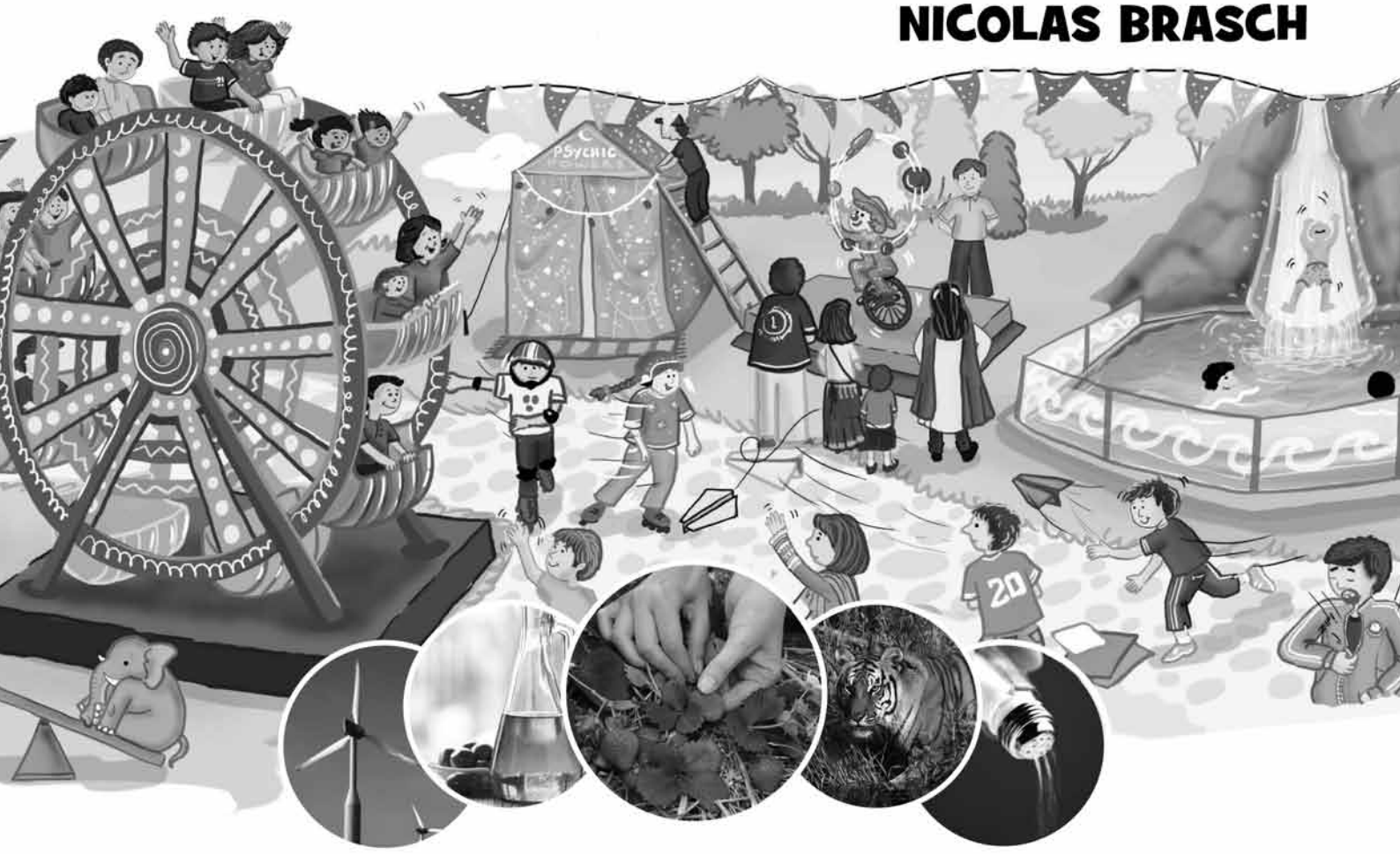
TEACHING GUIDE 4

The SCIENCE Factor

FOR PRIMARY CLASSES

NICOLAS BRASCH



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CONTENTS

INTRODUCTION

About this series

This science series has been painstakingly written, edited, and published with one aim in mind: to provide primary school students in Pakistan with a comprehensive, engaging, informative, and entertaining experience while learning about science.

The contents follow the guidelines provided by the Cambridge International Primary Programme and the UK National Curriculum for General Science.

Some students can find the idea of studying science an ordeal. They may have been exposed to learning materials that are too dry and dense: providing basic information without considering the learning needs of today's students. We have spent as much effort in making sure our series engages the student as we have on ensuring the accuracy and relevance of the content, making this an outstanding work in all respects.

Salient features of the series

- **consistent with the nature of learning**

  This series stimulates students' curiosity and develops their interest in learning. It also provides them with activities that facilitate their capacity for problem solving and enable them to learn more about themselves and the world around them.

- **coherent**

  The ideas within this series have a logical and natural connection with each other. There is a progressive articulation of concepts, skills, and content that prepares students to understand and use more complex concepts as they advance through the learning process.

- **developmentally appropriate**

  In accordance with providing for all areas of a child's development (i.e. physical, social, emotional, linguistic, aesthetic, and cognitive), this series provides for:

  - active exploration of the environment
  - self-directed and hands-on learning activities
  - balance between individual and group activities
  - regular and supportive interaction with teachers and peers
  - balance between active movement and quiet activities.

- **comprehensive**

  A great deal of work has gone into ensuring that students who work their way through this series end up with a sound knowledge of basic scientific principles that will put them in good stead for later learning, and indeed for when they have completed their formal education.

- **feasible**

  The combination of a student text, workbook, interactive CD, and teacher's guide make learning and teaching feasible and accessible, without the need to purchase other materials.

- **useful and relevant**

  The content in this series relates directly to students' needs and interests. It enables them to understand more about themselves and the world they live in.

General suggestions and advice on teaching science

Students should be encouraged to share what they know, so invite discussion and foster an environment where students feel comfortable. Starting from what a student knows helps them to feel confident about learning new things.

The main focus of science at this level is to encourage the students to participate and investigate and this is done through asking and answering questions. Actively encourage the students to participate in the different experiments and share their experiences.

A good way to approach the learning and teaching of science in every lesson is outlined below—all you have to remember is S.C.I.E.N.C.E.

S — Start by saying what the students are going to learn about.

C — Constantly encourage student participation and involvement.

I — Investigate the topic and follow students' interests.

E — Encourage all students to explore and contribute by rewarding participation and praising their involvement.

N — Notice the interests and questions of the students and explore them further.

C — Consolidate what has been learnt in the lesson and link it to other topics that have been taught and the world around them.

E — End on a positive note and explain what has been learnt and what is coming.

About this teacher's guide

This teacher's guide contains lesson plans, worksheets, and information that will enable teachers to actively support their students' development and provide opportunities for the students to acquire important knowledge and skills. Worksheets at the end of this guide and the workbook along with extension activities will help to reinforce and boost learning.

Teachers are encouraged to actively involve students in reinforcing concepts by interacting with the software CD. If the required facilities are not available assign tasks from the CD for practice at home.

The cartoon character, Super Scientist, is the narrator and has been used for generating interest in the text. He is smart since he is a scientist, but he is prone to acting silly at times. He should be referred to and made use of for eliciting laughter wherever possible.

UNIT 1 THE HUMAN BODY

Background

This unit builds on the functions and structure of the human brain, heart, lungs, intestines, and muscles in further detail. Students will be familiar with the basic functions of these. Use the activities in this guide as well as the Student's Book and Workbook to make your lesson enjoyable. They will also help to strengthen and reinforce these concepts. Highlight the importance of memory, blood circulation, breathing, digestion, and movement through this unit.

Expected learning outcomes for the unit

Students should be able to:

- describe the function of the brain
- describe the function of the heart
- explain the function of the lungs
- explain the function of the intestines
- describe how muscles work

1.1 What the brain does

Learning outcomes

Students should be able to:

Student's Book

- explain the importance of the brain in the body

Workbook

- label the parts of a brain and explain their functions

Resources

You will need:

- Student's Book pages 4 and 5
- Workbook page 2
- large roll of paper so that students can trace an outline of their bodies on it
- black markers, coloured pencils
- scissors, glue

- small cloths, such as tea towels to use in the memory test
- A3 copies of Worksheet 1 for all the students

Student's Book steps

1. Welcome the students into the class and ask them to sit at their tables.
2. Explain that they are going to be learning about the human body, but first you will see what they already know.
3. Arrange the students in pairs or groups of three.
4. Ask the students to take turns in lying down on a large sheet of paper while another student traces their outline. Continue until all students have an outline of their body.
5. Ask the students to cut out their outline.
6. Hand out Worksheet 1 and instruct the students to cut out the different parts of the body and stick them onto the outline of their body in the correct spot.
7. Display the outlines of the bodies around the classroom for future reference.
8. Ask them to put up one arm. Tell them that they did this because their brain sent a message to their arm telling it what to do. Explain that the brain sends messages all around their body to tell it what to do.
9. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement and look carefully at the diagrams with the students.
10. Help the students to practise pronouncing the names for the different parts of the brain.

Activities

- Arrange the students in pairs or threes and read aloud the activity. Allow the students to play the game with each other and collect different objects from around the room to hide under the cloth.
- Help the students to answer the questions from 'In your notebook'. Remind them that all the answers are in the Student's Book.

Workbook steps

Help the students to label the parts of the brain and write their function. They may do this individually in class and then check their answers with each other.

Answers to Student's Book 1.1

1. The occipital lobe processes what you see.
2. The temporal lobe controls memory and speech and processes what you hear.
3. The frontal lobe controls reasoning, planning, emotions, and problem solving.
4. The parietal lobe controls movement, recognition, and some senses.

1.2 What the heart does

Learning outcomes

Students should be able to:

Student's Book

- explain the basic features of the heart

Resources

You will need:

- Student's Book pages 6 and 7
- cardboard paper tubes—from a paper towel roll or the like—one for each group
- a stopwatch or clock with a minute hand
- the outline of the students' bodies

Student's Book steps

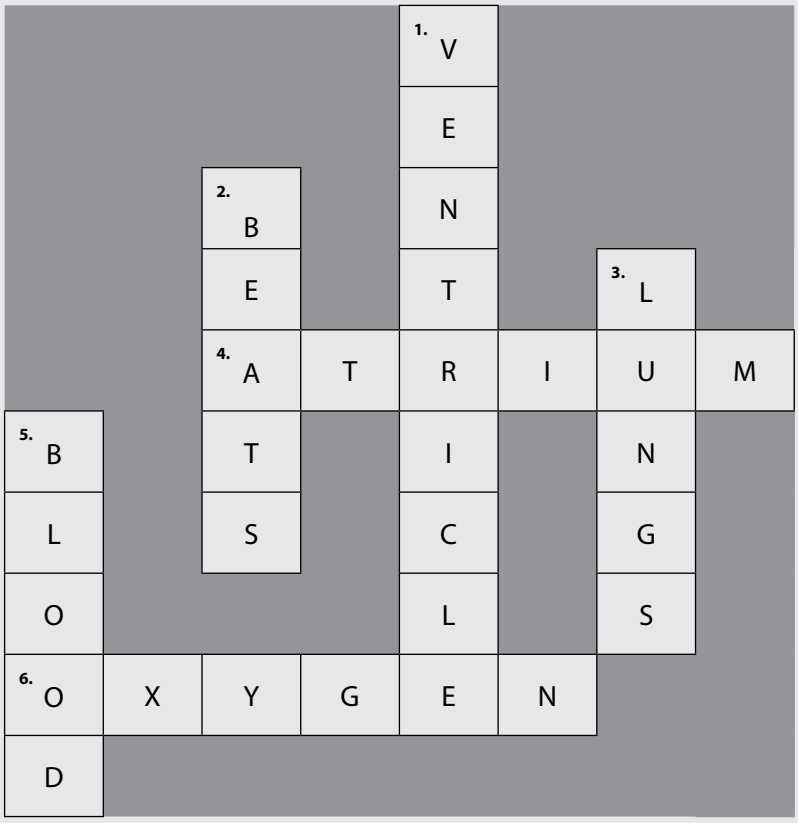
1. Welcome the students into the class and ask them to use the labelled diagram of the brain in their Student's Book to label the picture of the brain on the real-size body outline.
2. As the students label the brain. Walk around and encourage individual students to practise pronouncing the new words.
3. After the students have labelled the brain ask them to sit in a semicircle with you at the centre.
4. Explain that the heart is a muscle that pumps blood around their bodies.
5. Explain that doctors use a special tool called a stethoscope to listen to our heartbeat, but that we can hear our heartbeat if we listen very carefully through a very basic tube.
6. Explain that the heart is a very strong muscle about the size of their fists.
7. Explain that the heart is like the engine of a car, as it pumps the blood around the body. Just like the engine of a car works harder when a car goes uphill, the heart also works harder when we exercise or when we are sick.
8. Arrange the students in pairs or threes and give them a cardboard paper tube.
9. Ask them to listen to each other's heartbeat by placing one end of the tube over their heart and listening through the other end.
10. Ask them to count the heartbeats for 30 seconds and then multiply this by 2 to get the heartbeat for 1 minute.
11. Then get the person whose heart they were listening to, to run on the spot for one minute and then listen and count their heartbeat again.
12. Record the different readings and ask the students to consider why there might be a difference in the number of heartbeats for the two different readings.

13. Allow time for all the students to complete the activity and record the difference in the number of heartbeats counted in the first 'resting minute' and the second minute after exercise.
14. Explain that the paper tube is similar to the first-ever stethoscope which was used to hear the heartbeat over 150 years ago.
15. Read aloud from the Student's Book pausing after each statement and looking carefully at the diagrams. Make sure that you read out the labels on the diagrams and ask the students to practise pronouncing the new vocabulary.

Activities

Help the students to complete the crossword.

Answers to Student's Book 1.2



1.3 What the lungs do

Learning outcomes

Students should be able to:

Student's Book

- describe the importance of the lungs in breathing

Resources

You will need:

- Student's Book pages 8 and 9
- a diagram of the heart and lungs [similar to http://www.sciencekids.co.nz/pictures/humanbody/heartandlungs.html]
- enough balloons for all the students
- the body outlines of students

Student's Book steps

1. Review the diagram of the heart that the students stuck onto their outline. Emphasize that the heart is a muscle, somewhat like the muscles in their arms and legs.
2. Explain that the heart's basic function is to pump blood and nutrients around the body and remove waste.
3. It receives blood with oxygen from the lungs.
4. Show diagrams of the heart and lungs and read aloud the labels.
5. Explain that when we exercise our heart beats faster as more oxygenated blood in needed by all our body organs.
6. Ask the students if they were breathing faster when they ran on the spot in the previous lesson.
7. Explain that their lungs were supplying more oxygen to the heart when they were exercising,
8. Emphasize that the heart and lungs work together.
9. Give the students a balloon each and ask them to blow it and then slowly release the air. Allow them time to do this a few times.
10. Explain that the lungs are like the balloon, they fill with air as we breathe in and then push air out as we breathe out.

Activities

- Ask the students to see if they can feel their lungs working by following the instructions in 'Activity time'.
- Help the students to explain what happens when we breathe in and when we breathe out.

Answers to Student's Book 1.3

a. When you breathe in, your lungs get bigger as they take in oxygen from the air. This oxygen is then transferred into your blood and pumped around your body.

b. When you breathe out, you are getting rid of carbon dioxide that your body does not need.

1.4 Intestines

Learning outcomes

Students should be able to:

Student's Book

- explain the role of the intestines in digestion

Resources

You will need:

- Student's Book pages 9 and 10
- the body outlines of students

Student's Book steps

1. On one body outline, point to the brain, lungs, and the heart. Revise the learning from the previous session by asking individual students what they can recall about the functions of the brain, lungs, and the heart.
2. Make sure that all of the diagrams are labelled. Use the diagrams in the Student's Book to guide the labelling of the diagrams on the outline of the students' bodies.
3. Practise saying the new vocabulary aloud with the students.
4. Explain that another important part of the body is the intestines which are part of the digestive system.
5. Explain that there are two intestines, the large intestine and the small intestine. The intestines help us to digest food and get rid of food that we do not need.
6. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement and encourage the students to ask questions.
7. Look carefully at the diagrams and read out the labels for the students. Help the students to pronounce the new vocabulary by repeating the words aloud.

Activities

Help the students to describe their intestines and explain what they do.

Answers to Student's Book 1.4

Your intestines are part of the digestive system. They help to digest the food you eat and get rid of food that your body does not need.

There are two intestines. One is known as the large intestine, the other as the small intestine. The intestines are like tubes or hoses and they are coiled up to fit inside your body.

1.5 Muscles

Learning outcomes

Students should be able to:

Student's Book

- explain that muscles work by contracting and relaxing

Workbook

- solve a crossword and an anagram
- choose the correct answers related to body organs
- locate body organs on an outline of their bodies

Resources

You will need:

- Student's Book pages 10 and 11
- Workbook pages 3, 4, and 5
- the body outlines of students
- picture of quadriceps muscle [see this link for an example http://www.coriobayhealth.com.au/articles/11-quad-strains-LSPETCH.]

Student's Book steps

1. Welcome the students into the class.
2. The heart has already been introduced as a muscle. It is not the only muscle in the human body. The body has over 600 muscles.
3. Explain that muscles give us strength and help us to move.
4. Show the students a picture of the quadriceps muscle.
5. Explain that this muscle runs down the front of the leg to the knee.
6. Ask them to draw and label the quadriceps onto the outline of their bodies.
7. Display the completed outline of the students' bodies around the class.

Activities

- Encourage the students to try to smile without moving any muscles—this is a fun activity that the students will enjoy.
- Read out the questions for 'In your notebook' from the Student's Book and discuss the possible answers with the students. Ask them to write their answers for homework. Remind them that all of the answers are in the Student's Book.
- Read out the questions for 'Learning is fun!' and ask the students to complete the answers at home.

Workbook steps

1. Help the students to solve the body organs crossword.
2. Assign the body organs quiz for homework.
3. Help the students to solve the anagram activity.
4. Encourage the students to make an 'x-ray' of their bodies by drawing its outline and then drawing the brain, heart, lungs, intestines, muscles, sense organs, and any other parts of the body they know about.

Answers to Student's Book 1.5

a. Muscles help you to move. They also help to move things around your body. Your heart is a muscle—it moves blood around your body.

b. Muscles are attached to the bones. Muscles work by contracting and relaxing. Contracting means they get shorter. Relaxing makes them longer. As they move in this way, they move the bones in the body. They know when to contract and when to relax.

Learning is fun!

1. (a) The brain controls speech, thought, balance, movement, the senses, emotions, dreams, and all other body functions. Your brain sends messages around the body so that all the parts of your body know what to do and when to do them.

   (b) Your heart is divided into four chambers: the left atrium, the right atrium, the left ventricle, and the right ventricle.

   - Blood that is rich with oxygen flows from the left atrium into the left ventricle and then around the body.
   - Blood that contains little oxygen flows from the right atrium into the right ventricle and then to the lungs where it receives oxygen.

   (c) When you breathe in, your lungs get bigger as they take in oxygen from the air. This oxygen is then transferred into your blood and pumped around your body.

2. Students will draw a diagram similar to that on page 11 of the Student's Book.
3. The intestines help to digest the food you eat and get rid of food that your body does not need.
4. The brain

Answers to Workbook

Page 2

Students will label the brain like the diagram on page 5 of the Student's Book.

A. The frontal lobe controls reasoning, planning, emotions, and problem solving.

B. The parietal lobe controls movement, recognition, and some senses.

C. The cerebrum is the largest part of the brain.

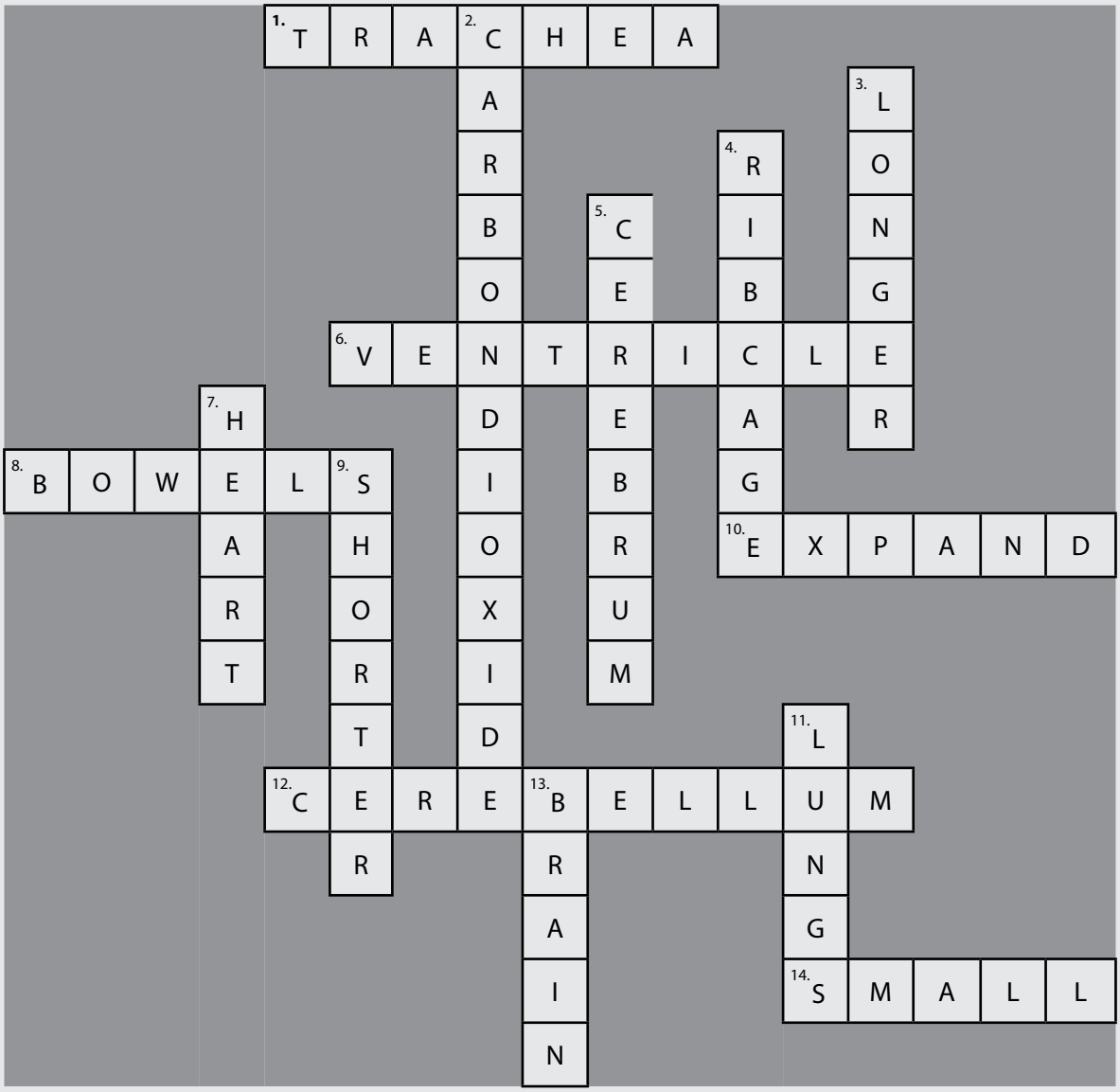
D. The temporal lobe controls memory and speech and processes what you hear.

E. The occipital lobe processes what you see.

F. The cerebellum controls balance and movement.

G. The brain stem links the brain to the rest of the body.

Page 3



Page 4

1. c	2. d	3. c	4. b	5. b
6. a	7. b	8. c	9. c	10. b

Page 5

1. brain	2. heart	3. intestines	4. skin
5. tongue	6. cerebellum	7. frontal lobe	8. ventricle

Answers to Worksheet 1

Students will cut out the pictures of the brain, heart, lungs, and intestines. They will then paste them correctly on the outline they have drawn of themselves.

UNIT 2 THE ANIMAL WORLD

Background

In this unit, students will explore the essential elements of survival for animals—water, energy, and oxygen. They will be introduced to how energy is transferred in a food chain. Prior knowledge of adaptation and habitats will enable students to understand how animals are able to survive in different environments. They will be familiar with animal growth which will help to extend their knowledge about animal movement and reproduction. The example of the life cycle of a frog will be useful to explain reproduction.

Expected learning outcomes for the unit

Students should be able to:

- identify what animals need for survival
- explain how animals have adapted over time
- explain how energy is transferred through a food chain
- explain how carbon dioxide and oxygen are exchanged between plants and animals.

2.1 Essentials of survival

Learning outcomes

Students should be able to:

Student's Book

- explain that animals need water, energy, and oxygen to survive
- describe a food chain

Workbook

- label a food chain
- identify suitable habitats for animals

Resources

You will need:

- Student's Book pages 12–16
- Workbook page 6

Student's Book steps

1. Welcome the students into the class. Explain that they are going to be learning about what animals need to survive.

2. Tell them that all living things (humans, plants, and animals) need the same basic things in order to survive. Ask the students to try and guess what these things might be. Encourage the students to try and guess by praising students who participate in the discussion.
3. Write a list on the board of all the things that the students come up with.
4. Go through the list one by one and ask the students questions to encourage them to think whether an animal might need this thing to survive or not. Ask questions such as:

   Would the animal die without this thing?

   Do we need this thing to survive or is it something that we just want?
5. Explain that animals need water, energy, and oxygen in order to survive.
6. Explain that all living things need food, water, sunlight, and air to survive.
7. Read aloud from the Student's Book pausing after each statement or question as you carefully look at the pictures with the students.
8. Emphasize that all animals need energy, water, and oxygen in order to survive. Remind the students that humans are animals. Remind the students of the difference between needs and wants.
9. Explain how energy is transferred through a food chain.

Activities

- Help the students set up a bowl or dish of water outside the classroom to see if any animals come and drink from it. They may notice birds coming to bathe and drink. The students may wish to do this at home and they should be encouraged to share what they observe.
- Ask the students to complete the section for 'In your notebook' at home. Remind them that the answers are in the Student's Book.

Extension

How to preserve students

Ingredients

1 small amount of discipline

1 large amount of understanding

1 large amount of love

Method

After the mixture of love, understanding, and discipline has matured for one day, place in warm water with plenty of soap. Repeat the method until such time as it is firm and able to stand.

Divide the students into pairs or threes and ask them to think about the things they need in life in order to exist. Ask the groups to make a list of these things and divide the list into what they need and what they want, for example, we need food, water, and shelter to survive. These are the basic things that we need. We may want to learn, to watch television, or to go on holidays, but we do not need these things

in order to survive. Ask the groups to share their list of needs and wants with the class and collate the list on the board.

Show and read out the above example of a recipe for raising students. Ask the groups to come up with a recipe for giving students what they need in life, but not necessarily what they want. Share the recipes with the class. Vote on the best recipe and display it in the classroom.

Workbook steps

1. Help the students complete the labels for the diagram 'From producer to consumer'. Remind them to look in the Student's Book for tips on how to label the different living things.
2. Remind the students that living things have adapted to their environments over a long time. Read out the list of animals from 'Adapting to environments' and ask the students to describe what the animals look like and any particular features they have. Read out the list of environments and ask individual students to describe the features of the particular environment. Explain that they need to match the animal with the environment that would best suit its features. Help the students make the right connections.

Answers to Student's Book 2.1

1. Animals need energy so they can do all the things that they do. This includes growing, mending the body, moving, and everything else.
2. Energy comes from the Sun but it is passed from one living thing to another living thing through food.

2.2 Adaptation

Learning outcomes

Students should be able to:

Student's Book

- demonstrate an understanding of how animals have changed over time to increase their chances of survival

Resources

You will need:

- Student's Book pages 17 and 18
- a relevant story book that shows someone adapting to meet a need, such as building a boat to reach somewhere, or taking an umbrella because it is raining

Student's Book steps

1. Welcome the students into the class.
2. Explain that over a very long period of time animals have changed or adapted themselves for better survival.

3. Read a relevant story book. Encourage the students to predict what they think might happen from the words and the pictures.
4. Explain how the book is about changing or adapting in order to do something. Ask the students to share any times that they have changed or adapted in order to get something or do something.
5. Explain that animals have adapted over time in order to survive.
6. Emphasize that these changes take a long time and help animals to survive.
7. Read aloud from the Student's Book pausing after each statement and looking carefully at the illustrations.

Activities

- Encourage the students to invent an animal that would best suit a freezing cold environment, an environment where food could only be found at the top of tall trees and one where water could only be reached from a hole in the ground. The students may finish their drawings at home and bring them back in the following lesson.
- Help the students to explain why animals need to adapt to their surroundings.

Answers to Student's Book 2.2

Living things are always changing to give themselves the best chance of survival. The animals that best suit their environment are most likely to survive long enough to reproduce.

2.3 Movement

Learning outcomes

Students should be able to:

Student's Book

- discuss the reasons animals need to move

Resources

You will need:

- Student's Book pages 18 and 19

Student's Book steps

1. Welcome the students into the class.
2. Without making any noise pretend to be a monkey swinging from branch to branch. The students may laugh at your funny behaviour—this is good! Encourage them to interact.
3. Now pretend to be a giraffe reaching high up to try and nibble on some leaves. Do not make any noise. Encourage the students to interact with you.
4. After some time, signal to the students that they need to listen.
5. Ask the students if they can guess what animal you were pretending to be.

6. Explain that animals move in different ways for a reason. They may be looking for food, for shelter, for water, or to escape.
7. Explain that it is their turn to try and move like an animal and the rest of the class has to guess what animal they are pretending to be. Remind the students that they can't make any noise. Allow enough time for different students to pretend to be an animal.

   Extension: Arrange the students in groups of four or five and encourage them to play Animal Charades so that they can all have a turn. Remind them that they can't speak, they can just move like an animal.
8. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement to look at the pictures and encourage the students to ask questions or to comment on what they are seeing and hearing.

Activities

- Arrange the students in pairs or threes and ask them to brainstorm the different animals that move in the ways listed in the Activity section.
- Ask the students to think about all the different ways that they move and why. Ask them to complete the 'In your notebook' question at home.

Answers to Student's Book 2.3

Answers will vary.

2.4 Reproduction

Learning outcomes

Students should be able to:

Student's Book

- discuss reproduction among different types of animals
- give an account of the life cycle of a frog

Workbook

- solve animal puzzles
- circle the correct answers for questions related to animals
- explain how a wild animal is adapted to its environment

Resources

You will need:

- Student's Book pages 20 and 21
- Workbook pages 7 and 8
- copies of Worksheet 2 for all the children

Student's Book steps

1. Write the word 'Reproduction' on the board.
2. Explain that reproduction is the process by which living things produce new living things.
3. Read aloud from the Student's Book pausing after each statement and looking at the diagrams with the students.
4. Explain that humans are mammals.
5. Explain asexual reproduction, giving examples of animals such as amoebas, some types of lizards and fish.
6. Explain the life cycle of a frog.
7. Ask the students to complete the crossword in Worksheet 2 at home.

Activities

Help the students answer the questions in 'Learning is fun!'. Remind them that the answers are in the Student's Book.

Workbook steps

1. Ask the students to complete the crossword and wordsearch at home.
2. Ask the students to look for animals in their environment. You may need to give the students a week or two to complete their observations. Ask the students to write down what they notice about any animals they observe.

   Do they fly?

   Do they swim?

   How do they move?

   Do they have fur, feathers, or skin?
3. Explain that there is no right answer and they just need to record what they can see.
4. Ask the students to attempt the multiple choice questions and discuss the answers at the end of the class.

Learning is fun!

1. water, energy, and oxygen
2. Animals can survive longer without food.
3. All energy comes from the Sun.
4. producer, primary consumer, secondary consumer, and tertiary consumer
5. If living things did not have the ability to reproduce, there would be no living things on Earth.
6. With some animals, the female lays the egg outside her body and the male then fertilizes it. The egg then hatches when the baby animal is ready to enter the world. With other animals, the egg is fertilized inside the female's body.
7. Metamorphosis is when an animal changes its appearance and body structure during the different stages of its life cycle.

Answers to Workbook

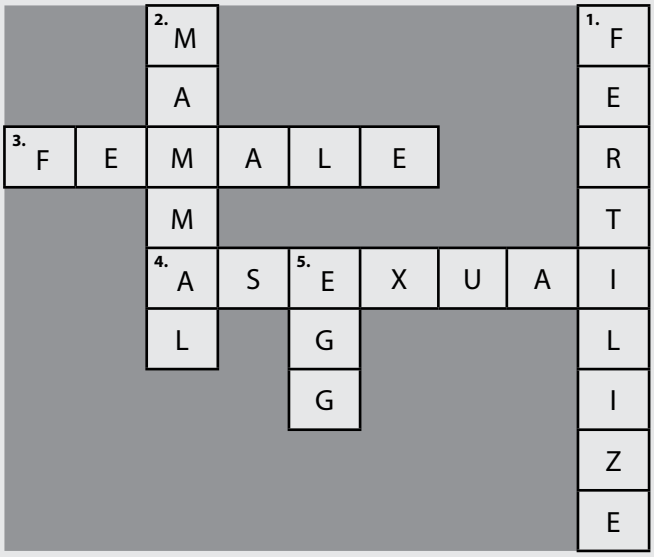
Page 6

I. Students will label the food chain like the diagram on page 15 of the Student's Book.

II. arctic environment—polar bear
desert environment—cactus
rainforest environment—gibbon
underground environment—mole
mountain environment—mountain goat
river environment—alligator

Page 7

I.



II.

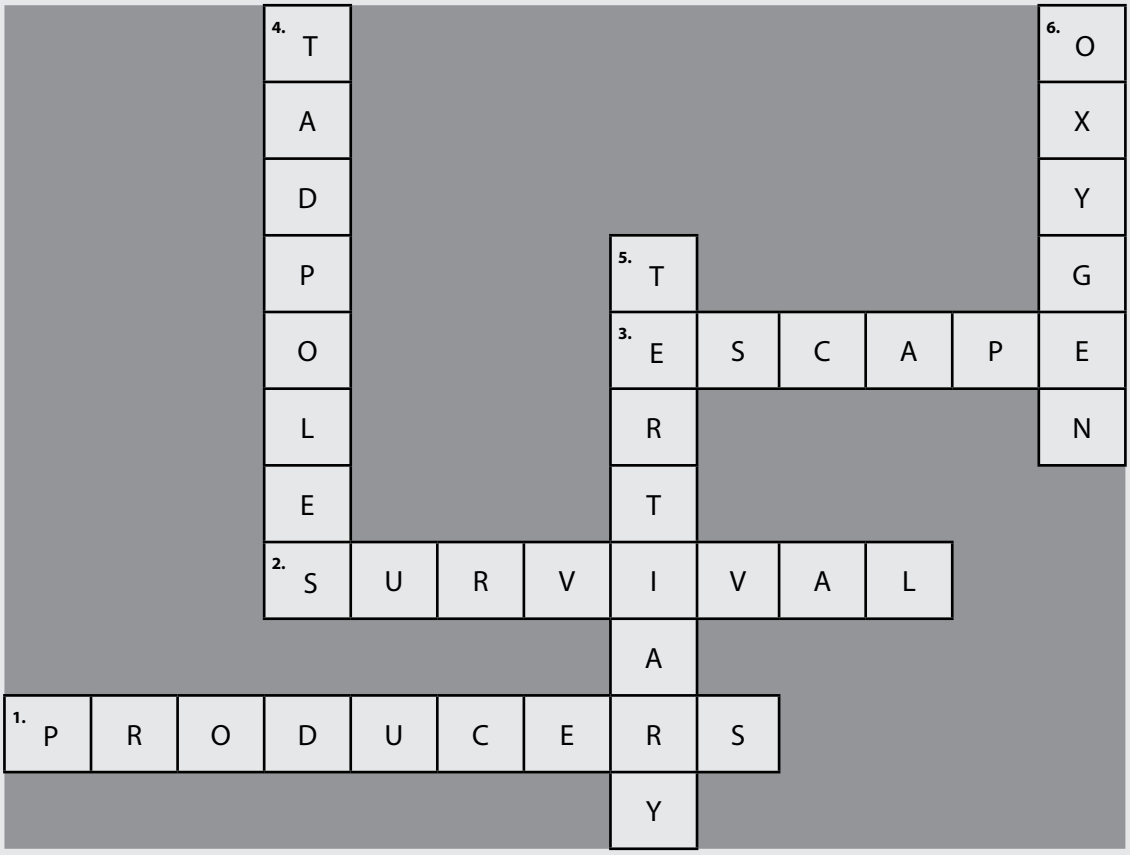
T	E	R	T	I	A	R	Y	S
P	N	A	A	S	T	M	S	P
O	E	D	E	G	G	C	H	E
I	R	A	O	A	T	O	E	C
U	G	P	I	H	Y	D	L	I
K	Y	T	E	B	L	E	T	E
J	S	U	R	V	I	V	E	S
C	A	R	N	I	V	O	R	E

Page 8

I. 1. a 2. c 3. b 4. b 5. d 6. b

II. Answers will vary.

Answers to Worksheet 2



UNIT 3 THE PLANT WORLD

Background

The purpose of this unit is to reinforce the main parts of a plant and how photosynthesis takes place. Extend students' knowledge by introducing more plant processes such as transpiration, transportation, and reproduction. Use appealing visual materials which help students to easily understand the structure and role of the roots and stem in providing nutrition and support to plants. Explain also the role played by flowers in the reproduction of plants.

Expected learning outcomes for the unit

Students should be able to:

- describe some of the main features of plants using correct vocabulary
- explain that plants go through four main processes to live, grow, and reproduce
- explain how reproduction takes place in a plant

3.1 Parts of a plant

Learning outcomes

Students should be able to:

Student's Book

- identify the four main parts of a plant and explain their functions

Workbook

- identify the parts of a plant and explain their function

Resources

You will need:

- Student's Book page 22
- Workbook page 9
- a small patch of garden to observe

Student's Book steps

1. If possible, start the lesson outside in a garden. Welcome the students and tell them that they are going to be learning about plants.

2. If you are outside, encourage students to smell and touch, different plants and to look at them carefully. If you are in the classroom, allow the students to smell, touch, and feel the plants you have brought in.
3. Point out to the students the leaves, flowers, and stems of the plants.
4. Explain the process of photosynthesis to the students.
5. Explain that some plants reproduce through their flowers.
6. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement and look at the pictures and encourage the students to interact.

Activities

Ask the students to answer the question from 'In your notebook' at home. Remind them that the answer is in the Student's Book.

Workbook steps

Ask the students to draw a line from the plant part to the description of its purpose.

Answers to Student's Book 3.1

The leaf is where food is produced. The system of producing food is called photosynthesis.

3.2 Plant processes

Learning outcomes

Students should be able to:

Student's Book

- explain the four main plant processes

Workbook

- solve plant puzzles
- identify the part of a plant which is eaten
- observe transpiration and transportation

Resources

You will need:

- Student's Book pages 23–25
- Workbook pages 10, 11, and 12
- fresh leaves
- two jars with lids
- copies of Worksheet 3 for all the children

Student's Book steps

1. Explain to the students that there are four main processes that help plants to live, grow, and reproduce.
2. Write the words photosynthesis, transpiration, transportation, and reproduction on the board.
3. Ask individual students if they can define any of the words. Praise them with positive feedback.
4. Explain to them that photosynthesis is the system for plants to produce food.
5. Explain that transpiration is the system that helps plants to keep cool.
6. Explain that transportation is the system that carries water and food from the roots to the leaves.
7. Explain that reproduction is the system that helps plants make more of themselves.
8. Read aloud from the Student's Book as the students follow in their own books. When the new vocabulary such as 'transpiration' and 'transportation' come up, encourage the students to say the words aloud and repeat their definitions.
9. Students can attempt Worksheet 3 at home.

Activities

- Help the students to answer the questions in 'Learning is fun!'.
- Assist them to observe pollination in a garden.

Workbook steps

1. Ask the students to solve the crossword and wordsearch at home.
2. Read out the list of different plants from the activity 'Which part do you eat?'. Ask the students to recall the different parts of a plant and see if they can identify the parts of the plants they eat.
3. Ask the students to recall the process of transpiration. Remind the students that this is how plants keep cool—like sweating is for humans. Explain that they can do an experiment to show how transpiration works. Read the directions aloud from the Workbook and put one jar of leaves in the refrigerator. Check the leaves with the students. When water droplets or mist appears, explain that this is how the plant keeps cool. This is the process of transpiration.

Learning is fun!

1. The roots absorb water and minerals from the ground. They also help to anchor the plant in the ground.

   The stem has several functions. It transports water up the plant. It also supports the leaves and flowers, particularly against wind. Some stems have spikes or hairs that protect the plant from insects and small animals.

   Leaves are the place where food is produced.

   Flowers produce seeds which form new plants.

2. Photosynthesis.

   Photosynthesis is the process of creating food. Leaves contain a green substance called chlorophyll (which is why leaves are green most of the time). The chlorophyll converts energy from the Sun and when this is combined with water and carbon dioxide, food is produced.

   Transpiration

   Transpiration takes place within the leaves. It is a process that involves water evaporating from a plant. Transpiration helps to keep plants cool.

   Transportation

   Plants have tubes that transport water, minerals, and glucose (food) to where they are needed. These tubes are of two types: xylem and phloem. Xylem are strong, thick tubes. They carry water and minerals from the plant's roots to the leaves. Phloem are thinner than xylem. They transport glucose from the leaves to other parts of the plant.

   Reproduction

   Plants contain both male and female parts. In flowering plants, reproduction takes place in the flowers. Plant fertilization occurs when a bird, insect, or the wind transfer pollen grains from the anther of one plant to the stigma of another plant. Most non-flowering plants produce spores instead of seeds. The spores are scattered by wind or water and start to grow if they land somewhere where the conditions are right. Some plants reproduce by growing new shoots that form roots and grow into new plants.

3. In flowering plants, reproduction takes place in the flowers.

   The stamen is the male part of the flower. The anther is part of the stamen. The anther is covered in pollen.

   The pistil is the female part of the plant. At the top of the pistil is the stigma, then a tube that leads down to the ovary.

   Plant fertilization occurs when a bird, insect, or the wind transfer pollen grains from the anther of one plant to the stigma of another plant.

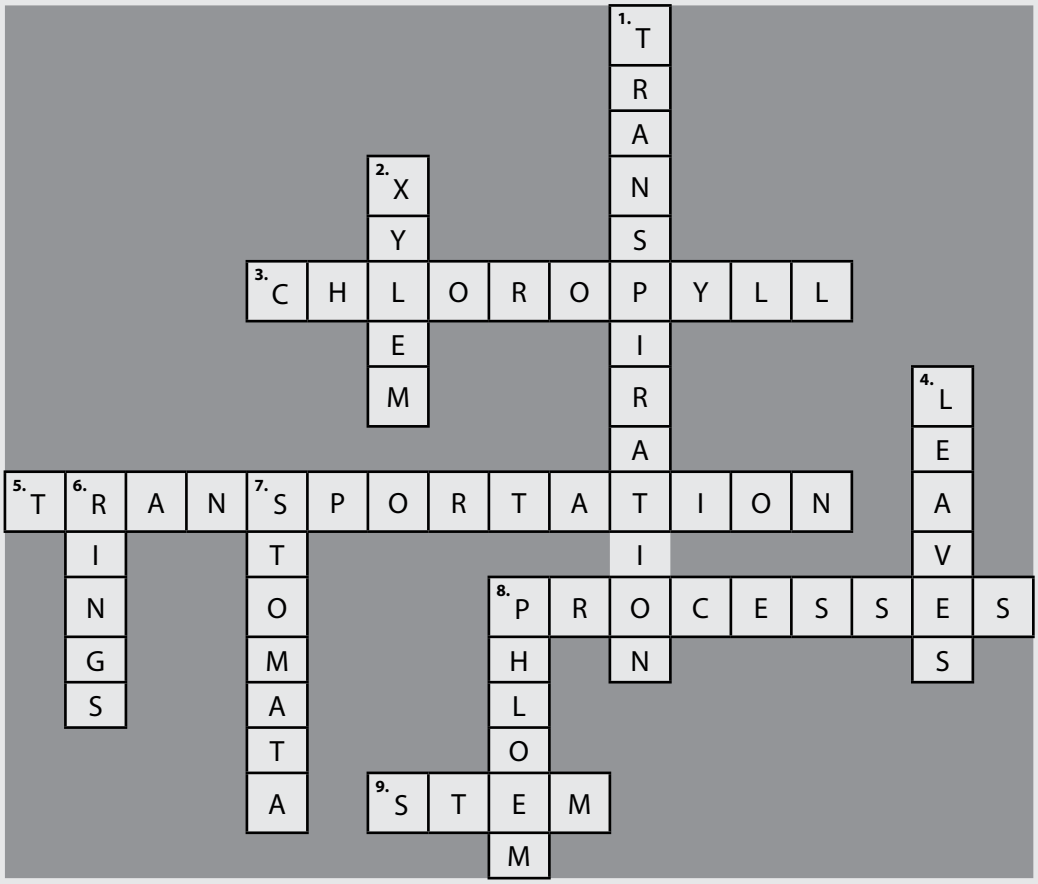
   From the stigma, the pollen goes down the tube to the ovary, where it fertilizes an egg and a seed is formed. Students will draw a diagram similar to that on page 24 of the Student's Book.

Answers to Workbook

Page 9

flowers—produce seeds that form new plants
roots—absorb water and minerals from the soil and anchor the plant
stem—transport water up the plant and support leaves and flowers
leaves—produce food for the plant

Page 10



Page 10

P	I	S	S	E	E	D	P	V	E
I	S	Y	T	S	P	O	R	E	T
S	P	O	I	E	O	V	A	R	Y
T	E	P	G	M	L	T	L	J	I
I	T	E	M	O	L	L	R	O	N
L	S	T	A	M	E	N	S	C	M
K	J	A	R	A	N	T	H	E	R
G	A	L	N	V	S	E	P	A	L

Page 11

apple—fruit
bean—seed
broccoli—flower
carrot—root
cauliflower—flower
celery—stem
spinach—leaf
tomato—fruit
turnip—root
peas—seed
onion—stem
lettuce—leaf

Page 12

I. Water droplets or mist appears which keeps the plant cool. This is the process of transpiration.

II. The tuberose in coloured water will turn red due to transpiration.

Answers to Worksheet 3

1. transports
2. chlorophyll
3. Transpiration
4. Phloem, leaves
5. Stomata
6. bud
7. Xylem
8. transportation
9. water, minerals
10. stem
11. pollen grains
12. seeds, spores

UNIT 4 FOOD AND DIET

Background

In this unit, students will learn about the different food groups and why each one is important for health. Students' background knowledge will base on healthy eating habits and the food pyramid. This will make it easier to reiterate the ideas of a balanced diet and good hygiene.

Expected learning outcomes for the unit

Students should be able to:

- explain how the right food helps us to be healthy
- list some foods that are good for them
- identify that their body needs proteins, carbohydrates, minerals and vitamins, and fats and oils
- explain what is meant by a healthy diet
- explain the importance of good hygiene

4.1 The right food

Learning outcomes

Students should be able to:

Student's Book

- name some foods that are mostly carbohydrates, proteins, minerals and vitamins, and oils and fats
- identify foods that they should eat every day and foods that should be eaten sometimes and rarely
- name some foods to make up a balanced diet

Workbook

- choose the correct answer related to food and diet
- identify healthy food

Resources

You will need:

- Student's Book pages 26–32
- Workbook pages 13, 14, and 15
- dictionaries—enough for every pair or group of three
- copies of Worksheet 4 for all the children

Student's Book steps

1. Welcome the students into the class.
2. Ask individual students to recall the things that animals and plants need in order to survive—water, energy, and oxygen.
3. Remind the students that we are living things like plants and animals and we need water, energy, and oxygen in order to survive too.
4. Explain that we get our energy from food. Food gives us energy to play, learn, and work. In fact, we can not move without energy.
5. Explain that there are foods we can eat which give us lots of energy and help us to stay healthy.
6. Ask the students to recall the sorts of foods that help us to stay healthy, such as vegetables, fruit, fish, and eggs.
7. Explain that in order to be healthy we need to eat a balanced diet of carbohydrates, proteins, fats, vitamins, and minerals. Write these words on the board and encourage the students to say them aloud.
8. Read aloud from the Student's Book pausing to look at the pictures and as the students follow in their own books.
9. Arrange the students in pairs or threes and ask them to look up the definition of the five different components of a healthy diet in a dictionary: carbohydrates, proteins, fats, vitamins, and minerals.
10. After some time, ask the students to share their definitions and come up with a class definition of carbohydrates, proteins, fats, vitamins, and minerals using the dictionary definitions and the information in the Student's Book. Write these definitions on poster paper and ask the students to draw some foods that have some carbohydrates, proteins, fats, vitamins, and minerals in them.
11. Emphasize that the best possible way to stay healthy is to eat food from all the different types of food groups This constitutes a balanced diet.
12. Display the posters around the room.
13. Help the students to complete Worksheet 4 in class.

Activities

- Help the students to explain why their bodies need proteins and answer the questions from 'In your notebook'.
- Read out the story from Aesop and discuss with the students what they think the tortoise and hare might have eaten.
- Help the students answer the questions about the two different types of carbohydrates from the section 'In your notebook'.
- Ask the students to answer the question on minerals and vitamins from 'In your notebook' at home. Check their answers in the next class.
- As a class, discuss the possible answers to 'What do I need more of?' Ask the students to write down the answers.

- Ask the students to complete the answer to the question about fats and oils from 'In your notebook' at home. Check their answers in the next class.

  Extension: Host a lunch where the students share healthy foods from all the different food groups.
- Ask the students to write down all the things they do every day to stay healthy.
- As a class, brainstorm what is meant by good hygiene from the section 'Learning is fun!' and ask the students to write down the answers.

Workbook steps

1. Ask the students to attempt the multiple choice questions at home.
2. Explain that they can check their answers for the task 'Food that adds up' by doing the simple sums. Remind the students that all of the information that they need about the different types of food is in the Student's Book.
3. Ask the students to complete the activity 'What do you like? What's best for you?' at home.

Answers to Student's Book 4.1

Protein is made up of amino acids. Your body needs amino acids to work properly. While your body can make some of the types of amino acids it needs, it cannot make all of them. The other amino acids are available in foods that contain a lot of protein.

Foods that are rich in protein:

- red meat
- fish
- poultry
- eggs
- beans
- nuts

1. There are two types of carbohydrates: simple carbohydrates and complex carbohydrates.
2. Complex carbohydrates are better for lasting energy.

   [Teacher to guide students to work out how many times they eat food with carbohydrates every day]

   Minerals come from the ground and in water. They are absorbed by plants and consumed by animals. We get these minerals when we eat the plants or meat that contains them. Minerals and vitamins are help to fight disease.

   Fats are solid at room temperature while oils are liquid at room temperature.

   The right sorts of fats and oils are good for our nervous system, including our brain. They are also good for the skin, protect vital organs, and control our body temperature.

4.2 Good hygiene

Learning outcomes

Students should be able to:

Student's Book

- understand that good hygiene is about good health

Resources

You will need:

- Student's Book pages 32 and 33
- index cards

Student's Book steps

1. Welcome the students into the class.
2. Remind the students that in order to be healthy we need to eat a balanced diet of carbohydrates, proteins, fats, vitamins, and minerals. Write these words on the board and encourage the students to say them aloud.
3. Brainstorm ways of maintaining good hygiene and list these on the board. Read from the Student's Book as the students follow in their own books.

Activities

- Ask the students to write down all the things they do every day to stay healthy.
- As a class, brainstorm what is meant by good hygiene from the section 'Learning is fun!' and ask the students to write down the answers. Students can write these on the index cards given to each of them. The cards can be pinned on the bulletin board.

Learning is fun!

Hygiene is about keeping clean. It is important to keep clean because dirty bodies attract germs and diseases. Ways of maintaining hygiene will vary.

Answers to Workbook

Page 13

1. b
2. c
3. a
4. c
5. d
6. b
7. c
8. b
9. d
10. b

Page 14

1. amino acids
2. protein
3. sugars
4. starches
5. carrots
6. They absorb them.
7. calcium
8. vitamin C
9. brain
10. fish

Page 15

Students will circle the apple in the first row.
Students will circle the carrot in the second row.
Students will circle the fresh fruit in the third row.
Students will circle the glass of milk in the last row.

Answers to Worksheet 4

potatoes—carbohydrates
chicken—protein
rice—carbohydrates
milk—minerals and vitamins
fish—proteins/minerals and vitamins
bread—carbohydrates
oranges—minerals and vitamins
eggs—proteins
peanuts—oils and fats
corn—carbohydrates
sunflower—oils and fats
red meat—proteins/minerals and vitamins
beans—proteins
broast chicken—oils and fats/protein
sugar—carbohydrates
olives—oils and fats

UNIT 5 ENVIRONMENT

Background

Students' existing knowledge about an environment will base on a background of what a habitat is and its different types. They will further explore how habitats support life and be introduced to the concepts of diversity and conservation. Elaborate on their meaning and importance using relevant examples. A concept web can be used to explain how an environment contains natural resources and these can be renewable or non-renewable. Provide examples of both of these resources and how they are used.

Expected learning outcomes for the unit

Students should be able to:

- outline how habitats support life
- define conservation and understand its importance
- define natural resources
- define renewable and non-renewable resources

5.1 How habitats support life

Learning outcomes

Students should be able to:

Student's Book

- explain how habitats support life

Workbook

- observe a habitat and its features

Resources

You will need:

- Student's Book pages 34 and 35
- Workbook pages 16 and 17
- books from the library that show and describe animals which live in different habitats or access to the Internet
- paper, coloured pencils

Student's Book steps

1. Welcome the students into the class.
2. Ask them if they can recall what is meant by a habitat. Remind them that habitats are an area where something lives and is active.
3. Explain that a habitat needs some basic things for animals and plants to survive in it: food, water, shelter, and a safe environment for the young.
4. Explain that there are many different habitats on Earth but some of the main ones are grasslands, polar regions, deserts, rainforests, and rivers or seas. Write these words on the board.
5. Divide the class into small groups and assign each group a different habitat to research: grasslands, polar regions, deserts, rainforests, and rivers or seas.
6. Provide each group with some books or other resources that depict animals that live in their designated habitat.
7. Ask each group to brainstorm all the different animals that might live in their assigned habitat, for example:

   deserts: camels, lizards, some types of snake, scorpions

   grasslands: bison, giraffes, elephants

   rainforests: frogs, monkeys, parrots

   rivers or seas: crabs, seagulls, dolphins

   polar regions: penguins, seals, polar bears.
8. Ask the group to make a list of the animals and discuss what features they have that allow them to live in this particular environment, for example: a polar bear has thick fur which is white which not only keeps it warm, but also helps it to stay camouflaged against the snow so it can hunt for food undetected.
9. Ask each group to share their list of animals and describe the ways in which it has adapted to its particular environment.
10. Display each group's list of animals and features around the room.
11. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement or question and look carefully at the images and ask the students to describe what they can see.

Activities

The students may answer the questions from 'In your notebook' at home.

Workbook steps

Give the students paper and colour pencils. Take them outside and ask them to find a small space to observe. Ask them to make a sketch of everything that they can see. Return to the classroom and ask them to colour the sketch with real-life colours.

Answers to Student's Book 5.1

1. A habitat is an area that contains the things that an animal or a plant needs to survive.
2. Diversity means differences. The more differences in a habitat, the more types of animals and plants it can have living within it.

5.2 Human activity in habitats

Learning outcomes

Students should be able to:

Student's Book

- describe how human activity affects the habitats of animals

Resources

You will need:

- Student's Book pages 35 and 36
- a relevant story book that shows people going into a natural environment such as camping or fishing

Student's Book steps

1. Welcome the students into the class.
2. Explain that most animals remain in their own habitats because it has everything in it that they need to survive—food, water, and shelter.
3. Explain that humans move in and out of different habitats for different reasons like holidays, to have fun, to find food, or to cut down trees to make things.
4. Ask individual students to share any times they have gone into different animal habitats—it may have been for a holiday, visiting a friend, and so on.
5. Read a story book about people going into a natural environment—such as camping, fishing, and so on. Ask the students to predict what they think might happen from the words and the pictures.
6. Read aloud from the Student's Book pausing after each statement or question and looking carefully at the images.

Activities

Ask the students to answer the questions from 'Learning is fun!' at home.

Answers to Student's Book 5.2

1. Humans use rivers, streams, and oceans to find food.
2. Humans cut down trees in forests to make houses, furniture, and other things. They go to other habitats for fun, and can destroy the things in a habitat that other living things need to survive.

5.3 Conservation

Learning outcomes

Students should be able to:

Student's Book

- describe the importance of conservation

Workbook

- understand conservation through a game

Resources

You will need:

- Student's Book pages 36 and 37
- Workbook page 20
- some counters and dice to play 'The Conservation game' in the Workbook

Student's Book steps

1. Welcome the students into the class. Ask the students if they can explain what 'conservation' might mean. Praise the students with positive feedback.
2. Explain that conservation is about protection and managing the environment.
3. Ask the students to think about a world where the people who lived before us had polluted the rivers and streams, asking questions such as:

   What do you think our school would look like if no one picked up their rubbish?

   What do you think the rivers and seas would look like if they were polluted?

   What do you think the park might look like if there were no trees or bushes left?
4. Read aloud from the Student's Book pausing after each statement and looking at the pictures.

Activities

- Ask the students to draw a picture of a habitat that had been looked after. Ask the students to draw a picture of a habitat that has not been looked after.
- Ask the students to answer the questions from 'In your notebook' at home.

Workbook steps

Arrange the students in groups and encourage them to play the 'Conservation game'.

Extension: Ask the students to make up their own questions and create their own version of the 'Conservation game.'

Answers to Student's Book 5.3

Conservation is about protecting and managing the Earth's natural resources and environment. It is needed so that the natural resources and environment are here for future generations.

5.4 Natural resources

Learning outcomes

Students should be able to:

Student's Book

- define natural resources

Workbook

- identify natural resources

Resources

You will need:

- Student's Book page 38
- Workbook page 21

Student's Book steps

1. Welcome the students into the class. Ask the students to remember what they learnt about conservation, asking leading questions such as:

   Can you describe what it means to conserve things?

   What would our world be like if we didn't look after it?
2. Explain that natural resources are things that grow or are created naturally—without human help. Natural resources are things that are useful to us, like water, gold, sand, and wind.
3. Write the words 'Natural resources' on the board and the definition: Natural resources are things that are natural and grow or are created without human help. They are resources because they are useful to us.
4. Ask the students to copy down the definition.
5. Read aloud from the Student's Book as the students follow in their own books.

Activities

- See how may natural resources the students can name. Ask them to write them down and then check them against the list in the Student's Book.
- Ask the students to write in their own words what natural resources are for the 'In your notebook' activity. Check their definitions in the next class.

Workbook steps

Ask the students to put a tick or a cross through the things that either are or are not natural resources.

Answers to Student's Book 5.4

Natural resources are things that grow or are created naturally, without human help. The word 'resource' means something that can be used. Only natural things that are useful to humans can be called natural resources.

5.5 Humans using natural resources

Learning outcomes

Students should be able to:

Student's Book

- explain how natural resources are used by humans

Resources

You will need:

- Student's Book page 39
- the story of 'The three little pigs'

Student's Book steps

1. Welcome the students into the class. Ask individual students to try and recall what natural resources are. Praise them with positive feedback.
2. Remind the students that natural resources are things that occur naturally for human use.
3. Read the story of 'The three little pigs' and ask the students to predict what they think might happen from the words and the pictures. Encourage the students to ask questions and engage with the story.
4. Ask individual students if there were any examples of natural resources in the story. Praise the students for trying to name the natural resources.
5. Explain that the three different materials that the little pigs made their houses with are all natural resources. These things occur in nature and humans use them.
6. Read aloud from the Student's Book pausing after each statement and inviting the students to comment or discuss what they have learnt. Look at the pictures together and comment on the different uses of natural resources.

Activities

Ask the students to answer the questions from 'In your notebook' at home. Remind them that all the answers are in the Student's Book.

Answers to Student's Book 5.5

Answers will vary.

5.6 Renewable and non-renewable

Learning outcomes

Students should be able to:

Student's Book

- differentiate between renewable and non-renewable resources

Workbook

- choose the correct answer related to the environment and natural resources
- identify uses of natural resources
- solve a crossword puzzle

Resources

You will need:

- Student's Book pages 40 and 41
- Workbook pages 18, 19, and 22
- copies of Worksheet 5 for all the children

Student's Book steps

1. Ask the students to recall any natural resources from the previous lessons.
2. Write a list on the board of all the natural resources they can recall.
3. Explain that some natural resources won't run out such as the Sun, wind, tides and these are called renewable resources.
4. Explain that other natural resources will run out and that we only have a limited amount of them such as coal and oil.
5. Write these definitions on the board and ask the students to copy them down.
6. Focus on the non-renewable resource of oil and brainstorm with the students all of the machines that rely on oil to work, including: cars, tractors, trains, planes, boats, and manufacturing plants.
7. Ask the students to consider a world where there was no longer any oil, asking questions such as:

   How would we get to places?

   What would this change about the way we live?

Whose parents need to travel to get to work?

What would happen if there was no oil to run trains, buses, and cars?

What would happen if there were no planes?

What would the world be like?

How would we get to different places?

What would change about the way we live if one natural resource, such as oil, ran out?

8. Ask the students to copy down the list of natural resources from the board.
9. Ask the students to put an 'R' next to the renewable resources on their list and an 'NR' next to the non-renewable resources. Encourage them to discuss their choices with other students in the class.
10. Ask individual students to share their lists and why they put an 'R' next to—the renewable resources and why they put an 'NR' next to—the non-renewable resources.
11. Read aloud from the Student's Book as the students follow in their own books. Look carefully at the pictures with the students.
12. Ask the students to complete Worksheet 5 at home.

Activities

Help the students to answer the questions from 'Learning is fun!' in class. Remind them that all the answers are in the Student's Book.

Workbook steps

1. Ask the students to circle the correct answer on pages 18 and 19. Remind them that all the information that they need to choose the correct answer is in the Student's Book.
2. Ask the students to draw a line from the picture to the description of what the natural resource is used for.
3. Ask the students to complete the crossword at home.

Learning is fun!

1. Answers will vary.
2. A habitat needs to be diverse so that animals and plants do not have to compete for the same food, water, and shelter. If a habitat is diverse, animals and plants can survive next to each other.
3. Habitats need to be conserved so that animals and plants can continue to survive in them for as many generations as possible.
4. Renewable resources are resources that will not run out. Humans can keep using them as much as they like. Non-renewable resources are resources that can only be used once. Once they have all been used up, there are no more of them. Examples will vary.
5. Natural resources must be conserved so they do not run out for future generations.

Answers to Workbook

Pages 16 and 17

Drawings will vary.

Pages 18 and 19

1. d	2. c	3. d	4. c	5. a and b
6. b and c	7. b	8. d	9. c	10. b

Page 20

Students will follow the instructions to play the game.

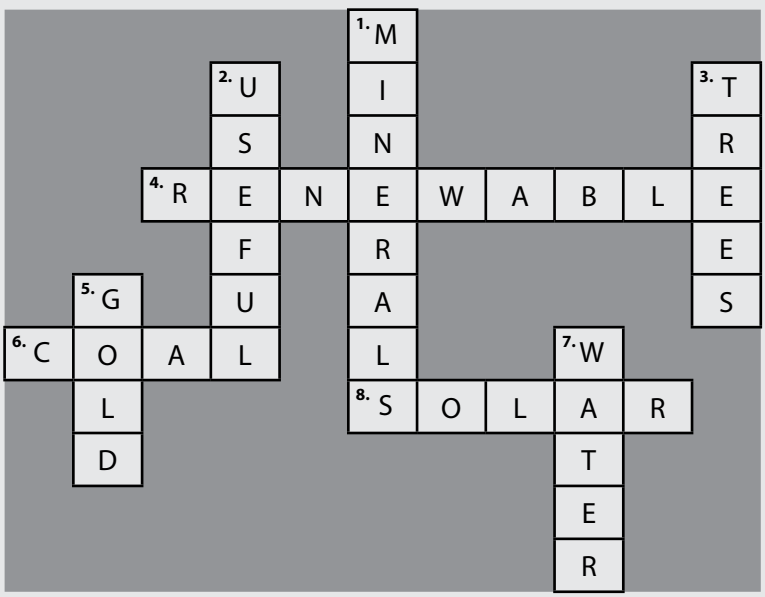
Page 21

√ tree, stream, coal, and oil X TV, laptop, car, wheelbarrow, key, and football

Page 22

I. The gold bars will be matched with the girl.
The fish will be matched with the plate.
Coal will be matched with the light globe/energy saver.
The tree will be matched with the house.
Oil will be matched with the car.

II.



Answers to Worksheet 5

1. Diversity is important so that animals and plants do not have to compete for the same resources.
2. Lists will vary.
3. If trees are cut down, there would be no place for animals to live. There would be no wood to build houses and less fresh air to breathe in.
4. Humans use water for drinking, washing, and transport. Water is a renewable resource.

UNIT 6 MATTER AND MATERIALS

Background

This unit highlights the three states of matter in further detail. Elicit the definition of matter and the names of the three states from the students. Use diagrams to explain the structure of an atom and a molecule. Dissolving sugar in water and observing how an ice cube melts will help in understanding of how matter changes from one state to another. Extend students' knowledge by explaining to them what a mixture is.

Expected learning outcomes for the unit

Students should be able to:

- explain that atoms are tiny particles
- describe that molecules are two or more atoms joined together
- revise the different forms of matter and how they behave
- explain how matter changes from one state to another
- describe the types of mixtures

6.1 Atoms and molecules

Learning outcomes

Students should be able to:

Student's Book

- explain that atoms make up everything
- explain that molecules are two or more atoms joined together
- explain the structure of an atom and a molecule

Workbook

- observe how molecules move in hot and cold water

Resources

You will need:

- Student's Book pages 42 and 43
- Workbook page 23
- a glass filled with hot water (be careful), a glass filled with cold water, food colouring, an eye dropper—for the experiment in the Workbook

Student's Book steps

1. Welcome the students into the class and explain that they will be learning about matter. Remind the students that matter is everything around us all living and non-living things, our food, the air we breathe, etc.
2. Ask the students if they can remember the three main forms of matter: solids, liquids, and gases.
3. Ask the students if they can remember any of the features of the three different forms of matter. Praise the students with positive feedback.
4. Write the following descriptions on the board and ask the students to copy them down. This is a good way of revising and consolidating their learning about matter.

Solid

Has a definite shape

Has a definite mass

Has a definite volume

Particles are tightly packed and usually do not move.

Liquid

Does not have a definite shape

Has a definite mass

Has a definite volume

Takes the shape of its receptacle

Particles are close together with no regular arrangement and can slide past each other.

Gas

Does not have a definite shape

Does not have a definite mass

Does not have a definite volume

Takes the shape of its receptacle

Will fill the space it is in

Particles are separated with no regular arrangement.

5. Explain that the tiny particles are called atoms.
6. Explain that when matter comes in the form of a solid it is easier to identify because it holds its shape and size. The only way it changes shape is by force because the atoms are packed very tightly together.
7. Point to all the solid objects in the room.
8. Explain that when matter comes in the form of a liquid, it simply takes the shape of the container it is put into. The atoms can move freely around and past each other. This is why liquid flows freely.
9. Explain that when matter comes in the form of a gas it is hard to identify because it has no colour or shape and that there is a lot of free space between the atoms so that the gas can move freely.
10. Breathe in and out deeply and explain this is the movement of gases.
11. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement and look at the pictures asking individual students to describe what they can see.

12. Explain the structure of an atom and a molecule using diagrams on the board.

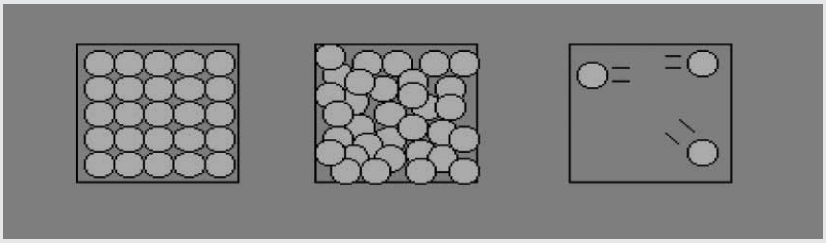
Activities

Ask the students to draw three diagrams to show how the particles are contained in a solid, a liquid, and a gas.

Workbook steps

Ask the students to read the directions in the Workbook to show how molecules move at different speeds in hot water and cold water. Carefully guide the students through the experiment on page 23 to show that molecules move faster through hot water than cold water.

Answers to Student's Book 6.1



Solid Liquid Gas

6.2 How matter changes

Learning outcomes

Students should be able to:

Student's Book

- explain how the state of matter can change

Workbook

- identify differences between physical and chemical changes in matter

Resources

You will need:

- Student's Book pages 44 and 45
- Workbook pages 24 and 25
- poster paper

Student's Book steps

1. Welcome the students into the class and ask them to recall the three different types of matter—solid, liquid, and gas.
2. Emphasize that everything around us is made from matter—tiny particles—and that matter can change.
3. Divide the class into three groups and assign each group one of the states of matter.

4. Ask them to work in pairs or threes and to use their notes and the Student's Book to research their particular state of matter.
5. Once they have agreed on its features, ask them to discuss it with their larger group to check their understanding.
6. Ask them to individually create a poster about their particular state of matter and include the following details: some examples of the particular type of matter, information on the matter's shape and volume, a general description of the behaviour of particles in the matter. All of this information is in the Student's Book and their notes from the previous lesson.
7. Read aloud from the Student's Book pausing after each statement to emphasize the main points and to look at the pictures. Invite the students to ask questions and to interact.

Workbook steps

Explain that matter can change in two different ways: a chemical change or a physical change. When something changes physically it changes in shape or size but is still the same thing. This change is temporary and the thing can go back to its original shape and form. When something changes chemically it changes into something new. This change is permanent and cannot be reversed. Help the students identify whether the objects have changed physically or chemically.

6.3 Mixtures, solutions, and suspensions

Learning outcomes

Students should be able to:

Student's Book

- explain what a mixture is
- differentiate between a solution and a suspension

Resources

You will need:

- Student's Book pages 45 and 46
- salt, sugar, and sand
- three glasses of water
- copies of Worksheet 6 for all the children

Student's Book steps

1. Welcome the students into the class and ask them to recall the three different types of matter—solid, liquid, and gas.
2. Explain that a mixture is a combination of two or more materials which can be separated.
3. Elaborate that there are two kinds of mixtures—solutions and a suspensions.

4. Explain the difference between solutions and suspensions
5. Read aloud from the Student's Book pausing after each statement to emphasize the main points and to look at the pictures. Encourage the students to ask questions and to interact.
6. Ask the students to attempt Worksheet 6.

Activities

Help the students to observe and record whether a mixture is a solution or a suspension following the steps in the activity on page 46 of the Student's Book.

Learning is fun!

1. Atoms are tiny particles. All matter is made of atoms. A molecule is a particle made up of two or more atoms.

   Students will draw diagrams similar to those on pages 42 and 43 of the Student's Book.
2. The easiest way to change the state of matter is by changing its temperature.

   Liquids flow. That's because the molecules in liquids have room to move. They are still packed together but not as tightly as solids. Liquids do not have a definite shape but they have definite mass and volume.

   Gases do not have definite shape or volume. They take the shape of the container but if a gas is not in a container, it will spread out in the air quickly and freely. This is because the molecules in a gas are spaced a long way from each other.

Answers to Workbook

Page 23

Food colouring will dissolve faster in hot water, because molecules move faster in hot water and so the colour is spread quickly.

Page 24

physical change—ice turning into water, cut apple, water turning into steam, and crushed can
chemical change—burnt wood and fried egg

Page 25

1. c	2. d	3. b	4. d	5. b
6. d	7. b	8. b	9. a	10. b

Answers to Worksheet 6

1. c	2. c
3. a	4. a
5. b	6. d
7. c	8. a
9. b	10. d

UNIT 7 HEAT, LIGHT, AND SOUND

Background

In this unit, students will be introduced to more concepts related to heat, light, and sound. Their knowledge from previous years will be useful to explore these in more depth. These include how a thermometer works, formation of shadows, how sound travels through different types of matter, noise, and frequency. Hands-on activities and interesting visuals will support in strengthening these ideas.

Expected learning outcomes for the unit

Students should be able to:

- define temperature and the way it is measured
- explain how a thermometer works
- explain how shadows are formed
- describe that sound travels in waves and travels differently through different matter
- define hertz, decibels, and frequency

7.1 Understanding temperature

Learning outcomes

Students should be able to:

Student's Book

- explain how temperature is measured

Resources

You will need:

- Student's Book pages 48 and 49

Student's Book steps

1. Welcome the students into the class and explain that they are going to be learning about heat, light, and sound.
2. Explain that heat is a type of energy that is produced when molecules start moving.
3. Explain that heat is measured by temperature and that in Pakistan we measure temperature on the Celsius scale.
4. Write the word 'Celsius' on the board so that the students can see it. Practise saying the word 'Celsius' aloud.

5. Explain that the word 'Celsius' was the name of a Swedish scientist who invented this way of measuring temperature.
6. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement or question and encourage the students to comment. Reward them with positive feedback.

Activities

Ask the students to research the temperature in your city or town for the last seven days. They may need access to the Internet, newspapers, or the radio to try and find out this information. Help them to draw a graph to plot different temperatures.

Answers to Student's Book 7.1

The three scales used for measuring temperature are Celsius, Fahrenheit, and Kelvin.

7.2 How a thermometer works

Learning outcomes

Students should be able to:

Student's Book

- describe how a thermometer works

Workbook

- conduct an experiment to observe how temperature changes in a thermometer

Resources

You will need:

- Student's Book page 49
- Workbook page 26
- temperature forecast for the day and week
- clinical thermometers
- anti-bacterial wipes
- an empty plastic squeeze bottle (e.g. one that had tomato sauce or mayonnaise), plasticine, a clear, thin drinking straw, food colouring, waterproof marking pen, water—to make a thermometer

Student's Book steps

1. Ask the students to recall what temperature is. Reward them for trying to define temperature with positive feedback.
2. Explain that a thermometer measures how much heat energy an object has.
3. Ask individual students if they know what the forecasted temperature is for the day or the week.

4. Show the students the forecasted temperature for the day or the week and explain that there are forecasted minimum and maximum temperatures.
5. Explain that there are ways of measuring our own temperature. Ask the students if they have ever had their temperature measured.
6. Explain that the human body has a temperature range of 35°-42° Celsius. Explain that our body temperature can show whether we are sick and have fever.
7. Explain that there are two different types of thermometers to measure temperature: clinical thermometers which measure the temperature of the human body and laboratory thermometers which measure other things.
8. Explain that thermometers are very fragile and need to be handled carefully.
9. Hand out clinical thermometers and ask the students to look at the range of temperatures on the side.
10. Ask the students to try and explain why clinical thermometers only have a range of 35°-42° Celsius (this is the temperature range of the human body).
11. Ask them to take their temperature by first gently cleaning the thermometer with anti-bacterial wipes, then placing it in their armpit, and gently closing their arm.
12. Encourage all the students to take their temperature and record their temperature on the board.
13. Explain that the temperature of the human body does not have a big range but does change when someone is ill. It becomes higher than normal because the body is warmer. The normal temperature of the human body is 37°C.
14. Explain how the thermometer works using the Student's Book as the students follow in their own books.

Activities

Ask the students to draw a picture that explains how a thermometer works. Remind them that the information that they need is in the Student's Book.

Workbook steps

Read aloud the instructions from the Workbook on how to make a thermometer. Carefully guide the students through the process. You will need to have access to a refrigerator to show how the water level changes with cooler temperatures.

Answers to Student's Book 7.2

As the temperature of a thermometer increases, the molecules of liquid begin to spread out and take up more space. This causes the liquid to move up the thermometer to find more room. The hotter the temperature, the higher the liquid travels up the tube.

Students will explain this with the help of a diagram.

7.3 Shadows

Learning outcomes

Students should be able to:

Student's Book

- explain how shadows are formed
- describe how the size and position of shadows change

Workbook

- draw shadows depending on the position of the Sun
- observe the formation of shadows and solve a wordsearch puzzle

Resources

You will need:

- Student's Book pages 50 and 51
- Workbook pages 27 and 28
- torches for the students
- clear plastic wrap, tracing paper, aluminium foil
- the song *I Can Sing a Rainbow*

  Red and yellow and pink and green,
  Purple and orange and blue.
  I can sing a rainbow,
  Sing a rainbow,
  You can sing one too!

  Listen with your eyes,
  Listen with your eyes,
  And sing everything you see.
  You can sing a rainbow,
  Sing a rainbow,
  Sing along with me.

  Red and yellow and pink and green,
  Purple and orange and blue.
  You can sing a rainbow,
  Sing a rainbow,
  Now you've sung one too!

Student's Book steps

1. Teach the students the song 'I can sing a rainbow'. They will enjoy singing the song and it is a good song to return to at different stages throughout the year.

   Extension: Ask the students to make up actions to the song and perform the song at a school assembly or community outing. They may paint pictures of rainbows and the different colours as props to add to their performance.

2. Explain that the colours in the song are the colours that we can see. There are other forms of light in the electromagnetic spectrum that we can't see.
3. Explain that light enables us to see and the colours of the rainbow are the colours of light that we can see.
4. Explain that the Sun provides natural light to the Earth and man-made light is created through electricity and burning things—these sources of light are called luminous, and things that reflect light, such as the Moon, or a soccer ball, are non-luminous because they do not emit any light and we can only see them with the help of a luminous object.
5. Write these new words and their definitions on the board and ask the students to copy them down.
6. Explain that non-luminous objects can be further classified into how they interact with light. Transparent objects allow light to transfer through them (like windows), translucent objects allow some light to pass through (like tissue paper) but it is difficult to see through opaque objects that block all light (like a brick wall).
7. Write these new words and their definitions on the board. Ask the students to practise saying them aloud.
8. Explain how the size and position of shadows change depending on the light source.
9. Read aloud from the Student's Book as the students follow in their own books.

   Extension: Provide the students with different materials to create a shadow puppet show. Darken the room and get the students to perform their 'light shows'.

Activities

- Arrange the students in pairs or groups of three and give them a torch, some plastic wrap, some tracing paper, and some aluminium foil. Explain that they need to determine if the different material is translucent, opaque, or transparent and observe how the light changes as it hits the material. Encourage the students to experiment with other material around the classroom and note their observations. Ask the groups to share their observations and to describe what happens to the light.
- Encourage the students to experiment with shadows by following the directions in the section 'Activity time'.
- Ask the students to answer the question from 'In your notebook' at home.

Workbook steps

1. Ask the students to draw the shadows for homework.
2. Help the students make shadow puppets in class and solve the wordsearch.

Answers to Student's Book 7.3

1. Three things are needed to form a shadow: a light source, an opaque or translucent object, and a background to capture the shadow. When the light hits the object, a shadow forms behind that object where the background remains unlit.
2. The size and position of a shadow change according to the position of the light source.
   If an object is moved closer to the light source, the shadow gets bigger. If an object is moved further away from the light source, the shadow gets smaller.

7.4 Sound and matter

Learning outcomes

Students should be able to:

Student's Book

- explain that sound travels in waves
- explain that different forms of matter transmit sound waves differently

Workbook

- identify sounds from the quietest to the loudest
- observe and record how sound travels through different types of solids
- choose the correct answer related to heat, light, and sound

Resources

You will need:

- Student's Book pages 52–55
- Workbook pages 29, 30, and 31
- musical instruments, such as maracas, guitar, triangle, piano, drums
- image of sound waves
- diagram of an eardrum
- glasses, water, pencils
- a ticking watch or small clock (not digital), different types of solids (about the same thickness), e.g. wood, glass, concrete, plastic, paper.

Student's Book steps

1. Hand out the musical instruments and allow the students to experiment by freely playing with them.
2. Ask the students to make a loud and a soft noise.
3. After all the students have had a chance to play, ask the class to recall what they did with the different instruments in order to create louder and softer noise. Explain that noise is measured in decibels.

4. Show an image of sound as a wave.
5. Explain that sound is created through vibration and these vibrations create energy, like heat, that comes in pulse like waves and is picked up by our eardrums.
6. Show a diagram of an eardrum.
7. Ask all the students to close their eyes and sit quietly and listen to the different sounds they can hear.
8. Ask the students to share the different sounds that they can hear; encourage them to describe the different sounds.
9. Ask the students to recall a time when they covered their ears because a sound hurt.
10. Explain that there are certain sounds that can hurt our ears and can damage them permanently.
11. Ask the students to recall if they have ever had a ringing in their ears, and if so what sound caused the ringing.
12. Explain that this ringing is caused by loud noises that can damage parts of our ear that help us to hear. Explain that prolonged exposure to certain sounds can damage our hearing permanently.
13. Explain how sound travels through different states of matter.
14. Read aloud from the Student's Book asking the students to follow in their own book. Look carefully at the diagrams with the students and read out the labels.

Activities

Arrange the students in pairs or threes and give them some water and some glasses. Ask them to experiment by filling the glass with water to different levels and tapping the glass with a pencil to listen to the sound it makes. Follow the instructions in 'Activity time' and see how the sound waves travel through the water. Allow time for the students to experiment with different water levels.

Workbook steps

1. Ask the students to order the sounds from quietest to loudest at home.
2. Read aloud the directions in the Workbook for the experiment on sound and matter. Arrange the students in groups and encourage them to experiment with different types of solids to see what they can observe. Ask them to complete the chart and share their observations with the rest of the class.
3. Ask the students to attempt the heat, light, and sound quiz.

Noise and its effects

Learning outcomes

Students should be able to:

Student's Book

- define hertz, decibels, and frequency

Resources

You will need:

- Student's Book pages 53–55
- copies of Worksheet 7 for all the children

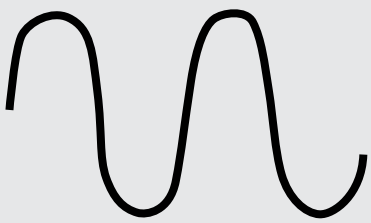
Student's Book steps

1. Ask the students to recall the scale for measuring temperature—Celsius.
2. Explain that the scale for measuring sound is called decibels.
3. Explain that the higher the number of decibels the louder the sound and the more harmful it is to our ears.
4. Explain that each sound has a frequency that is measured in units called hertz.
5. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement or question and look carefully at the diagrams with the students. Read out the labels and the examples of the different levels of the sounds.
6. Help the students to complete the crossword in Worksheet 7.

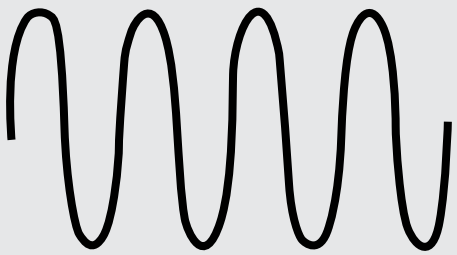
Activities

- Arrange the students in groups and ask them to consider how they could protect their hearing from loud noises. For example, loud music can damage hearing so turning the volume down can protect your hearing. Ask the students to create a poster showing how to protect your hearing from loud sounds such as a jet taking off, a pneumatic hammer, loud music, an angle grinder, noisy traffic, or a train. Display the posters around the room.
- Ask the students to complete the 'Word Find' at home.
- Help the students answer the questions in 'Learning is fun!' in class. Remind them that all the answers are in the Student's Book.

Learning is fun!

1. Heat is measured by temperature. Temperature really measures how much heat energy an object has.
2. The Celsius scale is named after a Swedish scientist, Anders Celsius. The Fahrenheit scale is named after a Polish-born scientist, Daniel Gabriel Fahrenheit.
3. An eclipse is a shadow that occurs when a planet, moon, or other celestial object moves between the Sun and another planet, moon, or celestial object. Because these bodies are opaque, they stop sunlight passing through, and cast a shadow.
4. 

Large space between crests means low sounding noise



Small space between crests means high sounding noise

5. Frequency is the number of waves produced in a second. The higher the frequency, the higher the sound. It is measured by the space between crests in sound waves.

Answers to Workbook

Page 26

The temperature will rise and fall when the bottle is kept in heat or cold.

Page 27

If the Sun is on the right of the tree, students will draw the shadow on the left. If the Sun is on the left of the tree, students will draw the shadow on the right. When the Sun is above the tree, the shadow will be formed below the tree.

Page 28

Students can make these shadow puppets using a light source and a white wall.

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

Page 29

Answers may vary and are subject to discussion.

whisper	vacuum cleaner
ticking watch	motor bike
refrigerator	helicopter
moderate rainfall	car horn
conversation	rock concert
alarm clock	jet engine

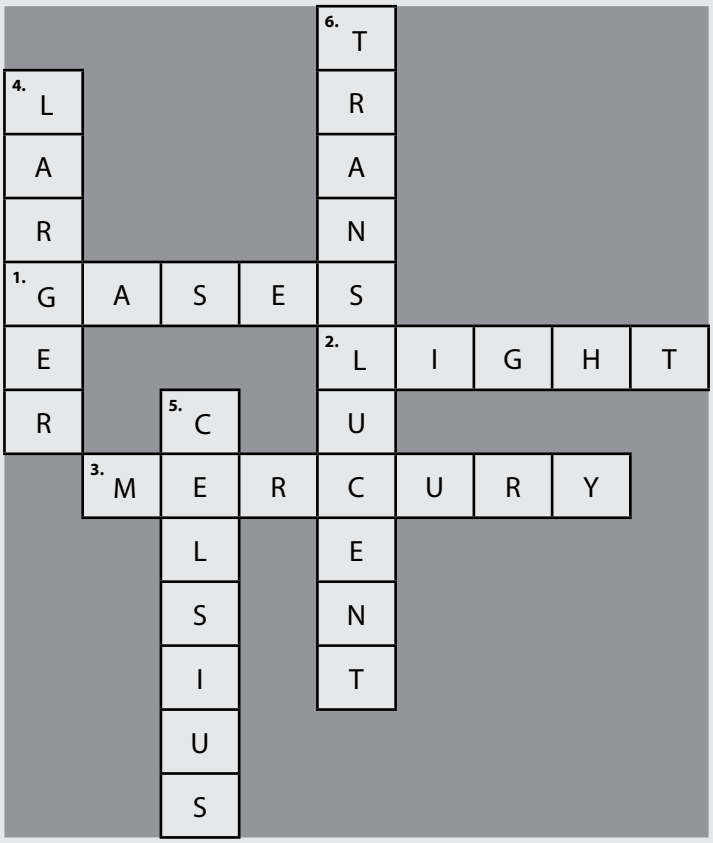
Page 30

Results will vary according to the types of solids used in the experiment.

Page 31

1. d	6. c
2. a	7. c
3. b	8. a
4. b	9. c
5. a	10. b

Answers to Worksheet 7



UNIT 8 FORCE, TOOLS, AND MACHINES

Background

Students' prior knowledge about this topic will provide support in understanding concepts which are introduced in this unit. Extend their knowledge by using everyday examples to explain buoyancy, gravity, friction, and air resistance. Ensure that students understand the terms, 'fulcrum', 'effort', and 'load' before you introduce levers, planes, wedges, screws, wheels, axles, and pulleys to them.

Expected learning outcomes for the unit

Students should be able to:

- identify some of the different forces at work
- describe the types of forces
- explain the way some machines work
- explain the importance of simple machines in our lives

8.1 Types of forces

Learning outcomes

Students should be able to:

Student's Book

- describe buoyancy and gravity

Workbook

- observe and record how buoyancy and gravity act against each other

Resources

You will need:

- Student's Book pages 56–58
- Workbook page 34
- paper

Student's Book steps

1. Welcome the students into the class. Ask them if they can remember what a force is. Encourage them for attempting to define a force by providing positive feedback.

2. Explain that a force makes something move—it can be a push or a pull. Explain that there are lots of different types of forces including buoyancy, gravity, friction, and air resistance.
3. Write these words on the board and practise saying them with the class.
4. Explain the force of gravity and buoyancy using the examples.
5. Ask all the students to stand up and jump up and down.
6. Explain that the reason why they came down is because of the force of gravity.
7. Explain that gravity is the force that attracts objects with mass to each other. Tell them that gravity is working on us all the time pulling us towards the centre of the Earth and therefore stopping us from floating around.
8. Ask the students to predict which will fall faster to the ground: a shoe, or a piece of paper.
9. Demonstrate the experiment and explain that gravity pulls the shoe faster because the paper has more air resistance pushing upwards (like a plane).
10. Roll the paper into the ball and ask the students to predict whether the paper or the shoe will fall faster.
11. Demonstrate the experiment and explain that they both fall at the same time because even though their masses are different, gravity makes them accelerate at the same speed when air resistance is not a factor.
12. Read aloud from the Student's Book pausing to look at the diagrams and allowing time for the students to follow in their own books. Emphasize that the Earth's force of gravity keeps everything on the ground.

Activities

Help the students to answer the questions from 'In your notebook'. Remind them that the answers are all in the Student's Book.

Workbook steps

Carefully help the students set up the experiment to demonstrate buoyancy and gravity. Allow them time to play with the materials seeing what floats and what sinks.

Answers to Student's Book 8.1

1. Objects float because of buoyancy. Buoyancy is a force that works in water. It is an upward pressure.
2. Gravity is the force that keeps us on Earth. It is the force that makes sure that what goes up must come down.

8.2 Friction

Learning outcomes

Students should be able to:

Student's Book

- explain that friction slows things down
- identify some of the ways we use friction
- explain how air and water resistance works

Workbook

- identify the types of forces

Resources

You will need:

- Student's Book pages 59 and 60
- Workbook page 32
- ice blocks
- coins
- erasers
- paper to make paper planes with

Student's Book steps

1. Remind the students that forces are at work on everything around us.
2. Explain that the force of friction always slows down the movement of an object.
3. Explain that friction can be positive as it can help us to control and slow movement. It can be negative when it can reduce speed and impede movement.
4. Ask the students to consider when they have experienced some differences in friction; such as riding their bike over rough roads and then over smooth surfaces, or riding a scooter on smooth concrete or over grass. Elicit responses from individual students and provide positive feedback for sharing even if it is not an example of friction.
5. Read aloud from the Student's Book as the students follow in their own books. Look carefully at the images with the students.
6. Explain that friction is more or less depending on the size, shape, and mass of an object.
7. Arrange the students in pairs or threes and give them a tray, some ice blocks, coins, and erasers or similar objects.
8. Ask the students to predict which object will slide the easiest on the tray and is therefore less affected by friction.

9. Ask the students to line up the objects and slowly tilt the tray so that the objects begin to move.
10. Ask the students to observe which objects moved first and therefore had less friction and which objects moved last.
11. Ask the students to discuss why this might be so.
12. Explain that the objects which moved faster had less friction and therefore could slide faster.
13. Explain air and water resistance using examples from the Student's Book.

Activities

- Show the students two identical pieces of paper. Ask the students to predict which piece of paper will fall faster from a height, paper rolled up into a ball or a flat piece of paper. Explain that the flat piece of paper acts like the wings of a plane (causes drag) and will therefore fall slower. Demonstrate the experiment for the students. Give the students pieces of paper and encourage them to try and create the fastest paper plane that will be least affected by drag and friction. Test the different planes to see how far they can travel. Explain that designers do this with lots of machines such as planes, trains, and cars to minimize friction. Ask the students to consider what cyclists do to reduce friction. Ask them to consider what parachutists do to use friction. Elicit what swimmers do to reduce friction.
- Help the students complete the 'True or False' questions.
- Ask the students to answer the questions from 'In your notebook' at home. Check their answers in the next class.

  Extension: Set up a slide inside, or head out to a play area where there is a slide. Ask the students to collect different objects from around the classroom, such as a shoe, a pencil, and predict which will go down the slide faster when released from the top.

Workbook steps

Ask the students to attempt the worksheet on page 32 at home. Discuss answers in the next lesson.

Answers to Student's Book 8.2

1. Friction is the force that slows or stops objects that are sliding past each other. Friction occurs when brake pads on a bike rub against the tyre to slow or stop the bike. A cricket ball rolls along grass and slowly stops because of friction.
2. Air resistance is a type of friction. Instead of having one object rubbing against another to slow it down, air slows the object down. Examples include parachutes and trying to walk on a windy day.

8.3 Simple machines

Learning outcomes

Students should be able to:

Student's Book

- explain how some simple machines work

Workbook

- identify the simple machine needed for a particular task

Resources

You will need:

- Student's Book pages 61–65
- Workbook page 33
- copies of Worksheet 8 for all the students

Student's Book steps

1. Welcome the students into the class. Ask the students if they know of any simple machines that help us to do things: scissors, wheels, wheelbarrows, pulleys, ramps, and screws.
2. Remind the students that a machine is made of fixed and moving parts and can be powered by other forms of energy, not just human force.
3. Read aloud from the Student's Book pausing after each statement and looking carefully at the pictures. Read the labels on the pictures and encourage the students to comment on the images or share any examples of simple machines that they know of.
4. Explain that humans have invented many simple machines to harness the forces of friction and gravity and make lives simpler, including levers, planes, wedges, screw, the wheel and axle, and pulleys.
5. Explain that a wedge is a simple machine that is designed to push two objects apart.
6. Explain that an inclined plane can make moving objects a lot easier.
7. Explain that the cutting edges of knives, axes, chisels, and other cutting instruments are wedges. Ice picks, nails, pins, needles, and other piercing devices also are wedges.
8. Explain how levers, inclined planes, screws, wheels and axles, and pulleys work, using examples.

   Extension: Experiment with different sized wedges. Use wedges that are flatter, rounder, and with different measurements and discuss the different results.

Activities

- Help the students to write the names of any levers or inclined planes that they have used at home, at school, or somewhere else. They can draw a picture of the lever or plane at home.

- Help the students to write down what a wedge, screw, wheel and axle, or pulley might be used for. They can draw a picture of it being used at home.
- Help the students to complete the answers to the questions from 'Learning is fun!' in class. Remind them that all of the answers are in the section on Simple Machines.
- Ask the students to complete Worksheet 8 at home.

Workbook steps

1. Help the students identify which simple tools and machines they would use by looking carefully at the pictures.
2. Ask the students to attempt the 'Force, tools, and machines quiz'. Discuss answers at the end of a lesson.

Learning is fun!

1. Boats are able to float because of the force of buoyancy. Students will draw a diagram of a boat similar to the one on page 56 of the Student's Book.
2. Some things sink because their weight is more than the total weight of the water they move.
3. Gravity is the force that keeps us on Earth. It is the force that makes sure that what goes up must come down. Gravity works because all objects try and pull other objects towards them. The strength of the force of gravity is not identical for every object: the larger the object, the greater its pull. Most gravitational movement is so tiny that it cannot be noticed.
4. There is very little friction on a slippery floor so our feet find it hard to grip the floor.
5. A lever is a simple machine that can lift objects with little effort. It has an arm that rests on or is attached to a point known as a fulcrum. When pressure is put on one end of the lever, the other end moves an object that would normally be very hard to move.

   Students will draw a diagram of a lever, e.g. a see-saw similar to the one on page 61 of the Student's Book.
6. An inclined plane is a flat surface that joins one level with a higher level. Inclined planes are used to move objects from a lower level to an upper level.
7. A wedge is two inclined planes joined together. With a wedge, the pointed edge surface is used to split or cut things apart. Examples include an axe and a chisel.
8. A screw is a plane wrapped around a cylinder. When you twist a screw into a piece of wood, the wood moves along the screw.
9. A door knob is a wheel and axle with the knob acting as the wheel, and the rest acting as the axle.
10. A crane is a type of pulley.

Answers to Workbook

Page 32

1. friction
2. buoyancy
3. air resistance
4. gravity
5. gravity
6. air resistance
7. buoyancy
8. air resistance
9. friction
10. gravity
11. buoyancy
12. friction
13. friction

Page 33

open a tin of paint—lever

keep a door open—wedge

bind two pieces of wood together—screw

steer a car—wheel and axle

lift heavy weight—pulley

Page 34

The boat will sink when its weight is more than the total weight of the water. The weight will increase as coins are added.

Page 35

1. c
2. b
3. c and d
4. b
5. d
6. c
7. b
8. b
9. b
10. b

Answers to Worksheet 8

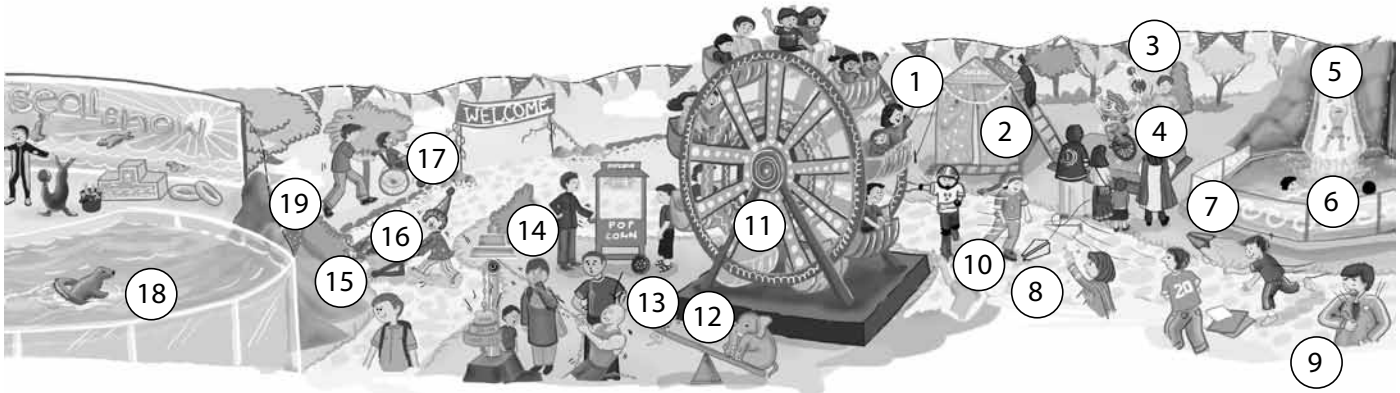
A.

1. False
2. True
3. True
4. False
5. True
6. True
7. False
8. True
9. rue
10. False
11. True
12. False

B.

1. Planes
2. lever
3. together
4. screw
5. chisel, axe

Type of forces illustrated on the cover



1. gravity, water resistance
2. inclined plane
3. gravity
4. wheel and axle
5. gravity
6. water resistance
7. air resistance
8. air resistance
9. wedge
10. friction
11. wheel and axle
12. lever
13. wheel and axle
14. pulley
15. lever
16. inclined plane
17. wheel and axle
18. buoyancy
19. friction

UNIT 9 ELECTRICITY AND MAGNETISM

Background

This unit introduces current and static electricity to the students. Their familiarity with atoms and electrons will be useful in understanding how electricity is created. Encourage student participation to generate uses of electricity. Use experiments and common examples to illustrate magnetic fields and electromagnets.

Expected learning outcomes for the unit

Students should be able to:

- explain the importance of electricity in our lives
- explain how electricity is produced
- explain what is meant by magnetic fields and electromagnetism

9.1 What is electricity?

Learning outcomes

Students should be able to:

Student's Book

- explain how current and static electricity are produced
- state uses of electricity

Resources

You will need:

- Student's Book pages 66–69
- balloons, woollen fabric to demonstrate static electricity

Student's Book Steps

1. Welcome the students into the class and explain that they are going to be learning about electricity.
2. Explain that electricity is a type of energy.
3. Explain that there is electricity inside us, in nature, and we can also harness electricity.
4. Explain that there are two different types of electricity: static electricity which doesn't move and current electricity which moves from one place to another. Write these definitions on the board and ask the students to copy them down.

5. Explain that we use current electricity for many things.
6. Brainstorm a list of things that we rely on, which use electricity and record them on the board.
7. Ask the students if they have ever experienced a shock while putting on a jumper in the winter.
8. Explain that this is an example of static electricity being produced.
9. Arrange the students into pairs or threes and explain that they are going to generate static electricity.
10. Give the groups a balloon and some woollen fabric.
11. Ask them to blow up the balloon and rub it on the woollen fabric and then hold it near their hair to see what happens.
12. Explain that they have put a positive charge in their hair and the balloon has a negative charge and that opposite charges attract each other.
13. Give the groups another balloon and rub both balloons on the woollen fabric and try to put them together.
14. Explain that they are repelling each other because they are both negatively charged.
15. Allow the students to experiment rubbing the balloons on different fabrics and see if they can generate static electricity.
16. Read aloud from the Student's Book as the students follow in their own books.
17. Emphasize all the different ways that we rely on electricity in our lives.

Activities

- Encourage the students to record all the different ways they use electricity in a day.
- Ask the students to complete the answers to the quuestion from 'In your notebook' at home. Check their answers in the next class.

Answers to Student's Book 9.1

1. Current electricity is a flow of electricity produced when billions of electrons leave their own atom and start jumping from one atom to another, all in the same direction.
2. Static electricity is caused by friction when two objects are rubbed together.

9.2 Magnetic fields and electromagnets

Learning outcomes

Students should be able to:

Student's Book

- explain that magnetism and electricity create electromagnetism

Workbook

- explain how some metallic objects can be magnetized
- illustrate how an electromagnet works
- choose the correct answer related to electricity and magnetism

Resources

You will need:

- Student's Book pages 69–71
- Workbook pages 36 and 37
- magnets of different sizes and strengths
- metallic and non-metallic items
- a long iron nail, a length of insulated copper wire, wire strippers, electrical tape, battery, and paper clips to make electromagnets
- magnets, needles, and pins for the Workbook experiment
- copies of Worksheet 9 for all the students

Student's Book steps

1. Remind the students of the lessons on forces and explain that magnetic force is also a type of force.
2. Explain that lightning is like the static electricity that builds up when we rub our feet across a nylon carpet and then releases when we touch something that will return it to the Earth. Ask the students to recall how they created static electricity with their balloons and woollen fabric.
3. Explain that all magnets have poles and that like poles repel each other and unlike poles attract each other.
4. Arrange the students in groups and give them different magnets to play with.
5. Explain that the two poles of a magnet are called the north pole and the south pole. Show them small metallic and non-metallic objects and ask them to identify the objects, that are matalic.
6. Ask them to use their magnets to separate the metallic objects from the non-metallic once.

7. Explain that electromagnets are magnets that work through a combination of electricity and magnetism. Explain that we use electromagnets all the time (door bells, electric motors, junk yard cranes).
8. Read aloud from the Student's Book as the students follow in their own books. Pause after each statement and look carefully at the images of magnetic field and an electromagnet as you read the captions aloud.
9. Help the students complete Worksheet 9 in the class. Explain a few examples in the class, and ask them to complete it at home if you are short on time.

Activities

- Explain that electricity and magnets are closely related and that you can use electricity to turn conductors into huge magnets that can be turned on and off. Demonstrate to the students how to make an electromagnet. Strip some of the copper from both ends of the wire. Wrap the wire tightly around the nail—be careful not to change direction or to overlap the insulated wire. Use electrical tape to attach the exposed ends of the wire to the positive and negative terminals of the battery. Identify the different poles of the nail (which should now be magnetised) through moving paper clips.

  Extension: Provide materials so that the students can make an electromagnet in small groups and experiment with turning it on and of.

- Help the students answer the questions in the 'Q&A' section in class. Remind them that all of the answers are in the Student's Book.

Workbook steps

1. Carefully assist the students to help make other materials magnetic by following the instructions in the Workbook.
2. Ask the students to attempt the multiple choice questions on page 36 at home.

Learning is fun!

1. A magnetic field is an invisible area around a magnet. This area also has magnetic power. Magnetic objects that come within this field may be attracted to the magnet even without making contact.
2. Electromagnets are magnets that work through a combination of electricity and magnetism. Electromagnetism involves an electric current passing through something with magnetic properties. When the current is turned on, the magnet works; when the current is turned off, the magnet stops working. This means energy is not wasted.
3. Answers will vary.

Answers to Workbook

Page 36

1. b
2. c
3. c
4. b
5. d
6. c
7. d
8. c
9. a
10. d

Page 37

I. Electromagnets are magnets that work through a combination of electricity and magnetism. When the current is turned on, the magnet works, when the current is turned off, the magnet stops working.

Students will draw a diagram similar to that on page 70 of the Student's Book.

Answers to Worksheet 9

1. hairdryer
2. electrons
3. poles
4. electromagnet
5. wires
6. metal
7. static
8. repel
9. electricity
10. magnetic field
11. turned on
12 current

UNIT 10 THE SOLAR SYSTEM

Background

This unit helps to reinforce the concepts of rotation and revolution of the Earth in the solar system. Use diagrams and objects such as a globe and a torch to explain the shape of the Earth, its tilt and movement which cause day, night, and seasons. Extend their space vocabulary by introducing the terms, 'space', 'nebula', and 'galaxy' from the text.

Expected learning outcomes for the unit

Students should be able to:

- explain that the Earth is always moving
- explain that the movement of the Earth creates the seasons
- describe space, nebulae, and galaxies

10.1 Movements of the Earth

Learning outcomes

Students should be able to:

Student's Book

- identify that the Earth is a sphere in shape
- explain that the Earth spins on its axis and tilts

Workbook

- observe how seasons and day or night occur

Resources

You will need:

- Student's Book pages 72–75
- Workbook page 38
- poster paper, coloured markers, fishing line, light wood, scissors to create mobiles of our solar system
- a chart of the planets [similar to http://spaceplace.nasa.gov/planet-weather/8_planets.jpg]
- large ball (e.g. football), a small ball (e.g. tennis ball or table tennis ball), a marker pen to demonstrate the seasons in the Workbook experiment
- copies of Worksheet 10 for all the children

Student's Book steps

1. Ask the students to recall what they know about the movement of the Earth, the Sun, and the other planets, asking questions such as:

   Who can describe the difference in size between the Earth and the Sun?

   Does the Earth travel around the Sun or the Sun travels around the Earth?

   What causes the seasons on Earth?

   Can anyone describe the difference between the Earth's rotation and the Earth's revolution?

2. Explain that the Earth orbits or revolves around the Sun and this takes a year.
3. Explain that the Earth is tilted and it also rotates and this gives us day and night.
4. Explain that there are planets, stars, and satellites in our solar system (natural satellites).
5. Ask the students to name the planets in our solar system (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune).
6. Explain that there are many mnemonics which can help us to remember the order of the plants—one popular one My Very Educated Mother Just Served Us Nuts—with each letter standing for a planet: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.

   Extension: Ask the students to come up with their own mnemonic or song to help recall the order of the planets in our solar system.

7. Show the students a poster or an image of the planets. Give them some cardboard, coloured pencils, scissors, fishing line, and some light wood and ask them to draw pictures of the Sun and the planets and create a mobile.
8. Explain what are space, nebula, and galaxy.
9. Read aloud from the Student's Book as the students follow in their own books.
10. Ask the students to complete Worksheet 10 at home.

Activities

- Help the students to complete the 'True or False' activity in class. Remind them that all of the answers are in the Student's Book.
- Help the students to answer the questions in 'Learning is fun!'.

Workbook steps

Arrange the students in pairs or threes and allow them to go outside or into a large space where they can conduct the activity. Encourage them to take turns being the Sun and the Earth so they can see the results from different perspectives.

Learning is fun!

1. The axis is an imaginary line passing through the North and South Poles. The Earth is constantly spinning on its axis.
2. As the Earth tilts on its axis, some parts of the Earth are positioned closer to the Sun at certain times of the year than other parts, and further away from the Sun at other times of the year. This is how the seasons come about. Students will draw a diagram similar to the one on page 73 of the Student's Book.
3. (a) Space is the area in which planets, stars, moons, and other bodies exist. Space is everywhere except within the atmospheres of these bodies. You may have heard that space is a vacuum. A vacuum is an area that contains no matter. In fact, there is matter throughout space. There are gases and dust in space but there is far less matter than is found on planets and stars.

   (b) A nebula is a cloud of gas and dust that exists in space. Most of them have a lot of hydrogen gas in them. Some nebulae are the remains of stars that have exploded and died. Others are stars in the process of being formed. It is hard to see nebulae from Earth because they do not give out light. However, they can sometimes be seen because of light from nearby stars.

   (c) Galaxies are huge areas of space that contain stars, planets, dust, and gas. Earth and our solar system exist in a galaxy known as the Milky Way. There are three types of galaxies. They all contain the same type of things but they are different shapes. The most common is the spiral galaxy. The Milky Way is a spiral galaxy.

Answers to Workbook

Observations will vary.

Answers to Worksheet 10

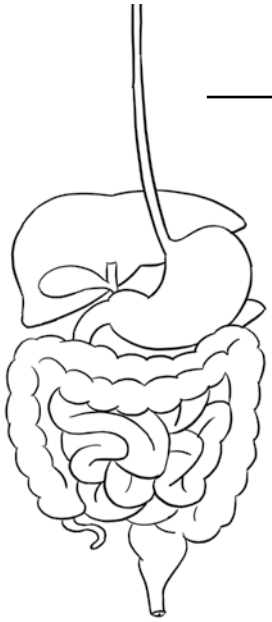
A. 1. axis
   2. seasons
   3. Nebula
   4. tilt
   5. day
   6. Milky Way

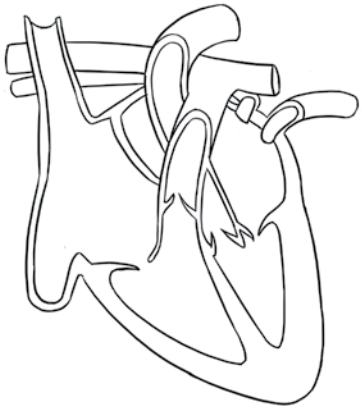
B. The Sun was facing Karachi causing day while New York on the other side of the Earth had night time. Therefore, when Ahmed was awake in Karachi during daytime, Raza was asleep in New York.

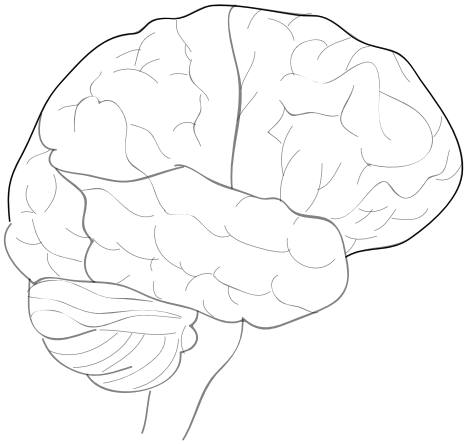
Name: _____ Date: _____

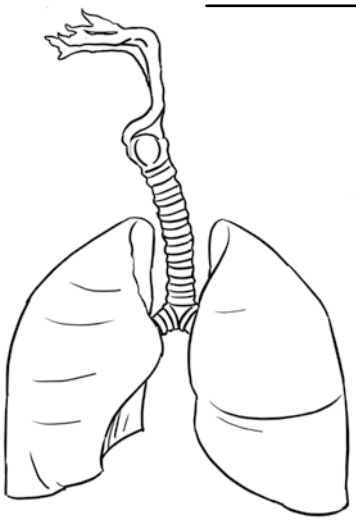
Essential parts of your body

Colour and label these different parts of the human body.





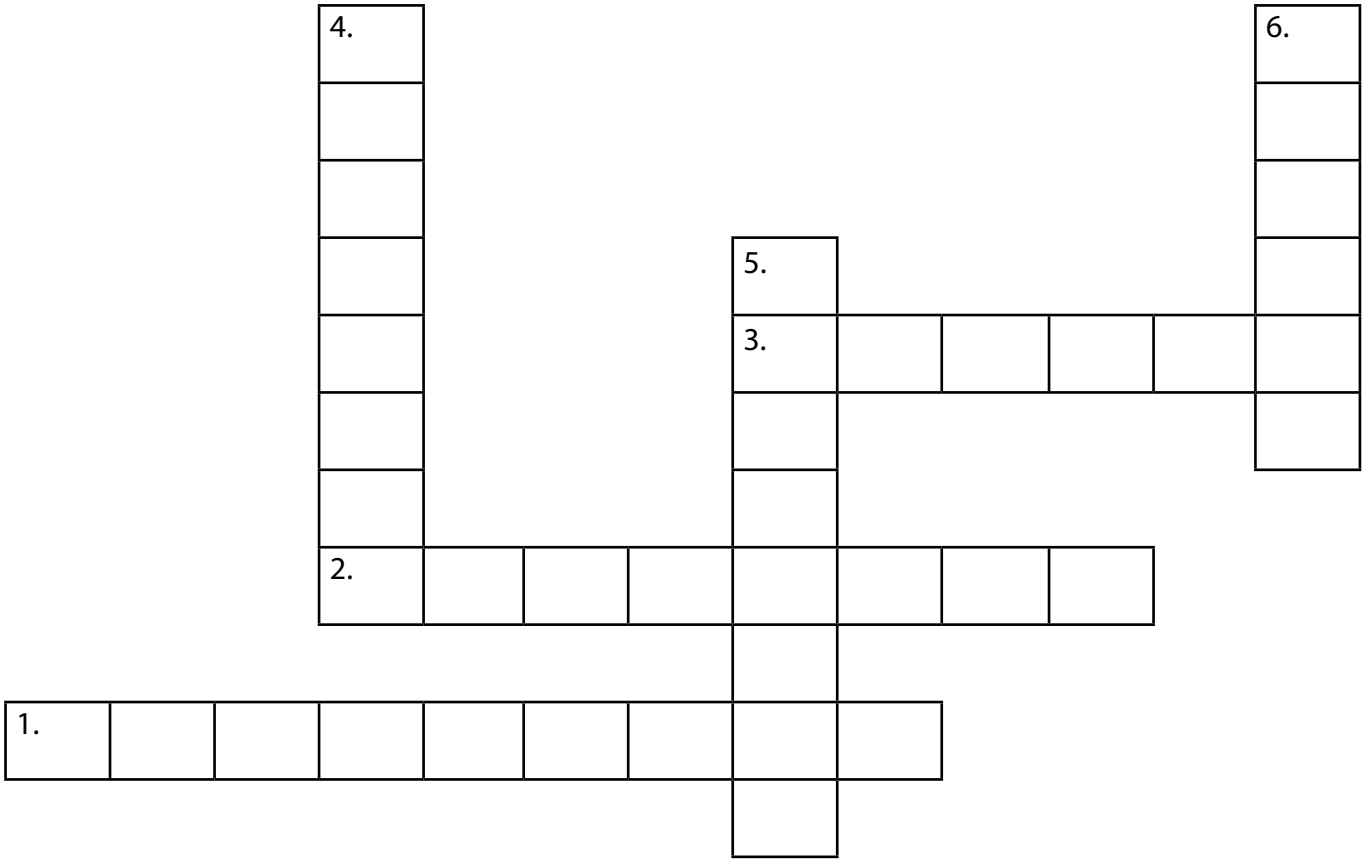




Name: _____ Date: _____

Animals

Complete the crossword about animals below using the clues given.



Across

1. The food chain starts with them.
2. Living things change for best chances of _____.
3. Animals move to _____ predators.

Down

4. Frog eggs hatch into _____.
5. These animals eat secondary consumers.
6. Name of a chemical

Name: _____ Date: _____

Plant processes

Fill in the blanks.

1. The stem _____ water to the plants.
2. Leaves contain a green substance called _____.
3. _____ is a process through which water evaporates from a plant.
4. _____ tubes are thin and transport food from the _____ to other parts of a plant.
5. _____ are part of the leaves that open up during photosynthesis.
6. The sepal protects the _____ before it opens into a flower.
7. _____ tubes are thicker than phloem tubes.
8. The process in which the xylem and phloem tubes are used is called _____.
9. The roots absorb _____ and _____ from the ground.
10. The leaves and flowers of a plant are protected from the wind by the _____.
11. Insects help to transfer _____ _____ during fertilization.
12. In flowering plants, _____ are produced during reproduction. On the other hand, in non-flowering plants _____ are produced during reproduction.

Name: _____ Date: _____

Food groups

Colour the right box to which the foods listed below belong. Some may belong to more than one food group.

Name of food	Carbohydrates	Proteins	Vitamins and minerals	Oils and fats
potatoes				
chicken				
rice				
milk				
fish				
bread				
oranges				
eggs				
peanuts				
corn				
sunflower				
red meat				
beans				
broast chicken				
sugar				
olives				

Name: _____ Date: _____

Answer me

1. Why is diversity important?

_____

_____

_____

_____

2. List four natural resources. Next to each resource, write down whether it is renewable or non-renewable.

a. _____

b. _____

c. _____

d. _____

3. What would the effects be of cutting down trees?

_____

_____

_____

_____

4. Why do humans use water? Do you think water is a renewable or non-renewable resource?

_____

_____

_____

_____

Name: _____ Date: _____

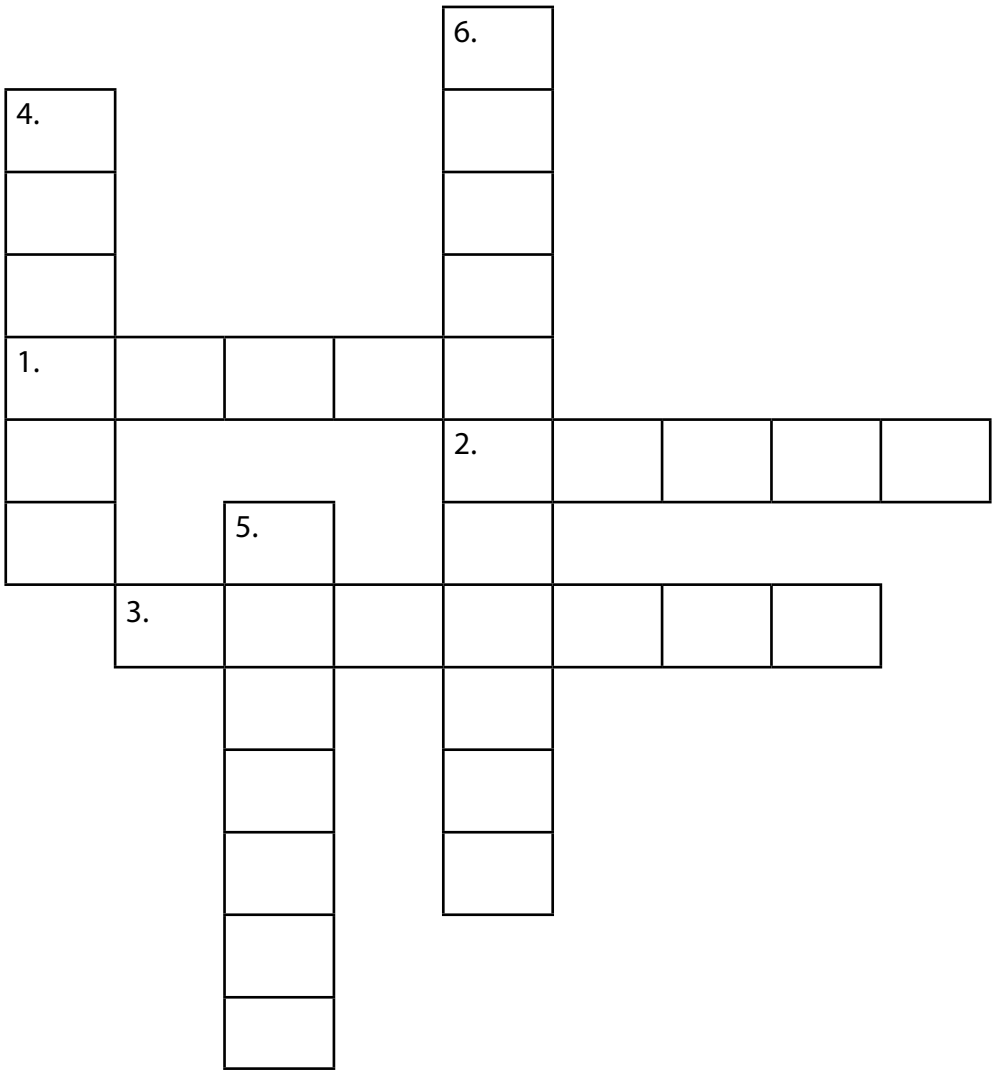
Circle the correct answer

1. Mark the statement which is not correct:
   a. Matter has volume. b. Matter is any substance.
   c. All matter has definite shape. d. Matter exists in 3 states.
2. Solids:
   a. can't flow b. can fly c. take the shape of the container
   d. exist in 3 states
3 We can smell a perfume in the nearby room because:
   a. The molecules of perfume are very loose and flow easily.
   b. It has been sprayed in the nearby room.
   c. Your nose is too sensitive. d. none of these
4. Which of the following has a definite shape?
   a. solid b. liquid c. gas d. none of these
5. The nucleus contains the:
   a. neutron and electron b. proton and neutron
   c. electron and proton d. none of the above
6. The size and shape of a _____ change when force is applied.
   a. atom b. gas c. molecule d. solid
7. Materials will _____ in a suspension if they are left to stand.
   a. boil b. dissolve c. separate d. evaporate
8. Mother is making rotis. She takes some dough and rolls it. Then she spreads it out with a rolling pin. This will change the _____ of the dough.
   a. shape b. volume c. mass d. state
9. The centre of an atom consists of the:
   a. electron b. nucleus c. proton d. neutron
10. Water is an example of:
   a. an atom b. an electron c. a particle d. a molecule

Name: _____ Date: _____

Heat, light, and sound

Complete the crossword below using the clues given.



Across

1. Sound travels fastest through _____.
2. The size and position of a shadow depend on this.
3. Found in a liquid form inside a thermometer

Down

4. The space between low frequency notes is _____ than the space between high frequency notes.
5. A scale for measuring temperature
6. These objects do not form clear shadows.

Name: _____ Date: _____

Friction and gravity

A. Label the following statements as True or False.

1. Smooth surfaces have more friction. _____
2. A piano and a pear would fall at the same speed if dropped from the same height. _____
3. Gravity is the force of attraction. _____
4. Friction can only happen with large objects. _____
5. There is more friction if you ice-skate on grass than on ice. _____
6. Without gravity the planets would fall out of space. _____
7. Without gravity we could still walk around.
8. Objects accelerate at the same speed if air-resistance isn't a factor. _____
9. The force of gravity is different for every object. _____
10. Friction speeds things up. _____
11. Every object on Earth is pulled towards the centre of the Earth. _____
12. Friction occurs between liquids and gases. _____

B. Fill in the blanks about simple machines.

1. _____ are used to move objects from a lower to an upper level.
2. A wheelbarrow is an example of a _____.
3. A wheel and axle move _____.
4. Objects are held in place by a _____.
5. Examples of a wedge include a _____ and an _____.

Name: _____ Date: _____

Match me

Match the sentences in the first column to the correct answers in the second column.

1. This appliance uses electromagnets.
2. Electricity is the flow of _____.
3. The two ends of a magnet are called the _____.
4. Temporary magnet produced when electricity passes over a conductor _____.
5. Electric current is sent along _____.
6. Magnets attract things made of _____.
7. _____ electricity involves friction.
8. If a magnet does not attract, it will _____.
9. Provides power for some appliances we use everyday _____
10. The space in which the force of a magnet can act in _____
11. An electromagnet works when current is _____.
12. _____ electricity is continuous.

turned on _____

magnetic field _____

current _____

electricity _____

poles _____

electrons _____

hairdryer _____

wires _____

electromagnet _____

static _____

metal _____

repel _____

Name: _____ Date: _____

The solar system

A. Complete the sentences using the correct words from the box below.

Nebula	day	axis	tilt	Milky Way	seasons

1. The _____ is an imaginary line passing through the North and South poles.
2. The tilt of the axis affects the _____.
3. _____ is not a planet.
4. The Earth's _____ causes the seasons.
5. The time it takes for the Earth to rotate on its axis is called a _____.
6. The _____ is a spiral galaxy.

B. Early one afternoon, Ahmed, who lives in Karachi, decided to call his cousin, Raza living in New York. Ahmed soon realized that it was not a good time to call Raza as he would be asleep.

Explain this difference in time.

_____

_____

_____

_____

_____