charge on the surface of objects is known as **static** electricity.
 - iii. In an electric circuit, the current flows from the to the terminal.
 - iv. Materials which allow electric current to pass through them easily are called **conductors**.
 - v. Materials which do not allow electric current to pass through them are known as **insulators**.
 - vi. All matter is made up of tiny particles called atoms.
 - vii. Lightning is caused by **static** electricity.
 - viii. When the number of electrons in an atom is equal to the number of protons, the atom is said to be **neutral**.
 - ix. When an atom loses electrons it becomes **positively** charged.
 - x. When an atom gains electrons it becomes **negatively** charged.
3. Match the definition in Column A with the correct term in Column B.

Column A	Column B
i. an object that loses or gains electrons	b. charged object
ii. the particle in an atom having a positive charge	f. proton
iii. the particle in an atom having a negative charge	e. electron
iv. the particles in an atom having no charge	a. neutron
v. the flow of electrons in an object	d. electric current
vi. the imbalance of positive and negative charges	c. static electricity

4. Mark these sentences with ✓ or ✗.
- i. A positively charged object will attract another positively charged object. ✗
 - ii. If some electrons are removed from an object, the object becomes negatively charged. ✗
 - iii. A material that does not conduct electricity is called an insulator. ✓
 - iv. A spark is an example of electric current. ✓
 - v. An atom is said to be neutral if it has more protons than electrons. ✗
5. Answer these questions. **Students should use what they have learned and attempt to answer the questions using their own words.**
- i. Define electric current. **Electric current is the flow of electrons in an object which is a conductor.**
 - ii. Describe in your own words how electric current passes through a wire. **A wire is made of metal which is a material that conducts electricity. In metals, the electrons are free to move. When such materials are connected to a battery or mains sockets, these free electrons become energised. They start moving through the metal. This flow is called electric current.**
 - iii. Explain why you get flyaway hair when you pull off a sweater in cold, dry weather. **This happens because of static electricity. When you pull off your sweater, your sweater rubs against your hair. Electrons move from your hair to your sweater. Now your hair has lost a few electrons and they are all positively charged. What**

happens when like charges are brought closer to each other? They repel each other. Since hairs have like charges, they repel each other. As a result, your hair becomes flyaway.

- iv. Define static electricity. **An imbalance of positive and negative charges is called static electricity.**
- v. Why does lightning tend to occur during storms? **Lightning tends to occur during storms because clouds rub against each other, causing electrons to move from one cloud to another. They heat up the air between the clouds. If too many electrons move very fast, the air between the clouds gets so hot that a spark is generated. Lightning is huge sparks.**

Unit 10 Magnets and Electromagnets

Concept Check

Name three magnetic materials and three non-magnetic materials. **Students can name any materials. If in doubt, they should test the materials using a magnet.**

Discuss and Answer

Which items in your classroom are magnetic and which are not? **Students can name any materials. If in doubt, they should test the materials using a magnet.**

Concept Check

Answer these questions.

- 1. What surrounds every magnet? **A magnetic field surrounds every magnet.**
- 2. Would the like or opposite poles of two bar magnets attract each other? **Opposite poles of two bar magnets will attract each other.**
- 3. List three ways in which a magnet can become demagnetised. **A magnet can become demagnetised if it is dropped repeatedly, heated, hammered, or stored too close to other magnets.**
- 4. Name four devices which use electromagnets. **Electromagnets are used in the speakers of TVs and radios, in ATM cards, in motors, in computer hard drives, in doorbells, in generators, in scrapyards (to separate materials), and under Maglev trains. Students may list other devices if they have done further research.**

Exercises

- 1. Choose the correct answer.
 - i. A magnetic field is the area around a magnet where its force is **b. strongest.**
 - ii. Which of these can prevent a magnet from becoming demagnetised? **a. store it carefully**
 - iii. Why are electromagnets useful? **c. They allow us to control magnetism.**
 - iv. Where does the needle of a magnetic compass always point? **c. to the North Pole**
 - v. Which of following does not use an electromagnet? **b. steam trains**

2. Mark these sentences with ✓ or ✗.
- Magnetism is a type of electricity. ✗
 - Magnets attract only steel or iron objects. ✗
 - Magnets can never lose their magnetism. ✗
 - The magnetic field of a magnet is the area of force around it. ✓
 - Electromagnets cannot be switched on and off. ✗
3. Fill in the blanks.
- A piece of iron or steel that can attract objects made of iron or steel is called a **magnet**.
 - The area around a magnet, where its force of attraction can be felt is called the **magnetic field**.
 - Opposite poles of a magnet **attract** each other, while similar poles **repel** each other.
 - The process or method by which a magnet loses its power is called **demagnetisation**.
 - An iron nail can be turned into a magnet by passing electric current around it. Such a magnet is known as an **electromagnet**.
4. Answer the following questions.
- Define the following terms.
 - magnetic material: **a material that is not attracted to a magnet**, and non-magnetic material: **a material that is attracted to a magnet**
 - magnetic field: **the area around a magnet where its force of attraction pulls metals towards it**
 - What is meant by demagnetisation? Explain any three ways to demagnetise a magnet. **Demagnetisation is the process of removing magnetic properties. A magnet can become demagnetised if it is dropped repeatedly, heated, hammered, or stored too close to other magnets.**
 - What are electromagnets? **An electromagnet is a magnet created by passing an electric current through wire coiled around iron. An electromagnet can be switched on and off.**
 - How can you turn an iron nail into a magnet? **An iron nail can be turned into a magnet by passing electric current around it.**
 - How can you increase the strength of an electromagnet? **You can increase the strength of an electromagnet by increasing the number of coils around the iron nail or by increasing the flow of current in the wire.**
 - Write any three uses of electromagnets in daily life. **Electromagnets are used in the speakers of TVs and radios, in ATM cards, in motors, in computer hard drives, in doorbells, in generators, in scrapyards machinery (to separate materials), and under Maglev trains. Students may list other devices if they have done further research.**
 - A special toy train is able to float above its track. Use your knowledge about magnetic repulsion to explain how this is done. **The magnets under the train and on the track are arranged in a way that the magnets face the same poles. Similar poles repel each other so, when the electricity is turned on, the train floats just above the track.**

Unit 11 Light

Concept Check

1. Which of these reflects more light? Why?

a smooth, polished surface OR a bumpy, dull surface **Because smooth surfaces are usually shiny. Smooth, polished surfaces reflect a lot of light.**

a black car OR **a white car** because **white objects reflect more light than dark objects. Dark surfaces absorb more light than they reflect.**

a log OR **a mirror** because **it has a smooth surface, made of glass. Smooth surfaces and glass reflect a lot of light.**

2. Give two examples of each of the following. **Some suggestions are given below but students may choose other possible responses.**

- opaque materials Steel, wood, rock, and other things through which light cannot pass are opaque materials.**
- transparent materials Glass, clear plastic, and other things through which light passes quite easily are transparent materials.**
- translucent materials Dark glasses, thin paper, coloured plastics, and other things through which only a little light can pass are translucent material.**

Discuss and Answer

Would a lighted match or an electric light have greater intensity? **The intensity of an electric light is greater than that of a lighted match.**

Concept Check

Answer these questions.

- What is the name of a very dark shadow with no light? **umbra**
- What is the name of a lighter shadow? **penumbra**
- What time of day is it likely to be if your shadow is very short? **midday**

Concept Check

Fill in the blanks

Eclipses can be **lunar** or **solar**. They can be **partial** or **total**.

Discuss and Answer

Work with a partner. One person explains the difference between solar and lunar eclipses. The other person then explains the difference between a total and a partial eclipse.

Help your partner to improve their explanation. **Students should complete the activity in pairs. Get some volunteers to share their clear and accurate explanations with the whole class.**

Exercises

- Choose the correct answer.
 - A pinhole camera is a camera that works without **a. a lens**.
 - The image from a smaller hole in a pinhole camera is **b. sharper**.

- iii. The image formed by a pinhole camera is **a. upside down.**
- iv. Shadows are formed by **c. an opaque object blocking the light.**
- v. What happens during a lunar eclipse? **c. The Earth passes between the Sun and the Moon.**

2. Match the following.

i. umbra	d. a dark shadow
ii. penumbra	c. a lighter shadow
iii. opaque	e. light cannot pass through
iv. translucent	a. a little light can pass through
v. luminous	f. gives off light
vi. transparent	b. light can pass through

3. Mark these sentences with ✓ or ✗.

- i. Total solar eclipses occur quite often. ✗
- ii. Light is the fastest thing in the universe. ✓
- iii. The umbra is a very dark shadow with sharp edges. ✓
- iv. The brightness of light is called its intensity. ✓
- v. Dark colours reflect more light than light colours. ✗
- vi. Smooth surfaces reflect more light than rough ones. ✓
- vii. A shadow is always smaller than the object itself. ✗

4. **Students should be allowed to conduct the experiment to find out the answers.**

Set up this experiment in a darkened room.

You will need:

a candle

a torch or electric lamp

a table

a shape cut out of card

a wall or screen

Answer these questions.

- i. Which gives out more light, **the torch** or the candle?
- ii. Which light casts a darker shadow, the candle or **the torch**? Move the candle closer to the object. Does the shadow become **bigger** or smaller?
- iii. Move the candle farther away from the object. Does the shadow become **smaller** or bigger?

5. Think about it!

- i. You are told that light travels in straight lines. Can you think of a way to prove this statement is true? **Students should be allowed to test their ideas to see if they work.**
- ii. What shadows will these objects make when
 - a. the light is to one side?

b. the light is above?

Can you draw the shadows of these objects?

Students should provide answers according to their observations.

6. Answer these questions.

- i. In your own words explain how a shadow is formed. **Students should use their own words to describe this. A shadow is formed (cast) when light rays are blocked by an object. The shadow appears on the side of the object opposite the light.**
- ii. What kind of materials are translucent? **Materials which only allow a little light through them are translucent.**
- iii. What do you understand by the word transparent? **The word transparent refers to objects through which light can pass.**
- iv. What happens during a solar eclipse? **During a solar eclipse the moon moves in front of the Sun as seen from a place on Earth.**
- v. How does a lunar eclipse take place? **A lunar eclipse occurs when the Earth comes directly between the Sun and the Moon. The Earth blocks the Sun's light from reflecting off the Moon.**
- vi. What do you understand by the word partial solar eclipse? **Sometimes, when the Moon comes between the earth and the Sun, only part of the Sun's light is blocked; this is called a partial solar eclipse.**
- vii. Name five luminous things. How are they different? **Students could name a number of things such as the Sun, lamps, lights, stars, candle, torch, etc.**

Fun Page

1. Solve the crossword puzzle with the help of the given clues.

Across:

- 4 The unit of measurement of mass **KILOGRAM**
- 5 The force of attraction between two objects **GRAVITY**
- 6 The amount of matter in an object **MASS**
- 7 The unit of measurement of force **NEWTON**
- 8 A push or pull **FORCE**

Down:

- 1 The amount of force acting on an object **WEIGHT**
- 2 The instrument used to measure force **SPRING BALANCE**
- 3 The force that acts when objects rub against each other **FRICTION**

2. When light hits a surface, it bounces back. This is called reflection. Do all things reflect light? Do all things reflect the same amount of light? Find out how light is reflected off a mirror. **Students should be allowed to conduct experiments to find out the answers.**
3. Make your own sundial. Even a stick placed upright in the ground can act as a sundial because it will cast a shadow. You will have to mark the hours on the ground. Check the

next day and see if you are able to tell the correct time without looking at a watch.
Students should be allowed to conduct experiments to find out the answers.

Unit 12 Air

Discuss and Answer

Wind is moving air. Air that is squeezed into a small space is called compressed air. Study the picture to find objects that are using the wind and those that are using compressed air. **Students should discuss the objects in the image. The ball, tyres, and balloons contain compressed air. The sailing boats and kite are using the wind. The hot-air balloon uses the wind to move and it uses compressed gas to fire the burner and create the hot air that makes it rise (because hot air is lighter than cool air). The air in the balloon is not compressed air.**

Concept Check

Answer these questions.

1. Why is nitrogen important to living things? **Nitrogen is important to all living things, but they do not take it directly from the air. Instead, plants take in nitrogen from the soil. Animals take in nitrogen from plants, and from meat and fish from animals that have eaten plants or plant-eating animals.**
2. What weather conditions are caused by water vapour in the air? **Many of our weather conditions, such as mist, fog, dew, humidity etc., are caused by water vapour in the air.**

Exercises

1. Choose the correct answer.
 - i. What is the lower layer of the Earth's atmosphere called? **b. troposphere**
 - ii. What does the ozone layer do? **c. It prevents some of the harmful rays of the Sun from reaching the Earth.**
 - iii. Which gas forms over 75% of the atmosphere? **b. nitrogen**
 - iv. As you go up higher the air gets **b. thinner.**
 - v. Which of the following is NOT true? **a. Air has no weight.**
2. Fill in the blanks.
 - i. The layer of air around the Earth is called the **troposphere.**
 - ii. Oxygen is used for breathing and **burning.**
 - iii. Plants use **carbon dioxide** gas from the air to make food.
 - iv. Air has weight and occupies **space.**
 - v. It is humid when there is a large amount of **water vapour** of in the air.
 - vi. Moving air is called **wind.**
 - vii. Air that is squeezed into a small space is called **compressed** air.
 - viii. When air is **warm/hot**, it rises.
 - ix. **Nitrogen** is the most abundant gas in the atmosphere.
 - x. The ozone layer is found in the layer of the atmosphere known as the **stratosphere.**

3. Match the percentages to the correct answers.
0.03% of the atmospheric air is composed of carbon dioxide
20.94% of the atmospheric air is composed of oxygen
78.08% of the Earth's atmosphere consists of nitrogen
4. Mark these sentences with ✓ or ✗.
- There is more oxygen in the air than any other gas. ✗
 - Compressed air is under greater pressure than air in the atmosphere. ✓
 - Carbon dioxide is used by plants in photosynthesis. ✓
 - Air is too light to have weight. ✗
 - The troposphere is the layer of the atmosphere farthest from the surface of the Earth. ✗
5. Put these in order as instructed.
- From the closest to Earth to the farthest:
troposphere, stratosphere, mesosphere, thermosphere, exosphere
 - From the closest to Earth to the furthest:
rain clouds, jets, weather balloons, meteors, shuttle
 - Most in the atmosphere to the least:
nitrogen, oxygen, carbon dioxide, xenon
 - From lowest to highest:
-32°C, 0°C, 0.05°C, 22°C, 100°C

Discuss your answers in class.

6. Think about it!
- A balloon filled with helium gas will float up into the air if it is not held down. Why does this happen? **Helium gas is lighter than air. Compare the behaviour of a helium-filled balloon with an air-filled balloon; the helium balloon floats on air and is less dense than the air. The air-filled balloon sinks because the weight of the rubber balloon makes it slightly heavier.**
 - When a fire is not burning properly, a way to get it going again is to fan it or blow on it through a tube. Why does the fire blaze again when this is done? **Fanning or blowing air on a fire gives the fire more oxygen which fire needs to burn.**
7. Answer these questions.
- Name some of the gases found in air. **Some of the gases found in air are nitrogen, oxygen, carbon dioxide, argon, helium, neon, krypton, hydrogen, xenon, and ozone.**
 - Why do astronauts have to wear oxygen masks in outer space? **Astronauts have to wear oxygen masks in outer space because there is no air (and no oxygen) there.**
 - In what way is carbon dioxide useful? **Carbon dioxide is used by plants during photosynthesis. The process of photosynthesis is essential for life on Earth because plants are a key part of all food chains.**
 - How is the ozone layer useful to us? **The ozone layer is useful to us because it blocks some of the harmful rays of the Sun.**

- v. What are some of the ways in which we use moving air? **Some of the ways in which we use moving air: to support gliders, to power sailing boats and windmills (windmills can be used to generate electricity or draw water), to operate weather vanes, and to fly kites, kite surf, para-sail, and move hot-air balloons.**
 - vi. What are some of the uses of compressed air? **Some of the uses of compressed air: to inflate rubber tubes inside tyres to support bicycles, cars and aircraft, to fill balloons, to power certain tools, and in the brakes of some kinds of vehicles.**
 - vii. What happens to air if it is compressed and cooled to -200°C ? **Air that is compressed and cooled to -200 degrees C turns into a blue liquid.**
 - viii. Why is the air immediately around the Earth more compressed than air that is further up in the atmosphere? **The air immediately around the Earth is more compressed than the air that is further up in the atmosphere because air has weight. The air above is pushing on (compressing) the air below it.**
 - ix. Why does the amount of water vapour in the air vary? **The amount of water vapour in the air varies because of the water cycle. The amount of water vapour increases due to evaporation and decreases due to condensation and precipitation (rain etc.).**
 - x. How are some of the minor gases in the atmosphere used? **Neon is used in some electric lights. Argon is used to produce an orange glow in glass tube, as streetlights. It is also used in lasers. Helium is used in balloons. Some of the minor gases, helium, neon, krypton, hydrogen, xenon, and ozone, are used in medicine and other fields. The students could research some of the other uses if there is time to do so.**
8. Tell your teacher in your own words **Students will use their own words.**
 - i. about the ways in which air is useful to you at home. How is it used? What machines need it to run?
 - ii. the gases in the atmosphere and how they are useful.
 9. Draw and label your own diagram to show the different layers of the atmosphere. If you had to put a bird in one of the layers, where would you put it? Why?
Answer available in the book.

Unit 13 Environmental Pollution

Discuss and Answer

1. What do you like and dislike about your school environment? Make two lists. **Students will make their own lists. Encourage them to think of positive solutions to the things they dislike.**
2. Look at these two pictures. What are the differences between these two environments? **Students should use their own words to describe the pollution in the second image. Can they say what harm it might cause, other than looking unpleasant?**

Discuss and Answer

What forms of pollution can you see here? **Students should use their own words to describe the pollution from factories chimneys (smoke and particles of dirt and ash), road works and construction (noise pollution, destruction of natural environments), litter and waste disposal in waterways (harm to wildlife, pollution of water supplies, microplastics entering the food chain, etc.).**

Concept Check

Answer these questions.

1. What does decompose mean? **Decompose means to decay and form raw materials from which something else can grow. When something decomposes it is broken down by bacteria and fungi into simple components like water, carbon dioxide, and plant nutrients.**
2. What does non-biodegradable mean? **When something cannot decompose or decay for many years we call it non-biodegradable.**
3. Give two examples of biodegradable waste and non-biodegradable waste. **Students can give any of a number of examples. Some suggestions of biodegradable items are wooden things, leaves, items made of cotton, cork, or paper, and vegetable scraps. Some suggestions of non-biodegradable items are things made of metal, ceramic, foam, and glass.**
4. What are three things you can do to reduce pollution? **Students can list any three ways. Some suggestions: the 3Rs (reduce, reuse, recycle), plant more trees, use public transport, walk or ride a bicycle, dispose of all your waste properly, campaign for better waste management, etc.**

Exercises

1. Choose the correct answer.
 - i. Which of the following is biodegradable? **c. a potato peel**
 - ii. What does it mean if something is non-biodegradable? **b. It will not decompose.**
 - iii. Which of the following causes air pollution? **d. all of them**
 - iv. When waste is not disposed of properly, it can cause **d. all of them**
 - v. Which of the following is not one of the three Rs? **b. reap**
2. Mark these sentences with ✓ or ✗.
 - i. Materials which decompose naturally are known as biodegradable. ✓
 - ii. Oil-spills and leaks in the ocean cause air pollution. ✗
 - iii. Glass and metal are two examples of biodegradable material. ✗
 - iv. Land pollution does not have any effect on plant and animal life. ✗
 - v. The ozone layer of the atmosphere protects the Earth from the harmful rays of the Sun. ✓
 - vi. Half of the Earth is covered by water. ✗
 - vii. Water pollution may cause infectious diseases like cholera and typhoid. ✓
 - viii. Paper is an example of non-biodegradable material. ✗

- ix. Gold is an example of biodegradable material. ✘
 - x. Some natural disasters, like floods and landslides, are a result of environmental pollution. ✘
3. Find out. **Students will need to conduct some research and feedback to the class.**
- i. How is waste disposed of in your school? How could the waste disposal system in your school be improved?
 - ii. How long does it take for different materials to decompose?
4. Answer the following questions.
- i. Define the following terms. a. environment **the environment is everything around you; environment also refers to the natural world** b. pollution **the contamination of air, water, or soil by substances that are harmful to living organisms**
 - ii. Complete the following table. **Students will need to use their own ideas as well as the information from the text. Here are some suggestions:**

Type of pollution	Causes	Effects	Ways to reduce
Land	Chemical waste from factories, human sewage, litter, overuse of pesticides and herbicides, and construction debris etc.	damages the soil, has very harmful effects on the entire ecosystem by damaging plants and affecting the food chain by introducing toxic chemicals into it etc.	reduced use of non-bio-degradable materials, stop use of harmful chemicals in products, pesticides and herbicides, safe disposal of waste etc.
Air	smoke from traffic and the burning of fossil fuels, such as coal, gas, and oil, smoke from factories and industry, wildfires and volcanic eruptions etc.	breathing disorders, such as asthma and bronchitis, damage to the ozone layer etc.	reduce or stop use of fossil fuels, reduce use of private vehicles and air travel etc.
Water	oil spills, untreated human sewage, pesticides, herbicides, fertilizers, and industrial waste etc.	spread infectious diseases, such as cholera and typhoid fever, damage or death to fish and other marine life, disease and sickness in humans and other animals etc.	hygienic sanitation with eco-friendly waste disposal, reduced use of non-bio-degradable materials, stop use of harmful chemicals in products, pesticides and herbicides, stop disposing of waste in water etc.

5. Packaging
- i. If you go shopping, you will come back with your purchases in a plastic bag. If you take a bag with you, you will not need a plastic bag! What are the separate items of packaging in each of the following?

a box of chocolates – **the wrapping around the box, the box, the packaging inside the box, the wrapping around individual chocolates.**

a packet of sweets – **the packet and the wrappers around individual sweets.**

a packet of chewing gum – **the packet, the cellophane around it, and the wrappers around individual sticks.**

tomato sauce – **the bottle, the lid, the labels.**

a computer – **the tape around the box, the box, the protective inner packaging, plastic bags around smaller items, the tags and tape used to keep wires etc. together neatly.**

a packet of cells – **the packaging around the cells, the card at the back of the package, the cover round the cells themselves.**

a long-sleeved shirt – **cellophane cover, tags, cardboard inner sleeve, pins, card to hold the collar in place, plastic clips.**

- ii. How might you recycle any of the packaging materials you listed in (i)? **Students should discuss this. Some ideas – reuse items, for example the cellophane could be used to wrap something else and other items could be used in crafts etc.; recycle items – the card, glass, and metal could be recycled at recycling centres.**
- iii. List any five items which you throw away or waste at home. **Students will make their own lists.**

Fun Page

1. Mark these things as follows:

biodegradable (BD) **mouse, flower, carrot, banana skin, twig,**

non-biodegradable (NBD) **marbles, beach ball, slippers, bottle, sunglasses**

2. Work with a friend and complete this word search. You need to find ten gases named in Unit 12.

Q	C	W	E	G	K	A	H	U	R	D	H	N	L
A	P	A	R	H	G	R	M	N	N	E	O	N	P
X	Z	Q	R	J	W	G	Y	M	S	K	P	I	I
Z	O	O	T	B	N	O	S	G	D	S	U	T	J
G	J	Z	H	K	O	N	Q	R	H	U	F	R	Y
W	H	X	E	N	O	N	V	N	Y	Y	M	O	T
N	G	X	L	L	X	S	D	A	D	J	L	G	D
S	F	C	I	P	Y	S	O	I	R	N	C	E	F
C	D	V	U	O	G	N	U	R	O	D	G	N	T
E	S	B	M	I	E	D	O	X	G	X	W	E	H
D	A	O	Z	O	N	E	N	I	E	C	I	R	M
F	M	N	U	Y	J	L	I	N	N	F	E	D	W
G	K	R	Y	P	T	O	N	X	B	M	H	U	E

3. Make a poster to show people what to recycle and how to do it. **The students are to make their own posters. Display them.**
4. Air has many uses and properties. Unscramble these words; they are all from Unit 12.

Unit 14 The Solar System

Discuss and Answer

Which planet is closest to the Sun? **Mercury** Which is the farthest? **Neptune**

Which is the biggest planet? **Jupiter** Which one has rings around it? **Saturn**

Note where the Earth is; which planets are closer to the Sun? **Earth is the third planet from the Sun, after Mercury and Venus.**

Concept Check

Mark the sentences ✓ or ✗.

1. There are man-made satellites that orbit the Earth. ✓
2. The Sun and the eight planets revolving around it form the solar system. ✓
3. The Sun is much larger than the Earth but it is smaller than Jupiter. ✗
4. Asteroids are small rocky bodies that orbit the Earth. ✗
5. Telescopes and space probes help us know about the solar system. ✓

Discuss and Answer

Do you think that humans will ever be able to visit another planet in the solar system? Give reasons for your opinion. **Students should give their own opinions and support their views with an explanation.**

Exercises

1. Choose the correct answer:
 - i. What is the Sun? **d. a star**
 - ii. Which is the smallest planet? **a. Mercury**
 - iii. How many planets are there in our solar system? **c. 8**
 - iv. Which planet is the furthest from the Sun? **b. Neptune**
 - v. Which planet is the closest to Earth? **b. Venus**
2. Study the information about the planets, mostly in the table on page 129, to find out the name of:
 - i. the largest planet **Jupiter**
 - ii. the smallest planet **Mercury**
 - iii. the hottest planet **Venus**
 - iv. the closest planet to Earth **Venus**
 - v. the furthest from the Sun **Neptune**
 - vi. the slowest to rotate **Venus**
 - vii. the fastest to rotate **Jupiter**
 - viii. the longest orbit round the Sun **Neptune**

- ix. the closest to the Sun **Mercury**
3. Fill in the blanks.
- The **Sun** has a diameter of 1,392,000 kilometres.
 - The **Moon** is the natural satellite of the Earth.
 - All the planets, including Earth, **orbit** the Sun.
 - The light we see on the Moon is **reflected sunlight**.
 - Saturn has at least **fourteen** moons.
 - The asteroids are to be found between the orbits of **Mars and Jupiter**.
 - Space probes** travel into space and send back information and photographs back to Earth.
 - The path of the planets round the Sun is called an **orbit**.
4. Mark these sentences with ✓ or ✗.
- Small rocky bodies that orbit the sun are called minor planets. ✓
 - The Earth is the smallest planet. ✗
 - Jupiter is the largest planet. ✓
 - The Sun is the biggest star in our solar system. ✓
 - Mercury is 57.9 km from the Sun. ✓
5. Answer these questions.
- What is the natural satellite of the Earth called? **The Moon**
 - What are asteroids? **small rocky bodies which orbit the Sun**
 - What are space probes? **Space probes are machine that are sent into space. They send back pictures and other information to Earth.**
 - Which planet has fourteen moons? **Saturn and Jupiter have at least 14 moons.**
 - Is there life on Venus? Give a reason for your answer. **There is no life on Jupiter because it is too hot for life to survive there.**
 - Are the planets the only objects orbiting the Sun? What are some of the other satellites orbiting the Sun? **Space probes, moons, asteroids and minor planets also orbit the Sun.**
6. Think about it!
- You know what conditions on Earth make it possible for there to be life on this planet. Do you think there is life on any of the other planets? Can you give reasons for your answer? **Students should give their own opinions and support their views with an explanation.**
7. Tell your teacher in your own words **Students will use their own words.**
- about which planet in the solar system you like the best and why you like it.
 - about space probes and how they can be very useful.

Fun Pages

- Sometimes a good way to learn something is by making up a mnemonic (a way of remembering something). For example, here is a way to remember how to spell BECAUSE – Big Elephants Can Always Understand Small Elephants! The sillier the rhyme, the easier it should be to remember it!

Make up a mnemonic for the planets, in order, starting with the one closest to the sun.

Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune

Students should make up a mnemonic for the planets, in order, starting with the one closest to the sun. Share effective ones. See who can remember the order of the planet next week.

2. What are these planets? Unscramble the letters to name the planets.

i. SUNTAR SATURN

ii. CURRYME MERCURY

iii. RIPJUTE JUPITER

iv. TEENPUN NEPTUNE

v. HEART EARTH

vi. RAMS MARS

vii. ARUNSU URANUS

And which one is missing from the list? **VENUS**

3. Play the ‘Which planet am I?’ game with a partner. Take it in turns to describe a planet in detail, without using its name, and see if your partner can guess correctly. **Students should take it in turns to describe a planet in detail, without using its name, and see if their partner can guess correctly.**

4. Think! Think! Think!

Imagine this scene. A black dog is standing in the middle of a road, in a city painted black. None of the streetlights are working because of a power cut (load-shedding)! A car with two broken headlights drives swiftly towards the dog. At the last second, the car swerves. The dog is not hit.

How could the driver have seen the dog in time?

In the daytime, the driver would be able to see the dog!

Sample Assessment Paper

Maximum marks: 50

1st term Examination

Time Allowed: 1 hour

Q1. Fill in the blanks:

[5]

- i. The average human brain weighs _____ grams.
- ii. _____ is protected by the skull.
- iii. The deepest layers of rock are called _____.
- iv. _____ is used to measure force.
- v. _____ can reduce friction.

Q2. Match the columns:

[5]

	Column A	Column B
i.	Protons	have a negative charge.
ii.	Static electricity	Electric current.
iii.	Neutrons	have a positive charge.
iv.	Electrons	The imbalance of positive and negative charges.
v.	Flow of electron	have no charge.

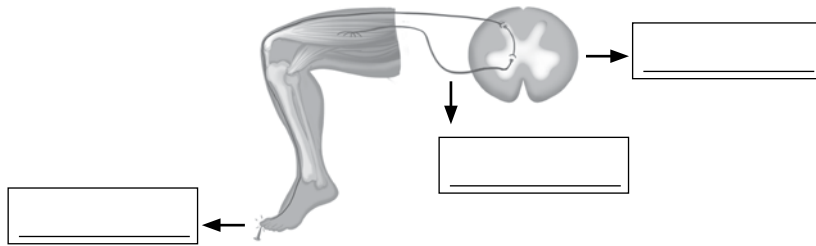
Q3. Choose the correct answers:

[5]

- i. Materials which do not allow electric current to pass through them are known as:
A. Electrons B. Conductors C. Insulators D. Protons
- ii. An object becomes neutral when
A. It loses or gains electrons.
B. The number of electrons is equal to the number of protons.
C. It is raining. D. It remains neutral.
- iii. Which one of the following is not caused by friction?
A. Slows down movement B. Fast movement
C. Stops movement D. Hard to move.
- iv. The surface layer of the Earth is called _____.
A. Topsoil B. Subsoil
C. Rock D. Bedrock
- v. Which one of the following soils has the smallest grains and feels smooth?
A. Silt B. Pebbles
C. Sand D. Clay

Q4. Label the following diagram:

[1 mark each]



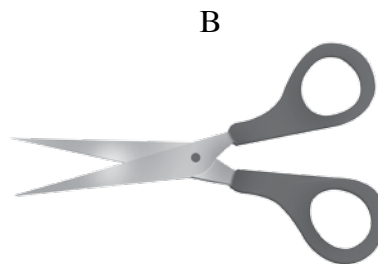
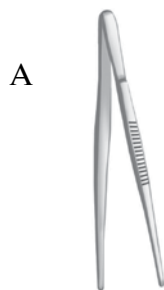
Q5. Complete the following diagram:

[2]



Q6. Label the Effort, Pivot and Load in the following diagrams.

[3 mark each]



Q7. Write two advantages and disadvantages of friction:

[1 mark each]

Q8. Give reasons of the following: [1 mark each]

i. If you touch a hot plate, you take your hand away.

ii. Germs kept out of tinned foods.

iii. Small animals improve the fertility of soil

iv. When the parachute is opened it slows the speed at which they are falling.

v. When you bring a charged comb near to pieces of paper, the comb attracts them.

Q9. Draw a labelled diagram of the following:

[2.5 marks each]

Internal structure of eye	Soil profile

Q10. Answer the following questions: [2 marks each]

i. What are the methods used to preserve food.

ii. Name the different kinds of nerves in the body.

iii. Write two ways in which soil is important for living things.

iv. Why does lightning tend to occur during storms?

v. Label the forces in the diagram and explain why the person in the illustration is standing still.

