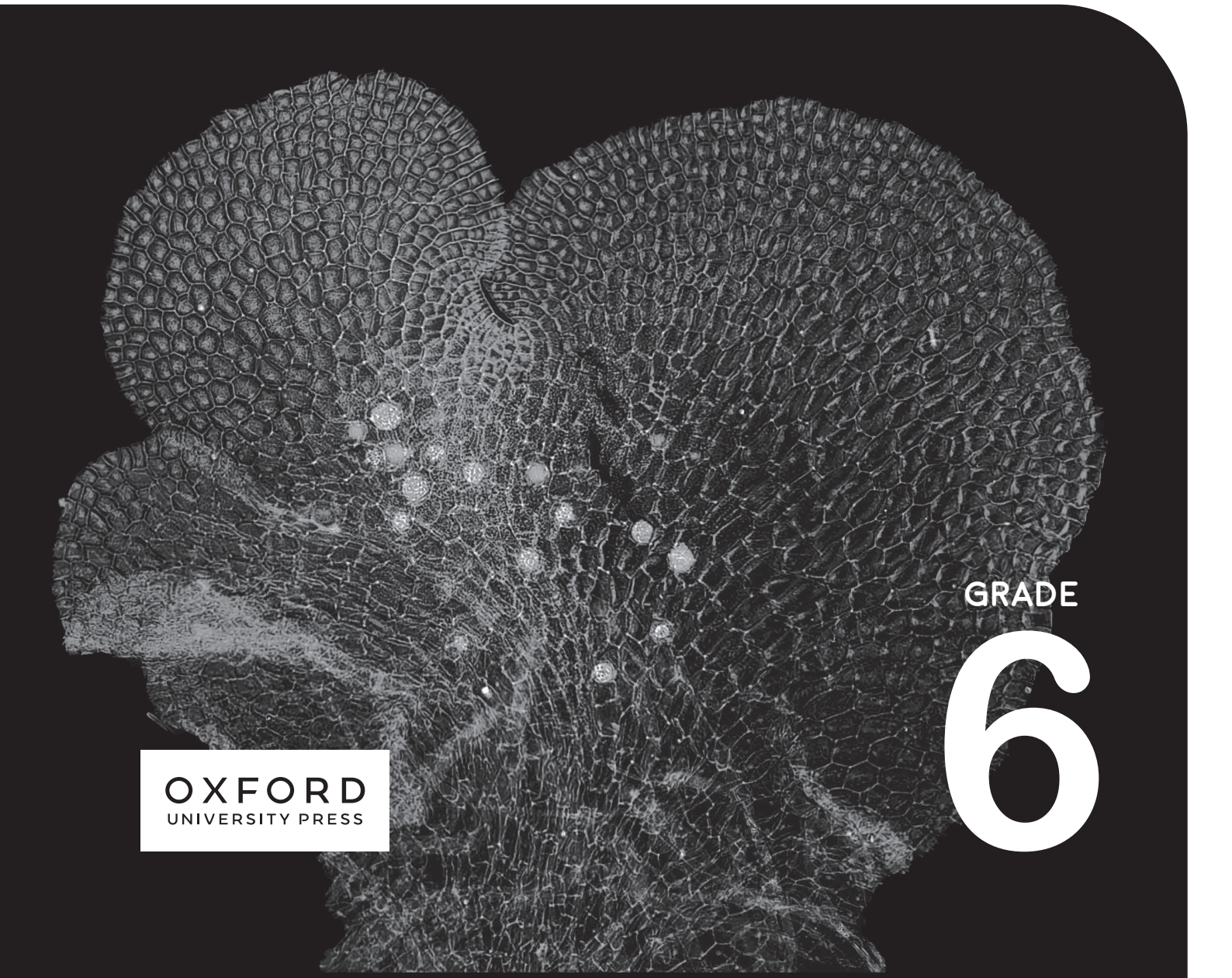
NEW OXFORD SECONDARY SCIENCE

TEACHING GUIDE



GRADE 6

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide. Oxford is a registered trade mark of
Oxford University Press in the UK and in certain other countries

Published in Pakistan by
Oxford University Press
No.38, Sector 15, Korangi Industrial Area,
PO Box 8214, Karachi-74900, Pakistan

First Edition published in 2024

ISBN 9780190703271

Acknowledgements
Illustrations: pp. 7 (shark), 8 (deer), 9 (skeleton), 16, 21, 33 (cola), 117, 124 (bell, bicycle), 139 (balloon, hair, girl with balloon), 163, 169, and 184 (yogurt): © Oxford University Press; p. 8 (bone tissue): © Designua / Shutterstock and (circulatory system): © Athanasia Nomikou / Shutterstock; p. 33 (food pyramid): © SZE, Connie / Oxford University Press; pp. 66 and 140 (circuit diagram with two lamps): © Six Red Marbles / Oxford University Press; p. 84: © Q2A Media / Oxford University Press; p. 89: © QBS / Oxford University Press; p. 140 (multiple circuits): © Tech-Set Ltd / Oxford University Press; p. 153 (electromagnet): © BlueRingMedia / Shutterstock; p. 184 (bread): © Tyson Smith / Oxford University Press

Photographs: p. 3 (onion cells): © D. Kucharski K. Kucharska / Shutterstock and (cheek cells): © Kallayanee Naloka/ Shutterstock; p. 5: © Katy Spichal / Shutterstock; p. 8: © Jose Luis Calvo / Shutterstock; p. 24 (garlic): © Nattika / Shutterstock, (ginger): © Valery121283 / Shutterstock, (carrot): © Maljalen / Shutterstock, and (runner): © Elena Masiutkina / Shutterstock; p. 33: © Bon Appetit / Alamy Stock Photo; p. 40 (whole wheat bread): © Surbhi S / Shutterstock, (bran cereal): © Alexas_Fotos / Pixabay, and (vegetables): © Maks Narodenko / Shutterstock; p. 47: © Summaiya Saleem; p. 67: © Eillen / Shutterstock; p. 116: © Hanasaki / Shutterstock; p. 118: © Dartrey / Shutterstock; p. 134: © haryigit / Shutterstock; p. 179: © bonchan / Shutterstock; p. 184 (penicillin): © Peter Hermes Furian / Shutterstock, (medicines): © fongbeerredhot / Shutterstock, (mushrooms): © Yasonya / Shutterstock, (cheese): © KIM NGUYEN / Shutterstock, and (red wine): © lenetstan / Shutterstock

Contents

Introduction

I. Overview:

In today's rapidly changing world, students must have a solid foundation of general knowledge in order to become well-rounded individuals. History, geography, science, literature, current events, and other subjects are all included in general knowledge. This teacher's guide series is designed for 6th, 7th, and 8th-grade teachers to assist them in facilitating effective learning experiences by providing a comprehensive framework based on the 5 E's lesson plan.

II. The 5 E's Lesson Plan:

The 5 E's Lesson Plan is an inquiry-based instructional model widely used in teaching to promote active learning and engage students in the learning process. Engage, Explore, Explain, Elaborate, and Evaluate are the five E's. This method encourages students to investigate concepts, construct meaning, and apply their learning in real-world situations. Each phase of the 5 E's offers a unique opportunity to deepen students' comprehension and foster critical thinking skills.

1. **Engage:** The Engage phase serves as a hook to draw students in and activate their prior knowledge. It arouses curiosity and provides a framework for learning. Teachers can use thought-provoking questions, multimedia resources, real-life examples, or interactive activities to pique students' interest in the topic of study during this phase. Engaging students from the start prepares them for an exciting and focused learning experience.
2. **Explain:** Students are given opportunities to articulate their understanding and make sense of the concepts they have learned during the Engage phase. Teachers play an important role in facilitating discussions, explaining concepts, and clarifying misconceptions. This phase encourages effective communication skills and assists students in developing a solid foundation of knowledge by organizing their thoughts and clearly expressing their ideas.
3. **Explore:** The Explore phase encourages students to further investigate and investigate the topic. Hands-on activities, experiments, group projects, and research are used to deepen students' understanding through firsthand experiences. This stage encourages teamwork, critical thinking, and problem-solving abilities. Teachers can help students conduct experiments, analyze data, and explore primary and secondary resources in order to gather information and make meaningful connections.
4. **Elaborate:** The Elaborate phase encourages students to broaden their understanding and apply what they've learned in real-world situations. It consists of activities that require students to think critically, solve problems, and make connections outside of the classroom. Project-based learning, case studies, debates, and simulations require students to analyze, synthesize, and create. This stage promotes creativity, independent thinking, and the ability to apply knowledge in a variety of situations.

5. **Evaluate:** During the Evaluate phase, teachers can assess students' learning progress and measure how well they met the lesson objectives. Formative and summative assessments are used to provide feedback and guide future instruction. Quizzes, presentations, projects, and written assignments are all examples of assessments. Teachers can provide personalized and targeted instruction by assessing students' performance and identifying areas of strength and areas that require additional reinforcement.

III. Sixth, Seventh, and Eighth Grade General Knowledge:

General Knowledge is critical to the overall development of students in the sixth, seventh, and eighth grades. It broadens their worldview, fosters their curiosity, and provides them with the knowledge they need to become active and informed citizens. General Knowledge subjects provide a holistic approach to education by fostering interdisciplinary connections and promoting critical thinking skills.

This teacher's guide series will provide a variety of General Knowledge topics appropriate for students in grades 6th, 7th, and 8th, with each topic aligned to the 5 E's lesson plan. It will suggest engaging activities, exploration strategies, explanation techniques, opportunities for elaboration, and evaluation methods. The guide's goal is to inspire educators to create dynamic, interactive learning environments that inspire students to develop a lifelong love of learning and exploration.

IV. Alignment with the Oxford Textbook Series:

This Oxford Teacher Guide series has been thoughtfully designed to work in tandem with the Oxford textbook series, giving educators a comprehensive and cohesive approach to teaching. Teachers can enrich students' learning experiences and deepen their understanding of the subject matter by incorporating the General Knowledge topics from this guide into the existing curriculum based on the Oxford textbooks. This alignment ensures a logical progression of topics, allowing students to gain a broader perspective, make interdisciplinary connections, and build a well-rounded knowledge base that supplements the content covered in the Oxford textbooks. Together, the Oxford Teacher Guide series and the Oxford textbook series form a potent combination that improves students' educational experiences and fosters intellectual growth.

V. How to use this guide:

1. **Familiarize Yourself with the Guide:** Read through the entire guide thoroughly to understand its structure and content. Make yourself familiar with the 5 E's lesson plan and its various phases: Participate, investigate, explain, elaborate, and evaluate.
2. **Plan Your Lessons:** Create a lesson plan for each topic using the 5 E's. Begin with the Engage phase, which aims to pique students' interest and activate prior knowledge. Choose appropriate strategies to engage your students from the start, such as thought-provoking questions, multimedia resources, or interactive activities.
3. **Explore and Discover:** Students proceed to the Explore phase, where they further investigate and explore the topic. To encourage active learning and critical thinking, create hands-on activities, experiments, group projects, or research projects. Give students opportunities to gather information, analyze data, and make connections.
4. **Explain and Clarify:** Move on to the Explain phase, where students express their understanding and make sense of what they've learned. Facilitate discussions, explain things, and clear up any misconceptions that may arise. Encourage students to ask questions, express their opinions, and participate in meaningful discussions.

5. **Elaborate and Apply:** In the Elaborate phase, students extend their understanding and apply what they've learned in real-world situations. Make it possible for students to think critically, solve problems, and make connections outside of the classroom. Encourage them to participate in project-based learning, case studies, debates, or simulations that require them to analyze, synthesize, and create.
6. **Evaluate and Assess:** At the end of each lesson, evaluate students' learning progress and measure their achievement of the lesson objectives. To provide feedback and guide future instruction, use a variety of formative and summative assessments, such as quizzes, presentations, projects, or written assignments. Identify and address areas for improvement in subsequent lessons.
7. **Adapt and Personalize:** Feel free to adapt and personalize the lessons to meet your student's specific needs and learning styles. To cater to diverse learners and create an inclusive classroom environment, modify activities, assessments, and resources.
8. **Reflect and Iterate:** Reflect on your teaching practice and the effectiveness of your lessons on a regular basis. Seek feedback from students and colleagues to improve and refine your instruction over time. Iterate on the lessons in response to feedback to improve student engagement and learning outcomes.

Progression Grid:

A comprehensive progression grid outlines the sequential development of concepts across the grades in the Teacher Guide. This progression grid is a useful tool for educators, highlighting the logical flow of topics and the increasing complexity of ideas as students' progress from sixth to eighth grade. The grid enables teachers to visualize the interconnectedness of concepts and identify the foundational knowledge that students will need to build on in subsequent grades. Educators can ensure a scaffolder learning experience in which students gradually deepen their understanding and skills over time by following the progression grid. The grid also helps educators anticipate and address potential gaps or overlaps in the content covered, which aids in curriculum planning. Overall, the progression grid provided in this guide enables teachers to create cohesive and coherent lessons that maximize student learning and promote a smooth educational journey.

Breakdown of the Academic Year:

The breakdown of the academic year provided in the guide allows for a systematic progression of topics throughout the academic year. Each term focuses on a specific set of chapters that cover a wide range of general knowledge topics. It allows for in-depth exploration, discussion, activities, and assessments within each chapter. Teachers can modify the pace and chapter allocation based on the needs of their specific curriculum and students.

PROGRESSION GRID		
Biology		
Grade VI	**Grade VII**	**Grade VIII**
Unit 1: Cellular Organization.	Unit 1: Plant Systems	Unit 3: Variations, Heredity, and Cell Divisions.
Unit 2: Reproduction in Plants	Unit 2: Human Respiratory and Circulatory System.	Unit 1: Ecology
Unit 3: Balanced Diet	Unit 3: Immunity and Diseases	Unit 4: Biotechnology
Unit 4: Human Digestive System		Unit 2: Human Nervous System

Chemistry		
Grade VI	**Grade VII**	**Grade VIII**
Unit 5: Matters as Particles	Unit 4: Structure of an atom.	Unit 5: Periodic Table
Unit 6: Elements and Compounds	Unit 5: Physical and Chemical Changes. Unit 6: Chemical Bonds	Unit 6: Chemical Reactions
Unit 7:Mixtures	Unit 7: Solutions	Unit 7: Acids, Bases and Salts.

Physics		
Grade VI	**Grade VII**	**Grade VII**
Unit 8: Energy	Unit 8: Force and Motion. Unit 9: Waves and Energy	Unit 8: Force and Pressure.
Unit 9: Electricity	Unit 10: Heat and Temperature.	Unit 9: Reflection and Refraction of Light.
Unit 10: Magnetism		Unit 10: Electricity and Magnetism

Space Sciences		
Grade VI	**Grade VII**	**Grade VIII**
Unit 11: Solar System	Unit 11: Earth and Space	Unit11: Our Universe

Technology in Everyday Life		
Grade VI	**Grade VII**	**Grade VIII**
Unit 12: • Grow seasonal plants and vegetables in earthen pots and demonstrate the effect of use of fertilizers on the growth of plants. • Prepare yogurt and cheese from milk to demonstrate the beneficial microorganisms. • Design a solar oven to convert solar energy into heat energy. • Assemble a circuit to demonstrate the working of an electric bell.	**Unit 12:** • Design a model to demonstrate a drip and sprinkle irrigation system for the conservation of water. • Use different techniques for preserving foods like orange juice, apples, and pickles. • Make a simple stethoscope. • Make a sanitizer using suitable substances.	**Unit 12:** • Make bioplastic from milk and vinegar as an application of biotechnology. • Make a toothpaste, soap and detergent as an application of acid and bases in daily life. • Assemble a concave mirror type solar cooker to convert solar energy into heat energy. • Assemble and operate simple wind turbine to produce electricity. • Demonstrate the working of a UPS and use it to operate a fan or an energy bulb.

ACADEMIC YEAR BREAKDOWN

Term 1:

Chapter 1: Cellular Organization
Chapter 2: Reproduction in Plants
Chapter 3: Balanced Diet
Chapter 4: Human Digestive System

Term 2:

Chapter 5: Matter as Particles
Chapter 6: Elements and Compounds
Chapter 7: Mixtures
Chapter 8: Energy

Term 3:

Chapter 9: Electricity
Chapter 10: Magnetism
Chapter 11: Solar System
Chapter 12: Technology in Everyday Life

CHAPTER 01

Cellular Organization

Student Book Pages 10–21

Learning outcomes

- Recognise cells as the basic unit of life that are organised into tissues, organs, systems and organisms.
- Arrange and rank different levels of cellular organisations – cells to tissues, organs and organisms.
- Relate the structures of some common cells (nerve, muscle, epithelium and blood cells) to their functions.
- Identify the structures present in an animal cell and plant cell as seen under a simple microscope and relate them to their functions.
- (only cell membrane, cytoplasm, nucleus, cell wall, chloroplast, mitochondria and sap vacuole).
- Describe the similarities and differences between the structures of plant and animal cells.
- Sketch the animal and plant cells and label key organelles in each.
- Compare and contrast an animal cell and plant cell by preparing slides using onion peels and cheek cells.

Overview of the Unit

- The tiniesit functional and structural unit of an organism; often microscopic; it is made up of cytoplasm and a nucleus covered in a membrane.
- Unicellular organisms are single-cell organisms. Digestion, excretion, and respiration all take place inside a single cell in a unicellular creature.
- Multicellular organisms are composed of more than one cell. They are complex organisms and have distinct organ systems and organs.
- Specialised cells means that although being similar, cells vary in size, form, or function according to their role in our body. In other words, each type of cell is transformed to work in the way required by our bodies.
- Groups of cells that share a similar structure and work together to carry out a certain function are called tissues.
- The cellular hierarchy starts with one cell and works its way to more complex structures that eventually form the most complex of living things.

Lesson Plan 1	Student Book pages	Time	Workbook pages
Cells	10–11	45 mins	2-7

Student Learning Outcomes

Recognize cells as the basic unit of life that are organized into tissues, organs, systems, and organisms.

Resources

Building blocks
Microscope
Permanent slides

Engage (5 mins)

Bring building blocks and ask students to build whatever they can within 5 minutes.

Explain (15 min)

Explain them the following points.

- Just like to build the structures, they needed building blocks similarly, cells are the building blocks of living things.
- They are so small that a microscope is required to see them.
- There can be different types of cells depending on the organism and which organ you are observing.
- Show a microscope and explain functions of its each part.
- Read pages 10-11 of student book.

Keywords

Cells
Microscope
Observe

Explore: (10 min)

Show slides of permanent slides of plant and animal cells under microscope.

Ask them to observe the cells.

Sketch what they see under the microscope, in their notebooks and write their observations as well.

Useful Link

https://www.youtube.com/watch?v=qaElp0M3NZw

Elaborate: (5 min)

Initiate the discussion about their observations and diagrams.

Evaluate: (10 min)

Complete Concept Check on page 11 of student book in their notebooks.

Homework:

Complete Q7 page 21 of student book.

Lesson Plan 2	Student Book pages	Time	Workbook pages
Structure of plant and animal cells	12–13	45 mins	2–4

Student Learning Outcomes

- Identify the structures present in an animal cell and plant cell as seen under a simple microscope and relate them to their functions (only cell membrane, cytoplasm, nucleus, cell wall, chloroplast, mitochondria and sap vacuole).
- Describe the similarities and differences between the structures of plant and animal cells. Sketch the animal and plant cells and label key organelles in each.
- Compare and contrast an animal cell and plant cell by preparing slides using onion peels and cheek cells.

Resources

Onion peel
Toothpicks
Methyl blue or any stain
Slides and slide covers
Beaker of water
Microscope
Dropper

Engage (5 mins)

You can make a cell out of food items, such as a pizza cell, and connect the various pizza ingredients to the cell's organelles. Pizza sauce, for instance, symbolizes the cytoplasm since it has a jelly-like texture (similar to the sauce).

Explain (10 min)

- Explain the cells and its different parts by showing posters of animal and plant cells.
- Read pages 12 and 13 of student book.

Keywords

Cell membrane
Vacuole
Nucleus
Cytoplasm
Mitochondria
Chloroplast
Cell wall

Explore: (15 min)

- Activity 1 and 2 on page 21-22.
- Students will observe the organelles on prepared slides and work in teams to explore the differences between plant and animal cell (e.g. shapes, different organelles).

Material:

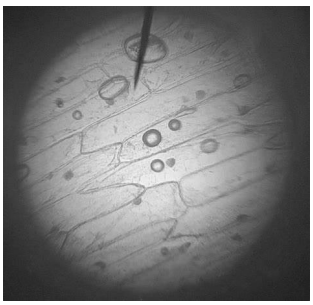
- Onion cell
- Cheek cell
- Toothpicks

- Methyl blue
- Iodine
- Slides and slide covers
- Beaker of water
- Microscope
- Dropper

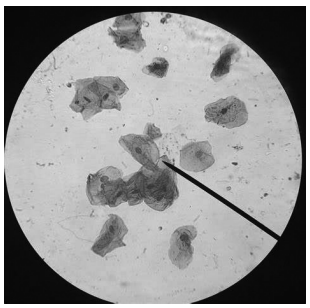
Procedure:

- Scrape the inside of you mouth with a toothpick gently.
- Rub it on the slide.
- Put a drop of water on a slide and observe cheek cells.
- Pick up a small and small onion peel piece, then put it on the slide. Add one drop of methyl blue or any stain, then cover with a cover slip.

After the lab is finished, instruct the students to complete worksheet 1 depending on what they have observed.



Onion cell slide



Cheek cell slide

Useful Link

For cheek cells slide:

https://www.youtube.com/watch?v=3aQYc6DeWsY&pp=ygULY2hlZWsgc2xpZGU%3D

For onion cells slide:

https://www.youtube.com/watch?v=EUXmC84aRFQ&pp=ygUQb25pb24gcGVlbCBzbGlkZQ%3D%3D

Difference between plant and animal cells:

https://www.youtube.com/shorts/IJJV34vXnAg

Elaborate: (5 min)

Explain further with the help of students answers on worksheet.

Evaluate: (10 min)

- Using index cards, write the names of different organelles of plant and animal cells and their corresponding functions. Turn down the cards. Call the students turn wise and ask them to flip the cards and find the matching pair (organelle and its function) within a given time (e.g. a minute).
- Complete Q2 page 20 of Student book.

Homework:

Complete Q3, 5, and 7 on page 2-4 of Workbook.

Lesson Plan 3	Student Book pages	Time	Workbook pages
Specialized cells	14–15	45 mins	8

Student Learning Outcomes

Relate the structures of some common cells (nerve, muscle, epithelium and blood cells) to their functions.

Engage (5 mins)

- Start the lesson by displaying images of various cell types (nerve, muscle, epithelium, and blood cells) and asking students to identify and discuss the cells.
- Discuss briefly with students the significance of cells in the human body and the various structures and functions that each type of cell has.

Explain (10 min)

- Give a brief overview of nerve, muscle, epithelium, and blood cell structures and functions.
- Explain how nerve cells are specialized for electrical impulse transmission, muscle cells for movement, epithelial cells for protective barriers and linings, and blood cells for transportation and immune response.
- Discuss each cell type's specific structures and how they contribute to their respective functions.

Keywords

Specialized
Blood
Nerve

Explore: (15 min)

- Divide the class into small groups and give each group a different cell type (nerve, muscle, epithelium, or blood cell).
- Allow students to research and explore the structures and functions of their assigned cell type using resources such as textbooks, diagrams, or online sources.
- Instruct students to create a visual representation or model of their assigned cell type, emphasizing key structures and explaining how those structures relate to the cell's function.

Elaborate: (5 min)

- Allow each group to present to the class their visual representation or model.
- Encourage students to explain how the structures and functions of their assigned cell type are related.
- Facilitate a class discussion comparing and contrasting the structures and functions of the various cell types, emphasizing how their distinct characteristics allow them to perform specific roles in the body.

Useful Link

https://www.youtube.com/watch?v=wNe6RuK0FfA

Evaluate: (10 min)

Do Q4 on page 21 of student book.

Homework:

Complete Q13 page 8 of Workbook.

Lesson Plan 4 Tissues and Organs	**Student Book pages** 15–18	**Time** 45 mins	**Workbook pages** 3-5 and 7

Student Learning Outcomes

Arrange and rank different levels of cellular organizations – cells to tissues, organs, and organisms.

Resources

Building blocks

Engage (5 mins)

- Divide students into groups and give them building blocks to build a simple house. Display any picture for reference.
- Ask students to explain how they have built the house.

Keywords

Tissues
Organs
Connective
Skeletal
Epithelial

Explain (10 min)

- Explain to the students that think of each building block as a cell so just like they have combined building blocks to make small structure for house like window, floor, etc., similarly same cells combine to form tissues. Similarly, different small structures were combined to form whole house just like an organ is formed when different types of tissues combine.
- Read and explain pages 15-18 of student book.

Explore: (15 min)

Ask students to search some interesting facts about tissues and organs.

Elaborate: (5 min)

Ask students to share the facts with the class and discuss them.

Useful Link

Difference between tissues and organs
https://www.youtube.com/watch?v=q3z1Kh0ZwEs

Evaluate: (10 min)

Do Q6 (iii and iv) on page 21 of student book.

Homework:

Complete Q4, 8, and 9 page 3 and 5-7 of Workbook.

Lesson Plan 5 Cellular hierarchy	**Student Book pages** 18	**Time** 45 mins	**Workbook pages** 2-7

Student Learning Outcomes

Arrange and rank different levels of cellular organizations – cells to tissues, organs, and organisms.

Resources

Laptops or computers with internet connectivity

Play doh or colorful sheets.

Engage (5 mins)

- Let the students play following game of sorting. https://wordwall.net/resource/8533775/science/group-sort-levels-of-organization

Write the words cells, tissues, organs, organ system and organism randomly on board and ask the students to arrange them in ascending order.

Keywords

Cellular hierarchy

Explain (10 min)

- Explain the term ‘hierarchy’.
- Read and explain pages 18 of student book.

Useful Link

Wordwall game

https://wordwall.net/resource/8533775/science/group-sort-levels-of-organization

Explore: (15 min)

- Do project 1 on page 22 of student book.
- Divide the students into groups.
- Simple models can be made with cardboard and colored sheets or with the help of play-doh.

Elaborate: (5 min)

Ask each group to present their model and explain its cellular hierarchy.

Evaluate: (10 min)

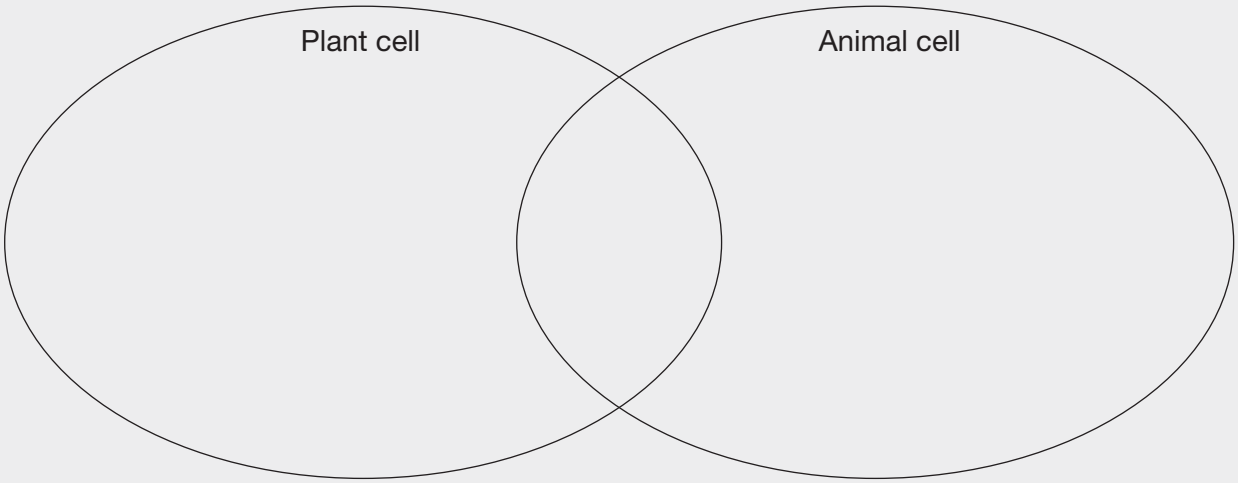
Do Q2 page 2 of workbook.

Homework:

Complete Q11 on page 7 of Workbook.

Worksheet 1

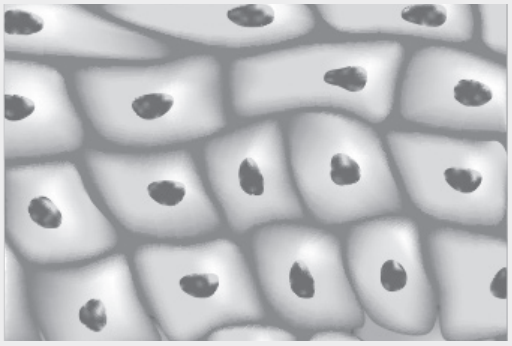
1. Complete the following Venn diagram about plant and animal cells.



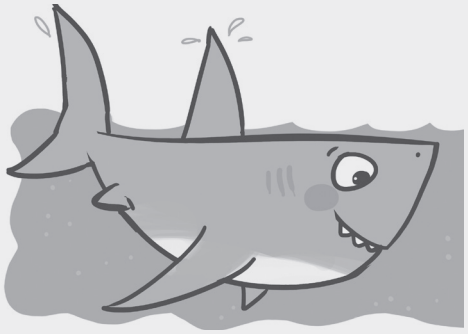
2. Define the function of the following parts of the cell:

Nucleus	
Cytoplasm	
Cell membrane	
Cell wall	
Vacuole	

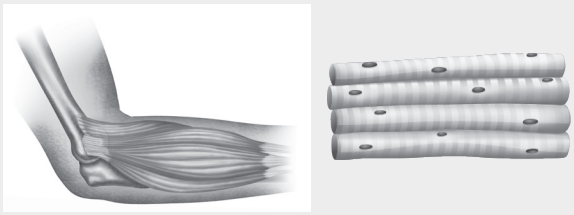
Flash cards



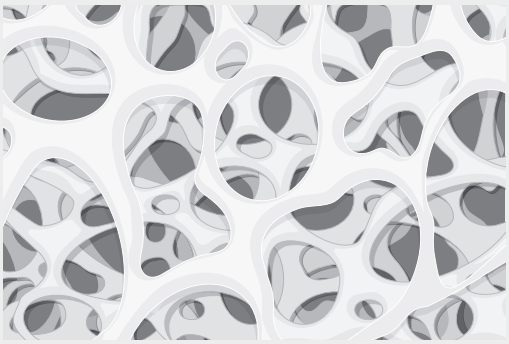
Skin cells



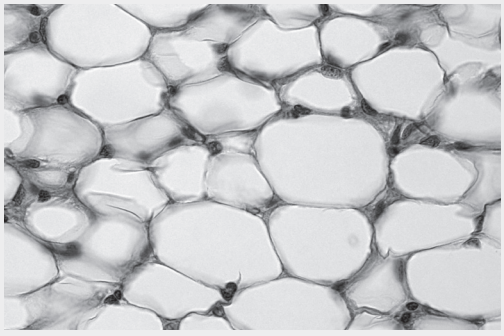
Shark



Muscle Tissue

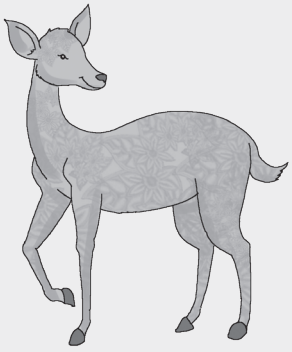


Bone Tissue



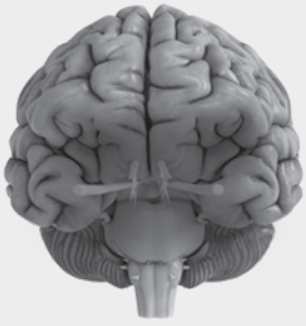
Fat Tissues

Blood cells

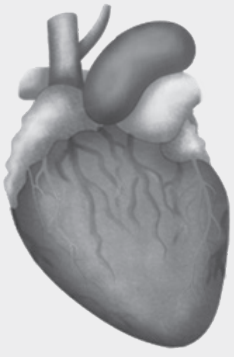


Deer

Lungs

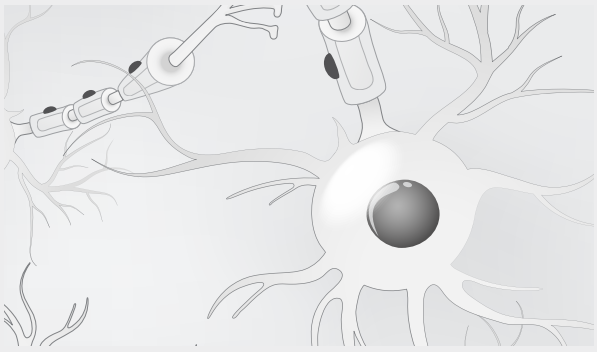


Brain

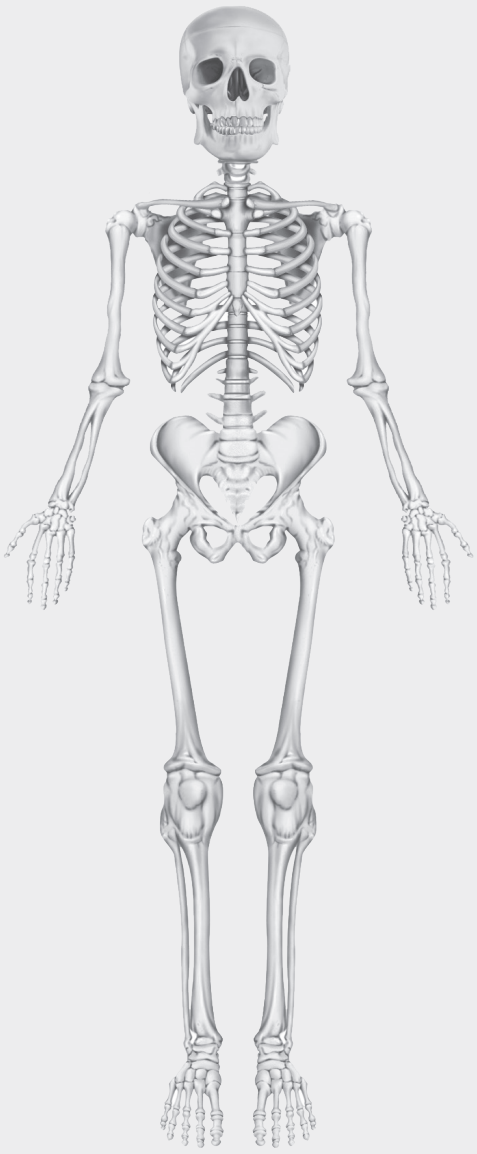


Heart

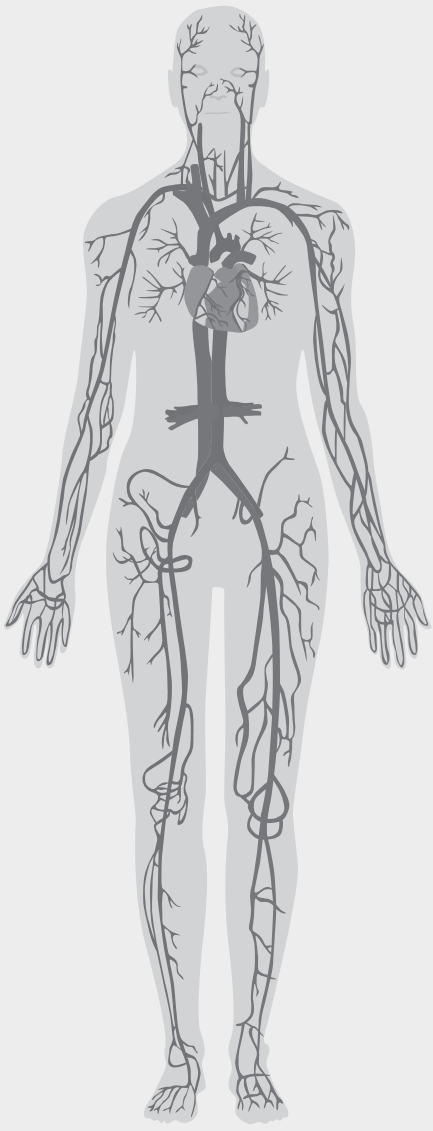
Baby



Nerve cell



Skeleton



Circulatory system

Answers for Worksheet 1

1. i. Animal cells lack a cell wall.
   ii. Plant cells have a fixed and rigid shape because of the presence of a strong cell wall.
   iii. The nucleus is relatively centrally placed in animal cells. However, it is situated on one side of the cell in plant cells.
   iv. Animal cells lack chloroplasts, whereas plant cells do. Plant cells want chloroplasts so that they can produce energy from sunlight through photosynthesis.

2. Define the function of the following parts of the cell:

Nucleus	It is the part of the cell that controls all the functions.
Cytoplasm	A jelly-like substance.
Cell membrane	The membrane that surrounds the cell.
Cell wall	The protective, rigid structure that gives plant cells their shape.
Vacuole	It stores material inside the cell.

3. i. Plant and animal cells are both eukaryotic (with true nucleus or genetic material surrounded by a membrane).
   ii. Animal and plant cells both have cell membranes or plasma membranes that control how chemicals travel within and outside of the cell.
   iii. Animal and plant cells each have distinct nuclei and cytoplasm.
   iv. Both plant cells and animal cells contain the majority of organelles, including the nucleus, mitochondrion, endoplasmic reticulum, and others.

Answers for Exercises

1. i. c ii. d iii. c iv. b
2. i. a. cell membrane b. nucleus
   c. chloroplast d. vacuole e. cytoplasm
   ii. nucleus and cell membrane
   iii.

Tissue	**Organ**
Similar cells combine to form a tissue.	Different tissues combine to form an organ.

3. i. tissue ii. bigger
   iii. tissues iv. unicellular
   v. more than one
4.

Name of cell	**Location**	**Function**
Epithelial cell	Outer layer of skin	Protect and produce secretion
Bone cell	Bones	Make up bones that support the body
Red blood cell	Blood	Carry oxygen around the body
Nerve cell	Brain, nerves, and spinal cord	Carry messages around the body.

5. i. Bone cells, palisade cells, nerve cells, etc.
   ii. It controls what goes into and out of the cell.
   iii. chlorophyll
   iv. similar cells combine to form tissue.
   v. it contains organelles which perform many functions.
   vi. different tissues combine to form an organ. Some of the organs are heart, brain, and lungs.
6. Both plant and animal cells have cell membrane, vacuole, and nucleus. Plant cell has cell wall while animal cell does not. Animal cell also does not have chloroplast while plant cells have.
   Diagram
   Refer to page 12 and 13 of student book.
   ii. For diagram refer page 18.
   Functions of main organs of plant
   Leaf: prepares food by photosynthesis for the plant.
   Stem: it transports food and water throughout the plant.
   Roots: they absorb water and minerals. They also support the plant.
   iii. A tissue is a collection of similar cells that work together on a specific task.
   Smooth muscle tissue contracts and relaxes to cause movement of internal body organs.
   iv.

Tissue	**Organ**
Similar cells combine to form a tissue.	Different tissues combine to form an organ.

7. i. Thin slice is required so that light can pass through it easily and clear image can be shown on microscope.
   ii. it is done to show the details more clearly through the microscope.

Workbook Answers

1.

S.no.	Name of the parts	Functions
1	Eye piece lens	Used to look into microscope
2	Objective lens	Show images of different magnifications
3	Fine focus	Used to make image sharp and clear
4	Condenser lens	It gathers and concentrates light onto the specimen.
5	Revolving nose piece	It holds two or more objective lenses and can be turned easily to change magnification.

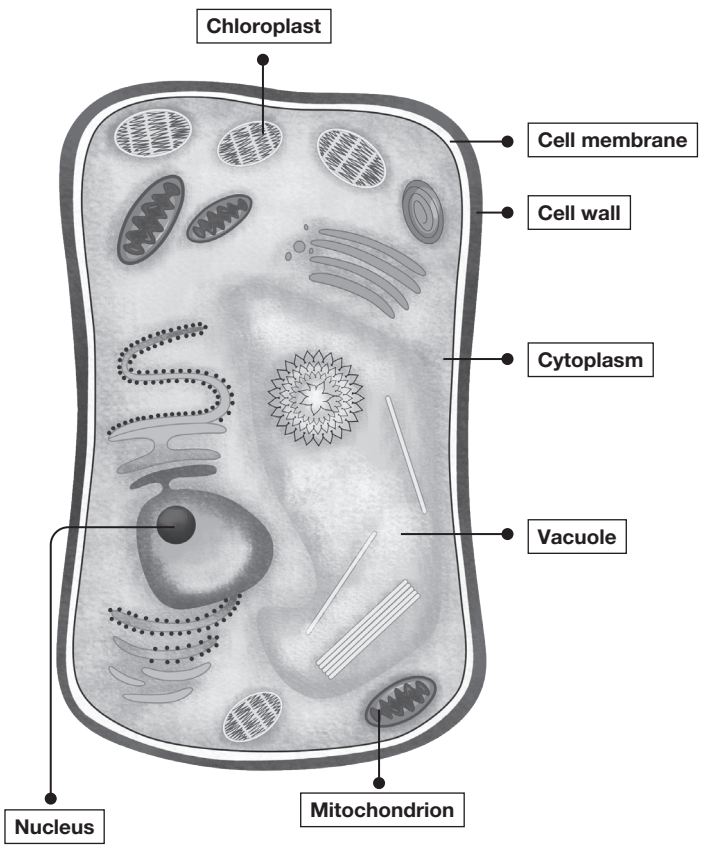
2. i. a. nerve cells b. nerve tissues
   c. brain d. nervous system
   ii. a. palisade cell b. palisade tissue
   c. leaf d. plant

3. Students can refer the student book and color the organelles themselves.

4.

Cardiac tissue	Contracts and relaxes to cause movements
Nerve tissues	Transport food
Xylem	Receive and transmit messages
Smooth muscles	Pumping blood
phloem	Transport water

5.



6. i. cell is the smallest unit of organisms. All organisms are made up of cells.
   ii. A microscope is an instrument which produces a magnified image of a small object which is too small to be seen with the naked eye.
   iii. cell sap is the solution of sugars present in vacuole of a cell.
   iv. red blood cells
   v. Plants breathe through stomata. Stomata, and their guard cells control exchange of gases.

7.

Plant cell	**Animal cell**
It has cell wall.	It does not have cell wall.
It has chloroplasts.	It does not have chloroplasts.

8. Smooth tissue
   Cardiac tissues
   Palisade tissues
   Nerve tissue
   Skeletal tissue

9.

Tissues	**Organs**
A tissue is a collection of similar cells that work together on a specific task.	An organ is a collection of two or more tissues organised to carry out a particular function.
Major structural components of an organ.	Major functional component of an organ system.

10.

Organelle	**Plant cell**	**Animal cell**	**Functions**
Cell membrane	✓	✓	controls what goes into and out of the cell.
Chloroplast	✓	✘	contain the green pigment chlorophyll. Chlorophyll is used by plants in photosynthesis
Nucleus	✓	✓	control centre of the cell.
Cell wall	✓	✘	made up of a material called cellulose and it helps to keep the plant rigid.
Cytoplasm	✓	✓	The cytoplasm contains a number of small structures called organelles. These perform several functions.

11. Take image from pg. 17
12. Take image from pg. 10
13. a)
    A. Cell wall
    B. Chloroplast
    C. Vacuole
    D. Cytoplasm
    E. Nucleus

b) D and E

c) Mitochondria

i. They are long, thin, and branched to effectively carry electrical messages.

ii. The root cells have long extensions (root hair) which increases the surface area for the absorption of material.

iii. It lines the different organs such as skin and wind pipe.

i. Their structures help them to form a network of nerve cells easily to carry messages.

ii. The root cells have long extensions (root hair) which increases the surface area for the absorption of materials.

iii. Their structure helps in filtration of particles.

14. i. True ii. False iii. True
iv. True v. False vi. True

CHAPTER 02

Reproduction in Plants

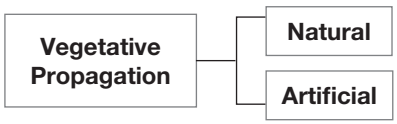
Student Book Pages 23–36

Learning outcomes

- Describe the different types of reproduction of plants
- Compare and contrast types of reproduction (sexual and asexual) in plants.
- Distinguish between artificial and natural asexual reproduction in plants. (Budding, grafting, Bulbs, Tuber, Runners, cutting, and layering.)
- Inquire how artificial propagation can lead to better quality yield in agriculture.

Overview of the Unit

- Plant reproduction is the process of producing new offspring from an existing plant. They can reproduce sexually or asexually.
- The fusion of gametes to produce offspring is referred to as sexual reproduction in plants.
- The following layers make up a typical flower:
  - Petals
  - Sepals
  - Stamens
  - Carpels
- Pollination is the transfer of pollen grains from one flower's anther to the stigma of another.
- Fertilization is the process through which the nucleus of the male cell (pollen grains) fuses with the nucleus of the female cell (ovum) to generate the zygote.
- Asexual reproduction or vegetative propagation is a process of obtaining new plants without seeds. It is the formation of a new plant from a single parent plant without the participation of gametes or sex cells.



- Natural vegetative propagation — **Budding, grafting, layering, cutting, tissue culture.**
- Artificial vegetative propagation — **Roots,bulbs, tubers, suckers, rhizomes, runners, plantlets.**

Lesson Plan 1	Student Book pages	Time	Workbook pages
Types of reproduction	23–24	45 mins	-

Student Learning Outcomes

- Describe the different types of reproduction of plants.
- Compare and contrast types of reproduction (sexual and asexual) in plants.

Keywords

Reproduction
Asexual
Sexual
Offspring

Engage (5 mins)

Initiate a brief discussion about plant reproduction with students, asking questions such as "How do you get new plants from the older ones?''

Explain (10 min)

- Explain sexual and asexual reproduction in plants in detail.
- Explain how sexual reproduction involves the fusion of gametes (pollen and ovules) from two parent plants, resulting in the formation of seeds and genetically diverse offspring.
- Asexual reproduction is defined as the process of producing new plants from vegetative parts of a single parent plant, such as stems, leaves, or roots, resulting in offspring that are genetically identical to the parent plant.
- Read page 23-24 of student book.

Useful Link

https://www.youtube.com/watch?v=ZUAL7hHdOXI

Explore: (15 min)

- Divide the class into small groups and assign each group a different type of reproduction (sexual

or asexual).

- Instruct students to research and investigate their assigned type of plant reproduction.
- They can use resources such as textbooks and online sources.
- Instruct students to create a poster summarizing the key features and examples of the reproduction type they have been assigned.

Elaborate: (5 min)

- Each group should present their poster to the class.
- Encourage students to compare and contrast the characteristics of sexual and asexual reproduction, such as gametes' involvement, genetic variation, and the types of structures involved.
- Facilitate a class discussion to investigate the benefits and drawbacks of each type of reproduction, taking into account factors such as genetic diversity, adaptation, and population growth.

Evaluate: (10 min)

Draw a Venn diagram to show similarities and differences between sexual and asexual reproduction.

Homework:

- Choose two plants, one that reproduces sexually and one that reproduces asexually. Flowering plants, ferns, mosses, and algae are some examples.
- Conduct research on each plant and determine whether it reproduces sexually or asexually. Describe the reproductive structures and processes that are involved.
- Compare and contrast the benefits and drawbacks of sexual and asexual reproduction in plants, taking into account factors such as genetic variation, reproduction speed, and adaptation to changing environments.

Lesson Plan 2	Student Book pages	Time	Workbook pages
Sexual Reproduction	24–27	45 mins + 45 mins	11

Student Learning Outcomes

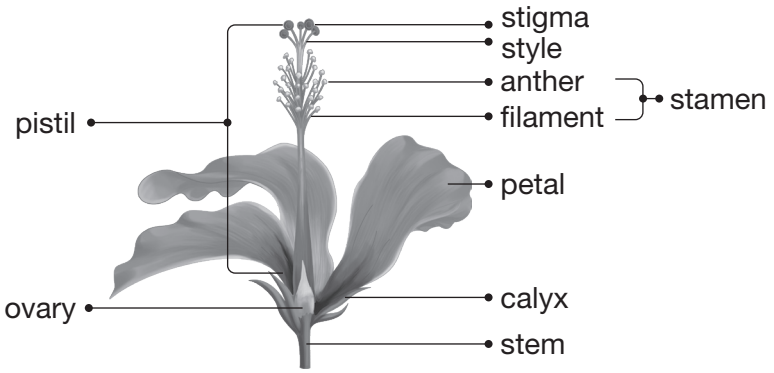
Describe the different types of reproduction of plants

Resources

Hibiscus flower
A small blade

Engage (5 mins)

- Divide students into groups.
- Bring a hibiscus flower also called China rose and distribute them among the groups.
- Ask the students to observe and count the parts of flower.



Keywords

Reproductive organ
Petals
Sepals
Carpel

- Encourage class discussion by posing questions like:
  1. "What do you think the function of flowers on plants is?"
  2. "Do all flowers have the same appearance?" "Do you notice any differences?"
  3. "Have you ever wondered how flowers reproduce and create new plants?"

Explain (10 min)

- Explain the parts of flower
- Give a brief overview of plant sexual reproduction, emphasizing the significance of flowers in this process.
- Key vocabulary terms such as pollination and fertilization are introduced and defined.
- Explain the different parts of a flower, such as the pistil, stamen, petals, sepals, and ovary, using visual aids (diagrams or illustrations).
- Discuss each component's role and how it contributes to the reproductive process.
- Describe the various types of pollination, such as self-pollination and cross-pollination.
- Read and explain pages 23-24 of student book.

Explore: (15 min)

Let students search the names of different plants and ask them to observe the reproductive parts and mode of pollination.

Elaborate: (5 min)

- Reassemble the class and distribute handouts with diagrams of flower parts and pollination types.
- Initiate a guided discussion with students by asking questions such as, "How do you think the different parts of a flower work together during pollination?"
- "What advantages might there be to cross-pollination versus self-pollination?"
- Allow students to share their thoughts and ideas, and encourage them to think critically and elaborate on their responses.

Evaluate: (10 min)

- Do Q3 (i and ii) page 34 of student book.
- Complete Q1, 2, and 4 of Workbook.

Homework:

Complete Q5, 6, 10, and 11 of Workbook.

Extension

- Identify and describe the key stages of sexual reproduction in plants, such as pollination, fertilization, seed formation, and seed dispersal.
- Investigate each stage's role in ensuring successful reproduction and the survival of the plant species.
- Write a summary paragraph emphasizing the importance and interdependence of each stage in the overall process of sexual reproduction for the flowering plant of choice.

Useful Link

Hibiscus flower dissection

https://www.youtube.com/shorts/fGcBbKENWDs

Sexual reproduction

https://youtu.be/R8_ScKzLAfE

https://www.youtube.com/watch?v=R8_ScKzLAfE

Lesson Plan 3	Student Book pages	Time	Workbook pages
Seeds and seed dispersal	28	45 mins	13-15–16

Student Learning Outcomes

Describe the different types of reproduction of plants.

Resources

Chart paper or whiteboard
Markers or chalk
Various seeds (examples: dandelion, maple, pea)
Models or pictures representing different seed dispersal methods
Handouts with diagrams of seed dispersal methods
Internet access or reference books

Engage (5 mins)

- Start the lesson by displaying a picture of a plant with seeds or bringing in various types of seeds.
- Inquire about students' observations and ideas about seeds, such as what they look like, how they travel, and where they might come from.
- In order to facilitate a class discussion, ask questions such as:
  - o "Have you ever noticed seeds growing outside in nature?"
  - o "Why do you think plants produce seeds?"
  - o "Can you think of any ways that seeds might travel or spread to new places?"

Keywords

Dispersal
Pods
Split
Spongy

Explain (10 min)

- Give a brief overview of seed dispersal and its significance for plant survival and species diversity.
- Introduce terms like seed dispersal, wind dispersal, explosive dispersal, animal dispersal, and water dispersal.
- Explain each method of seed dispersal using visual aids (models, pictures, or diagrams), emphasizing how plants have adapted to increase their chances of survival through these methods.
- Examine examples of plants and seeds that use each method, emphasizing their distinct adaptations.
- Read and explain pages 28 of student book.

Explore: (15 min)

- Form small groups of students and distribute seeds among them.
- Instruct each group to examine the seeds and discuss how they believe each type of seed will spread.
- Encourage students to share their ideas and make predictions about how each seed type will disperse.
- As students explore and investigate the characteristics of various seeds, provide guidance and support.

Elaborate: (5 min)

- Give each student an index card or a small piece of paper and ask them to write down a seed dispersal scenario.
- For example, they could write, "A plant with winged seeds gets blown by a strong gust of wind and lands on a nearby hill."

  "A plant with sticky seeds attaches to an animal's fur and is carried to another location."

"A fruit with seeds falls into a river and floats downstream to a new area."

- Put all of the written scenarios into a container.
- Allow each student to draw a scenario out of a hat or container without showing it to anyone else.
- Instruct the students to consider the seed dispersal method described in their scenario and discuss how the plant and seeds are adapted for that method with a partner or small group.
- After a few minutes, ask some groups to share their scenarios and adaptations.
- Encourage class discussion by asking follow-up questions like, "Why do you think plants have different ways of dispersing their seeds?"

  "How do you think each method of seed dispersal benefits the survival of plant species?"

  "Can you think of any other adaptations that plants might have for seed dispersal?"
- As needed, facilitate the discussion by providing additional information or examples.
- Finish the activity by emphasizing the importance of seed dispersal for plant survival and the various strategies that plants have developed to effectively spread their seeds.

Evaluate: (10 min)

- Do Q4 (i) and Q5 (vi) page 35 of student book.
- Complete Q13 on page 16 of Workbook.

Useful Link

https://youtu.be/06sbmWAzoys

Homework:

Complete Q7 and Q12 on page 13 and 15 of Workbook.

Extension

Choose a plant species and research its seed dispersal method. Explain how the plant produces and disperses its seeds, emphasizing the benefits of the chosen method for plant survival and propagation.

Lesson Plan 4	**Student Book pages**	**Time**	**Workbook pages**
Natural Asexual Reproduction	29–30	45 mins	-

Student Learning Outcomes

Distinguish between artificial and natural asexual reproduction in plants. (Budding, grafting, Bulbs, Tuber, Runners, cutting, and layering.)

Resources

- Paper and Pen
- Chart paper
- Markers
- Raw vegetables or Pictures of Vegetables representing different seed dispersal methods
- Handouts with diagrams of seed dispersal methods
- Internet access or reference books

Engage (5 mins)

Ask questions like:

- Do we use seeds to grow all types of plants?
- If you want to grow onion how would you grow it?

Explain (10 min)

Explain the topic through the pages from the textbook.

Explore: (15 min)

- Take the students to the school garden and show them the plants that are growing naturally by vegetative propagation.
- Divide them in groups.
- Each group will find out the specimen of any one type of natural vegetative propagation.
- Each group will then write the features of the type of plant they have picked after group discussion.
- The group will present their findings in front of the class.

Keywords

Runners
Vegetative
Bulb
Plantlets

Elaborate: (5 min)

Students will create a poster and paste the specimen on it, along with the characteristics of the type of natural vegetative propagation to which the specimen belongs.

Useful Link

https://youtu.be/VN_p20dDrnY

Evaluate: (10 min)

Do Discuss and Answer pg. 30 of student book.

Homework:

Provide copies of worksheet 2.1 to complete at home.

Extension

Collect various vegetables on your table, select one at a time, and ask what part of the plant this is. For example, show them a carrot and ask them what it is. Is it a stem or a root, etc.

Lesson Plan 5	**Student Book pages**	**Time**	**Workbook pages**
Artificial Asexual Reproduction	31	45 mins	11

Student Learning Outcomes

Distinguish between artificial and natural asexual reproduction in plants. (Budding, grafting, Bulbs, Tuber, Runners, cutting, and layering)

Engage (5 mins)

Show students a Rose Plant and ask them how they would feel if we got twenty plants (number of students in class) from this one plant. Explain to them that this is possible through artificial vegetative propagation.

Explain (10 min)

- Explain different types of artificial asexual reproduction with the help of the video.
- https://youtu.be/NmUiOFroYZM.

Resources

A rose plant
Scissors.
Clean plastic water bottles with the tops cut off (perform this under the supervision of a teacher because cut bottles might be sharp).
Soil.
Images of types of artificial asexual reproduction

Explore: (15 min)

Keywords

Cutting
Budding
Crafting
Layering

Procedure:

To ensure your cutting will turn into a new plant, ask students to keep the following points in mind.

- Use clean instruments for cuttings.
- Place your cuttings in moist fertile soil.
- Each cutting should be 4 to 6 inches long and have at least 4 leaves.
- Cuttings require high humidity and warm temperatures to develop. You may do this by making a tent out of a plastic bag and prop it up with pencils or wooden sticks, so the leaves don't touch the sides.
- Throughout the day, spray cuttings with a spray bottle to keep the soil and air around the cutting moist.
- Check the plants regularly for stem growth and keep track of any changes. e.g when new leaf appears etc.
- Wrap up the activities after two to three weeks of growth.
- Ask the students to prepare a summary of their results.
- Have a discussion about their conclusions.

Useful Link

https://youtu.be/NmUiOFroYZM

Elaborate: (5 min)

Taking a cutting requires removing a section of a leaf, stem, or root and placing it in a growing medium, where it develops the other components (i.e., a stem will then grow roots, a root will then grow a stem). Tell students that this activity could be done with any other plant but then we would have to select a different method of propagation according to the features of that plant.

Evaluate: (10 min)

- Do Q3,4 and 7 on page 35 of student book.
- Worksheet 2.2

Homework:

Complete Q3 and 8 on page 11 and 13 of Workbook.

Extension

Activity 3 on page 36 of student book.

Lesson Plan 6	Student Book pages	Time	Workbook pages
Artificial propagation can lead to better quality yield in agriculture	32	45 mins	-

Student Learning Outcomes

Inquire how artificial propagation can lead to better quality yield in agriculture.

Resources

Raw vegetables
Fruits
Grains
Paper and Pen

Engage (5 mins)

- Begin by having students brainstorm and discuss the significance of yield and quality in agriculture.
- Have a brief discussion with students about how farmers traditionally propagate plants and animals for agricultural purposes.

Explain (10 min)

- Explain artificial propagation in agriculture in detail.
- Explain how controlled breeding, cloning, or vegetative propagation of plants and animals for desired traits and characteristics is referred to as artificial propagation.
- Describe how artificial propagation can help improve yield quality by ensuring consistency, disease resistance, increased output, and desirable traits.

Keywords

Yield
Quality
Breed
Generation

Explore: (15 min)

- Divide the students into small groups and give each group a variety of agricultural products such as fruits, vegetables, or grains.
- Instruct each group to examine and compare the product quality, taking into account factors such as size, colour, texture, taste, and overall appearance.

Useful Link

https://byjus.com/question-answer/what-are-the-advantages-of-artificial-vegetative-propagation/

- Instruct students to discuss their observations and form hypotheses about the factors that contribute to the differences in product quality.
- Encourage students to investigate the concept of artificial propagation by asking them questions like,
  - "How might artificial propagation techniques impact the quality of these agricultural products?"
  - "Can you think of any specific examples where artificial propagation is commonly used in agriculture to enhance quality?"
- Encourage students to take notes or draw sketches to document their findings and observations.

Elaborate: (5 min)

- Allow each group to present their findings to the class.
- Encourage a class discussion about the larger implications and considerations of artificial propagation, such as ethical concerns, genetic diversity, and potential risks.

Evaluate: (10 min)

Do Discuss and answer page 32 of student book.

Homework:

Discuss about 'Artificial propagation can lead to better quality yield in agriculture' in your notebooks.

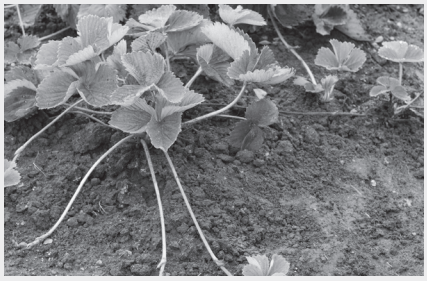
Extension:

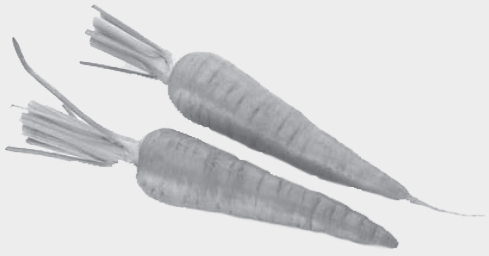
Organize a debate in which students argue for or against the use of artificial propagation in agriculture, taking into account various perspectives and potential consequences.

Worksheet 1

1. Choose the correct word from the word bank and write it under the image:

ROOT	BULB	TUBER	RHIZOME	SUCKER	RUNNER	PLANTLETS





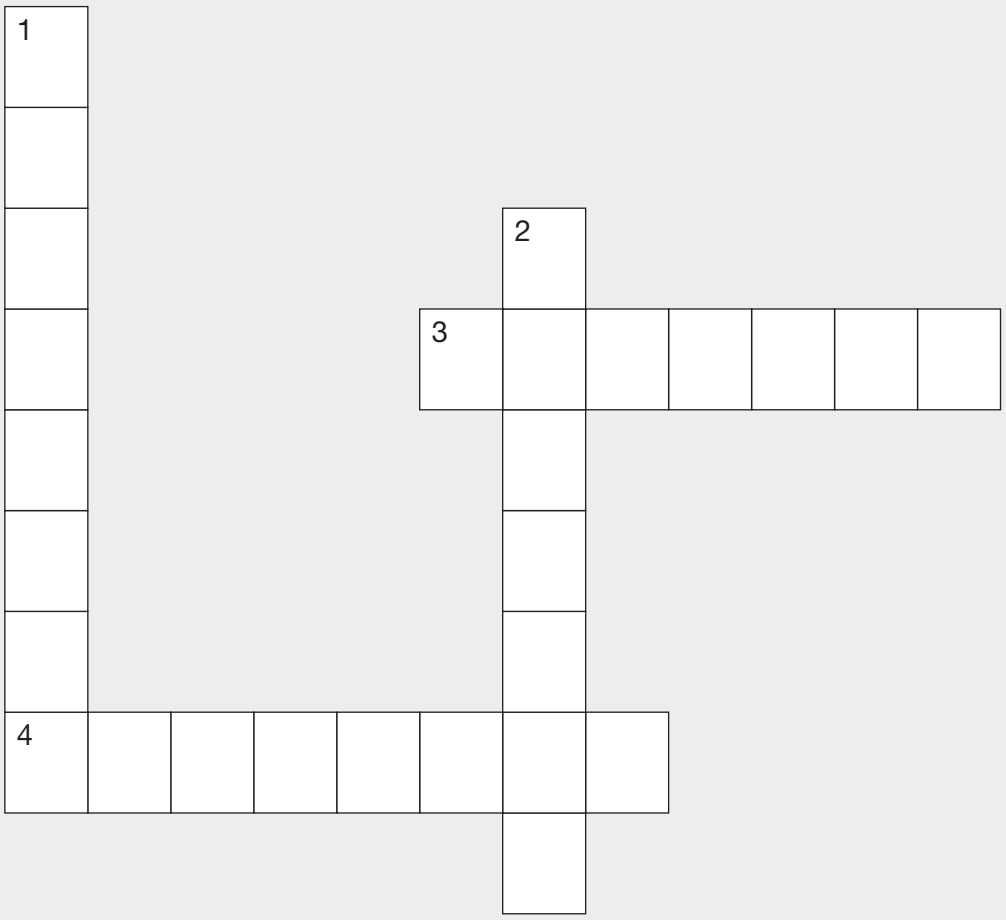
2. Match the following:

1. Swollen stem parts buried in the soil	1. Bulb
2. A horizontal underground plant stem capable of developing a new plant's shoot and root systems.	2. Runner
3. Small offshoots of the main plant from which more plants can be developed.	3. Rhizome
4. Develop from the base of the parent plant's stem	4. Tuber
5. A shoot is sent out from the parent plant to root in some far away, producing a new plant.	5. Plantlets
6. Shortened underground storage structures	6. Sucker

Worksheet 2

Use the clues to fill in the words above.

- Words can go across or down.
- Letters are shared when the words intersect.



ACROSS

3. Growing a plant from a stem or root that was cut from another plant.
4. A process in which different components of plants are united in order to unite and grow as one.

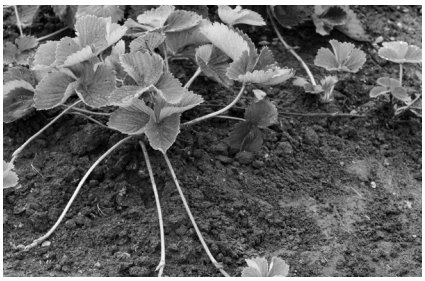
DOWN

1. The formation of roots on a stem while it is still attached to the parent plant.
2. A plant bud is grafted onto the stem of a rootstock plant.

Answers of Worksheet 1

1. Choose the correct word from the word bank and write it under the image:

ROOT	BULB	TUBER	RHIZOME	SUCKER	RUNNER	PLANTLETS



RUNNER

BULB

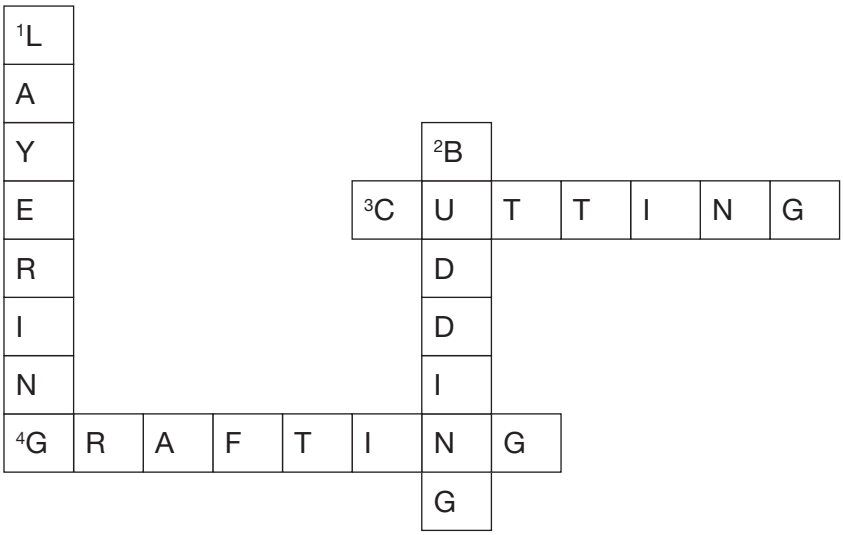
TUBER

ROOT

1. Match the following:

4. swollen stem parts buried in the soil	1. Bulb
3. A horizontal underground plant stem capable of developing a new plant's shoot and root systems.	2. Runner
5. small offshoots of the main plant from which more plants can be developed.	3. Rhizome
6. develop from the base of the parent plant's stem	4. Tuber
2. A shoot is sent out from the parent plant to root in some far away, producing a new plant.	5. Plantlets
1. shortened underground storage structures	6. Sucker

Answers of Worksheet 2



Answers of Exercise

1. Choose the correct answer.
   i. d) flower
   ii. b) seeds
   iii. b) sepals, petals, stamens, carpels
   iv. a) pollen grain
   v. d) ovule or egg-cell
2. Fill in the blanks.
   i. stigma ii. stigma iii. parent iv. Sexual v. petals
3. i. The diagram below shows a flower that has been cut in half to show its reproductive organs.
   ii. Write the letter of the flower part next to its job or function.
   A e) Has a sticky surface for the pollen to land on
   B a) Attracts insects to the flower
   C d) Makes and stores pollen
   D e) Has a sticky surface for the pollen to land on
   E c) Makes the seeds
   iii. Pollination
   iv. Wind, animal, or self-pollination
   v. Fertilization
   vi. By wind, animal dispersal (through fur, feathers, or digestion), or water dispersal
   vii. Water
4. Short answer questions
   i. Wind, animal dispersal, water dispersal, explosive dispersal
   ii. Self-pollination and cross-pollination

iii. Pollination is the transfer of pollen from the anther to the stigma of a flower.

iv. Asexual reproduction is the production of offspring without the involvement of gametes (sex cells).

v. The stages of sexual reproduction in plants are pollination, fertilization, seed formation, and seed dispersal.

5. Long answer questions

   i. Sepals: Protects the flower when it is a bud

      Petals: Attracts insects to the flower

      Stamen: Makes and stores pollen

      Stigma: Has a sticky surface for the pollen to land on

      Ovary: Makes the seeds

   ii. Pollination is the transfer of pollen from the anther to the stigma, while fertilization is the fusion of the male and female gametes (pollen and egg) to form a zygote.

   iii. The nucleus in a pollen grain travels from the stigma to the ovary through the growth of a pollen tube, which extends from the stigma, down through the style, and into the ovary.

   iv. Advantages of vegetative reproduction over sexual reproduction in plants include the production of offspring that are genetically identical to the parent, the ability to reproduce rapidly, and the preservation of favorable traits.

   v. Disadvantages of vegetative reproduction over sexual reproduction in plants include limited genetic variation, reduced adaptability to changing environments, and increased vulnerability to diseases or pests.

   vi. Insect-pollinated flowers produce fewer and larger pollen grains than wind-pollinated flowers because they rely on insects for pollination. Larger pollen grains are more likely to stick to the bodies of insects and be transported to other flowers.

   vii. A gardener may want to produce new plants from cuttings instead of growing them from seeds to ensure that the new plants have the same traits and characteristics as the parent plant, maintain specific traits or qualities, and propagate desirable varieties more efficiently and reliably.

6. Think about it

   i. It is most likely to be dispersed by wind.

   ii. Which parts of a tomato flower

      a) grow to form the fruit - Ovary

      b) fall off after fertilisation - Petals

      c) remain joined to the fruit - Sepals

Activities

1. Look at some flowers with a hand lens. Can you see the different parts of the flowers? Do all flowers have the same number of sepals, petals, stamens, and carpels? Make a list of the flowers you have inspected and number the various parts of each.
2. What happens if seeds are planted too close together? Plan an investigation using, say, marigold or nasturtium seeds to test your ideas. What will you plant the seeds in? How will you look after all the seeds in the same way to make sure your test is fair? What measurements or records will you collect?
3. Show students plants that can be grown other than seeds like potato, ginger, onion.
4. Students will perform seed germination experiments.

5. Students will learn five stages of the life cycle of plants by making charts: seed, germination, growth, reproduction, pollination, and seed spreading.

Projects

1. Look at the flowers in the garden or collect pictures of garden and wild flowers from magazines and seed catalogues. Record the name and colour of each flower. Make a histogram or bar chart of flower colours. What are the most common flower colours? Which coloured flowers are least common?
2. Take some dry bean seeds and weigh them. Soak them in water and leave them to grow. When two leaves have appeared on the seedling, reweigh it. Search the internet to find where the extra mass has come from. Make a video of this activity and share it with your friends.

Workbook Answers

1. Refer page 26 for labelled diagram

   Correct order: C, B, A

2.

Self pollination	**Cross pollination**
The transfer of pollen from a stamen to the stigma of the same flower or, to another flower on the same plant	The transfer of pollen between the stamens of one flower to the stigma of a flower on a different plant of the same species
Produces young plants which are almost identical to the parent plant	Produces a wider variety of young plants with variable characteristics

3.

	Natural asexual reproduction	**Artificial asexual reproduction**	**Description**
Layering		✓	Students will write answers in their own words.
Plantlets	✓		
Grafting		✓	
Rooting	✓		
Branches		✓	
Tubers	✓		
Runners	✓		

4. i. Y ii. X iii. E iv. C

   v. D vi. A vii. B

5. a.

   i. B II. A

   b. i. The transfer of pollen from a stamen to the stigma of the same flower or, to another flower on the same plant

   ii. Produces a wider variety of young plants with variable characteristics.

6.

Part of the flower	Function
A Stigma	pollen grains stick to stigma
B Ovary	ovaries have tiny ovules or egg-cells.
C Anther	It contains pollen grains
D Petal	They attract insects for pollination
E Sepal	It protects the flower when it is a bud.

7. Animal dispersal Explosive dispersal Wind dispersal
8. D, B, E, A, C, F
9. i. When male and female reproductive cells join together to form zygote, this process is called fertilisation.
   ii. Petals
   iii. New variety of organism is produced. The offspring has characteristics of both parents.
   iv. These are underground stems with thick leaves containing nutrients. These are young small plants. Some plants naturally grow plantlets on themselves as a form of asexual reproduction. These eventually break off and develop into mature plants.
10. Refer student book for diagrams.
11. From top to bottom
    Stigma, style, seeds, sepal, pedicel
12. i. Pollination
    ii. Pollination by birds
    iii. Fertilisation
    iv. Dispersal of seed by wind and animals.
13. i. Sycamore
    ii. Because it has wing like structures and it is light weight
    iii. Because it is sweet and juicy

CHAPTER 03 Balanced Diet

Student Book Pages 23–36

Learning outcomes

- Identify the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients.
- Identify the essential nutrients, their chemical composition, and food sources.
- Identify and describe essential nutrients' deficiency disorders.

Overview of the Unit

- A balanced diet is one that has an adequate amount of the nutrients that we need each day. A well-balanced diet has six major nutrients: fats, protein, carbohydrates, fiber, vitamins, and minerals.

Proteins
Minerals
Fibre
Vitamins
Carbohydrates
Fats
Water

Basic Nutrients of Balanced Diet

- A balanced diet is very important for human beings as:
  - a well-balanced diet improves both physical and mental wellness.
  - it helps in physical growth.
  - it boosts work capacity.
  - a well-balanced diet improves the body's ability to fight or resist sickness.

Lesson Plan 1	Student Book pages	Time	Workbook pages
Nutrition	37–38	45 mins	17

Student Learning Outcomes

Identify the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients.

Resources

Images of Food items.
Chart Paper and Markers
Glue
Scissors
Pen and Paper

Engage (5 mins)

- Write the term Essential Nutrients on the board.
- Start off the lesson by asking students to guess what is meant by the given term.

Explain (10 min)

- Give an in-depth description of essential nutrients and their importance.
- Explain that essential nutrients are substances that the body requires for normal growth, development, and overall health maintenance.
- Introduce the six major nutrient classes: carbohydrates, proteins, fats, vitamins, minerals, and water.
- Describe each nutrient class's chemical composition and basic functions.

Explore (15 min)

- Give each student a list of essential nutrients and their chemical symbols (carbohydrates, proteins, fats, vitamins, minerals, and water).

Keywords

Diet
Consume
Nutrients

- Instruct students to conduct research and find examples of foods that are high in each nutrient.
- Instruct students to make a nutrient collage.
- Students can create a nutrient collage by cutting out pictures or printing images of food items that are high in each nutrient and arranging them on a poster or piece of paper.
- Encourage students to be creative, and have them present their nutrient collages to the class, explaining the significance of each nutrient in the human diet.

Elaborate: (5 min)

- Give each student a different nutrient deficiency scenario.
- Students should conduct research on the signs, symptoms, and consequences of the assigned nutrient deficiency.
- Ask students to write a short story about a person suffering from nutrient deficiency and the effects it has on his health.
- Allow students to share their personal experiences with the class, emphasizing the importance of a well-balanced diet and the role of the assigned nutrient in preventing deficiencies.

Useful Link

https://youtu.be/inEPlZZ_SfA

Evaluate (10 min)

Do discuss and answer page 38 of student book.

Homework

- Do Q2 on page 17 of workbook.
- Create a nutrient chart or table with the six essential nutrient classes and examples of food sources.

Lesson Plan 2	Student Book pages	Time	Workbook pages
Carbohydrates	38	45 mins	-

Student Learning Outcomes

- Identify the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients.
- Identify the essential nutrients, their chemical composition, and food sources.

Resources

Poster of balanced diet pyramid
Pen and Paper
Images of Food items

Engage (5 mins)

- One day before the lesson, ask the children to bring carbohydrate-rich foods. e.g. pasta, rice or bran bread sandwich.
- Arrange the food on the table. Now, discuss with your students about healthy carbs and unhealthy carbs.
- Also, discuss the primary advantages of eating carbohydrates.

Keywords

Molecules
Calories
Glucose
Instant

Explain (10 min)

- Explain the topic from the textbook.
- Display the balanced diet pyramid to children and explain the importance of carbohydrates as the foundation of a balanced diet.

Explore (15 min)

- Make a list of the carbohydrates you ate the day before.
- Sort these carbohydrates into two categories: Good Carbs and Bad Carbs.
- Write down the number of carbohydrates you consume in a day and the number of servings you should take.

Elaborate: (5 min)

Ask students to explain the problems that we can face if we do not take the proper amount of carbohydrates in our diet on a paper.

Evaluate (10 min)

- Show students the images of various foods and ask them to identify which are high in carbohydrates.
- You can also ask them if it is a good or bad carb.
- Worksheet 1

Useful Link

https://youtu.be/lJUwdlups9o

Homework

- Do Concept Check page 39 of student book.

Lesson Plan 3 Proteins and Fats	Student Book pages 38	Time 45 mins	Workbook pages -

Student Learning Outcomes

- Identify the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients.
- Identify the essential nutrients, their chemical composition, and food sources.

Resources

Markers
Pictures of food items
Handout with examples of protein-rich and fat-rich foods
Whiteboard and markers

Engage (5 mins)

- Begin by asking students what their favourite foods are and why they like them. Encourage them to consider the nutrients found in these foods.
- Show students pictures of various food items and ask them to classify them as protein-rich or fat-rich. As a class, discuss their responses.
- Explain that they will learn about proteins and fats, two important nutrients found in food, in this lesson.

Keywords

Enzyme
Protease
Building
Repairing

Explain (10 min)

- Introduce the concept of proteins and explain why they are necessary for the growth, repair, and maintenance of body tissues. Make a note of the definition on the board.
- Discuss various protein sources, such as meat, fish, eggs, legumes, and dairy products. Mention that proteins are composed of building blocks known as amino acids.
- Introduce the concept of fats next. Explain how fats are a concentrated source of energy and how they help to insulate and protect organs. Make a note of the definition on the board.
- Discuss various fat sources, such as oils, butter, nuts, and avocados. Explain the distinction between healthy (unsaturated) and unhealthy (saturated and trans fats).

Explore (15 min)

- Make small groups of students and distribute the handout with protein- and fat-rich food examples.
- Ask students to identify and circle the protein- and fat-rich foods on the handout in their groups.

Elaborate: (5 min)

- Allow each group to present their findings. Fill out the chart paper with their responses.
- Discuss the significance of eating enough proteins and fats as part of a balanced diet.
- Engage the students in a discussion about the consequences of eating too many or too few proteins and fats.

Evaluate (10 min)

Do Q3 page 46 of student book.

Homework

Do Q8 page 47 of student book.

Useful Link

https://youtu.be/jqrVl4V5ttQ

Lesson Plan 4 Vitamins	**Student Book pages** 40–41	**Time** 45 mins	**Workbook pages** -

Student Learning Outcomes

- Identify the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients.
- Identify the essential nutrients, their chemical composition, and food sources.

Resources

Markers
Pictures of food items
Handout with examples of protein-rich and fat-rich foods
Whiteboard and markers

Engage (5 mins)

- Arrange the 3D alphabet letters that represent various vitamins and hang them in your classroom.
- Inquire with students about what they intend to study today. Do they believe they will learn the alphabets like kindergarten students?

Explain (10 min)

- Plants produce vitamins as micronutrients. When you eat plants, such as fruits and vegetables, your body absorbs the vitamins.
- When you eat plants, such as fruits and vegetables, your body absorbs the vitamins. Animals have the same ability as humans to absorb vitamins from plants, so eating animal products such as eggs, fish, or meat provides some vitamins secondhand.
- You can also take vitamin supplements to meet your vitamin requirements. Vitamins perform numerous important and beneficial functions throughout the body.
- Deficiency of vitamins may cause the following problems:
  - Brittle hair and nails
  - Hair loss
  - Bleeding gums
  - Mouth ulcers or cracks in the corners of eyes.
  - Night blindness
  - Red or white bumps on the skin

Keywords

Enzyme
Protease
Building
Repairing

Explore (15 min)

- There are thirteen essential vitamins that are necessary for the body to function properly. Some of them are as follows;

Useful Link

https://youtu.be/5FpcDSpDW_w

Type of vitamins		sources	Importance	Deficiency disorders
A		Carrots	Increase growth and helps eyesight work well in the dim light	Night blindness
C		Citrus fruits, green vegetables	Keeps skin and gums healthy	Scurvy which causes skin, hair, gum and dental problems
D		Sunlight and dairy products	Keeps teeth and bones strong	Rickets which causes weak and soft bones, causing the legs to become bent

- Bring students to the computer lab and ask them to find at least five food items for each vitamin and write their names on a paper.
- Perform this activity in groups.

Elaborate: (5 min)

- Allow each group to present their findings. Fill out the chart paper with their responses.
- Discuss the significance of eating enough proteins and fats as part of a balanced diet.
- Engage the students in a discussion about the consequences of eating too many or too few proteins and fats.

Evaluate (10 min)

- Do Discuss and Answer on page 42 of student book.
- Do Q6 (iii) on page 47 of student book

Homework

Do Q8 page 47 of student book.

Lesson Plan 5	Student Book pages	Time	Workbook pages
Minerals, Fiber and Water	41–43	45 mins	-

Student Learning Outcomes

- Identify the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients.
- Identify the essential nutrients, their chemical composition, and food sources.

Engage (5 mins)

- Begin the lesson by asking students which fruits and vegetables they prefer and why. Encourage them to consider the advantages that these foods provide.
- Show students pictures of various foods and ask them to classify them as a good source of minerals, fiber, or water. As a class, discuss their responses.
- Explain that they will learn about minerals, fiber, and water in this lesson, which is essential for maintaining a healthy body.

Resources

Chart paper
Markers
Pictures of food items
Handout with examples of mineral-rich and fiber-rich foods
Whiteboard and markers

Explain (10 min)

- Introduce the concept of minerals: Explain that minerals are necessary for a variety of bodily functions, including bone health, muscle contraction, and nerve function. Make a note of the definition on the board.
- Discuss various minerals and their food sources, such as calcium in milk, iron in leafy greens, and potassium in bananas.
- Introduce the concept of fiber next: Explain that fiber is a carbohydrate that aids digestion and prevents constipation. Make a note of the definition on the board.
- Discuss various fiber sources, such as whole grains, fruits, and vegetables. Stress the significance of including fiber-rich foods in their diet.

Keywords

Minerals
Fiber
Roughage
Collects

Explore (15 min)

- Set up various stations around the classroom, each representing a different category: minerals, fiber-rich foods, and water sources.
- Provide visual aids, food samples, and informational cards with facts about the importance and sources of each category at each station.
- Divide the students into small groups and place each group at a different station.
- Instruct the groups to rotate to each station, spending a few minutes at each one to examine the visuals, read the information, and discuss.
- Encourage students to make observations, ask questions, and take notes about the various categories.
- Reconvene as a class after rotating through all of the stations, and have each group share their key findings and insights from each station.
- Facilitate a class discussion to reinforce the importance of minerals, fiber, and water in maintaining a healthy body and to clear up any misconceptions or questions that may have arisen during the activity.

Elaborate: (5 min)

- Discuss the role of minerals and fiber in maintaining a healthy body, including strong bones and a healthy digestive system.
- Introduce the concept of water by saying: Explain how water is necessary for hydration, temperature regulation, and nutrient transport throughout the body. Make a note of the definition on the board.
- Discuss the importance of drinking enough water each day and the consequences of dehydration.

Evaluate (10 min)

- Do Discuss and Answer on page 42 of student book.
- Do Concept Check on page 42 of student book.
- Ask students to create a menu for a balanced meal that includes mineral-rich foods, fiber-rich foods, and water.

Useful Link

https://youtu.be/uB5xg28Xyks

Homework

Do Q5 (iii) and Q6 (ii) on page 47 of student book.

Lesson Plan 6	Student Book pages	Time	Workbook pages
Balanced Diet is different for Everyone and the balanced diet and Fitness	43–45	45 mins	-

Student Learning Outcomes

- Recognize that a healthy diet contains a balance of foodstuffs.
- Correlate diet and fitness.

Resources

Chart paper
Markers
Pictures of different age groups and occupations
Handout with examples of balanced meals for different individuals
Whiteboard and markers

Engage (5 mins)

- Begin the lesson by asking students what they had for breakfast and whether they believe their breakfast was similar to that of others in their family.
- Display images of people of various ages (e.g., a child, an adult, and an elderly person) and occupations (e.g., a farmer, an office worker, and an athlete). Discuss how these people's nutritional needs may differ.
- Explain that in this lesson, they will learn how a balanced diet varies for different people depending on factors such as age and amount of work.

Explain (10 min)

- Introduce the idea of a well-balanced diet: Explain how a balanced diet consists of a variety of foods from various food groups that provide essential nutrients for growth, development, and overall health. Make a note of the definition on the board.
- Discuss the various food groups (e.g., grains, fruits, vegetables, dairy, protein) and their roles in a healthy diet.

Keywords

Balanced diet
Appropriate
Fitness

Explain how age, amount of work, and level of physical activity all influence the amount and types of foods required for a balanced diet.

Explore (15 min)

- Divide the class into small groups and distribute the handout with balanced meal examples for various individuals (e.g., a child, an office worker, an athlete).
- Ask students to analyze the meals in their groups and identify how they differ based on the factors mentioned (age, amount of work, physical activity level).

Elaborate: (5 min)

- Discuss the role of minerals and fiber in maintaining a healthy body, including strong bones and a healthy digestive system.

- Introduce the concept of water by saying: Explain how water is necessary for hydration, temperature regulation, and nutrient transport throughout the body. Make a note of the definition on the board.
- Discuss the importance of drinking enough water each day and the consequences of dehydration.

Evaluate (10 min)

- Hold a class discussion in which students share their personal experiences or observations about a balanced diet and the factors that influence it, as well as the relationship between a balanced diet and fitness.
- Ask open-ended questions like,
    - How do you think a student who participates in sports on a regular basis's diet differs from that of a student who does not participate in any physical activities?
    - Can you think of any specific foods or nutrients that are beneficial to people of different ages? Why are they significant?
    - What are some examples of professions or occupations that may necessitate individuals having special dietary requirements?
- Do Discuss and Answer on page 44.

Useful Link

https://youtu.be/r6UezI_Pveg
https://youtu.be/YimuIdEZSNY

Homework

Do Q5 (i) and Q6 (i) on page 47 of student book.

Worksheet 1

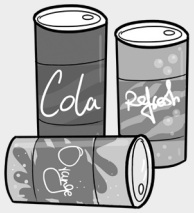
Encircle the carbohydrates that are good for health with green colour and encircle the carbohydrates that are bad for health with red colour

Refined Bread

Whole wheat bread

Bran Cereal

Fresh Fruits



Sugary drinks

Vegetables

Why are green-circled carbohydrates good for health?

Why are red-circled carbohydrates bad for health?

OXFORD
UNIVERSITY PRESS

Worksheet 2

Guess the vitamin from the given clue and write it in the box:

1. This vitamin is found in grapefruit.
2. Bread is rich in this vitamin.
3. We can find this vitamin in eggs.
4. Tomatoes are rich in this vitamin.
5. Carrot is rich in this vitamin.
6. Beans are rich in this vitamin.
7. Wheat contains this vitamin.

Worksheet 1

Good Carbohydrates: Whole grain bread, Fresh Fruits, Fresh Vegetables, Bran Cereals.
Bad Carbohydrates: Refined bread, Sugary drinks.
Why are green-circled carbohydrates good for health?

- Contains a lot of fibre and nutrients.
- Help you feel full while consuming fewer calories
- Naturally increases metabolism

Why are red-circled carbohydrates bad for health?

- Inadequate nutrients and fiber.
- A high level of blood glucose
- Conversion of empty calories to fats

Worksheet 2

(Students may answer any of the vitamins contained in that food item. Name of one contained vitamin for each food item is given below.)

1. Vitamin C
2. Vitamin B1
3. Vitamin D
4. Vitamin A
5. Vitamin C
6. Vitamin K
7. Vitamin B6

Answers for the Exercise

1. i. c. Water
   ii. c. Iron
   iii. b. Carbohydrates
   iv. b. Carbohydrates
   v. a. Minerals and vitamins
2. i. Vitamin A
   ii. Fiber
   iii. Anemia
   iv. Chewing
   v. Vitamin D
3. a. i.
   b. ii .
4. Nutrients Functions
   Protein: Building and repairing tissues, supporting growth and development
   Vitamin D: Facilitating calcium absorption, promoting bone health
   Calcium: Strengthening bones and teeth, supporting muscle and nerve function
   Carbohydrates: Providing energy for bodily functions and physical activity

5. i. A balanced diet is a diet that includes a variety of foods from different food groups in the right proportions to provide all the necessary nutrients, energy, and promote good health.
   ii. Different nutrients important to the body include proteins, carbohydrates, fats, vitamins, minerals, and water.
   iii. Water is an important nutrient because it is essential for various bodily functions such as digestion, nutrient absorption, waste removal, temperature regulation, and maintaining overall hydration.
   iv. Hypocalcaemia is a condition characterized by low levels of calcium in the blood, which can lead to symptoms like muscle cramps, weakness, and osteoporosis.
6. i. A balanced diet is important for maintaining overall health and well-being. It provides the body with all the essential nutrients, vitamins, and minerals it needs for proper functioning, growth, and development. It helps prevent nutrient deficiencies, supports a healthy weight, boosts the immune system, and reduces the risk of chronic diseases.
   ii. Minerals are very important for various bodily functions. They are involved in the formation of bones and teeth, maintaining fluid balance, transmitting nerve signals, supporting muscle contractions, and regulating enzyme activity.
   iii. Deficiency disorders of vitamins include scurvy (vitamin C deficiency), rickets (vitamin D deficiency), beriberi (vitamin B1 deficiency), pellagra (vitamin B3 deficiency), and night blindness (vitamin A deficiency), among others.
   iv. Problems with the digestive system can include indigestion, acid reflux, constipation, diarrhea, irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), and gastroenteritis, among others.
7. a) Faiz has eaten the most balanced lunch.
   b) Faiz has eaten a salad, which includes a variety of nutrients from vegetables, fish, which provides protein, and orange juice, which contains vitamin C.
8. Nuts, beef, butter and cheese:Fats

   Fruits, vegetables, brown rice, and bread: Fibre

   Fish, meat, eggs: Proteins

   Bread ,rice ,banana, beans :Carbohydrates

Activities:

1. Barrier Game: Mapping Nutrients with their sources
   - Learner 1: Describes food items without explicitly naming them.
   - Learner 2: Guesses the food item and aligns it with the nutrients on their worksheet.
   - Nutrients: Carbohydrates, Proteins, Fats, Water, Iron, Calcium, Vitamins (A, B, C, and D)
2. My Food Journal
   - Learners keep a journal of their daily meals and log all the food they have eaten.
   - After one week, they reflect on their nutritional consumption and identify any nutrient deficiencies.
   - They prepare a plan for the next week with changes to improve their nutritional intake.
3. Jigsaw for Diseases related to Nutritional Deficiencies
   - Students are sorted into groups, with each group becoming an expert on a specific disease caused by a nutritional deficiency.
   - Diseases: Malnutrition (PEM), Anaemia, Goitre, Scurvy, Osteoporosis, Night Blindness (choose 4-6 diseases).

- Each expert group explores their disease's causes, symptoms, and remedies/prevention strategies.
- Groups are reorganized into jigsaw groups, and experts share their knowledge with the rest of the members.

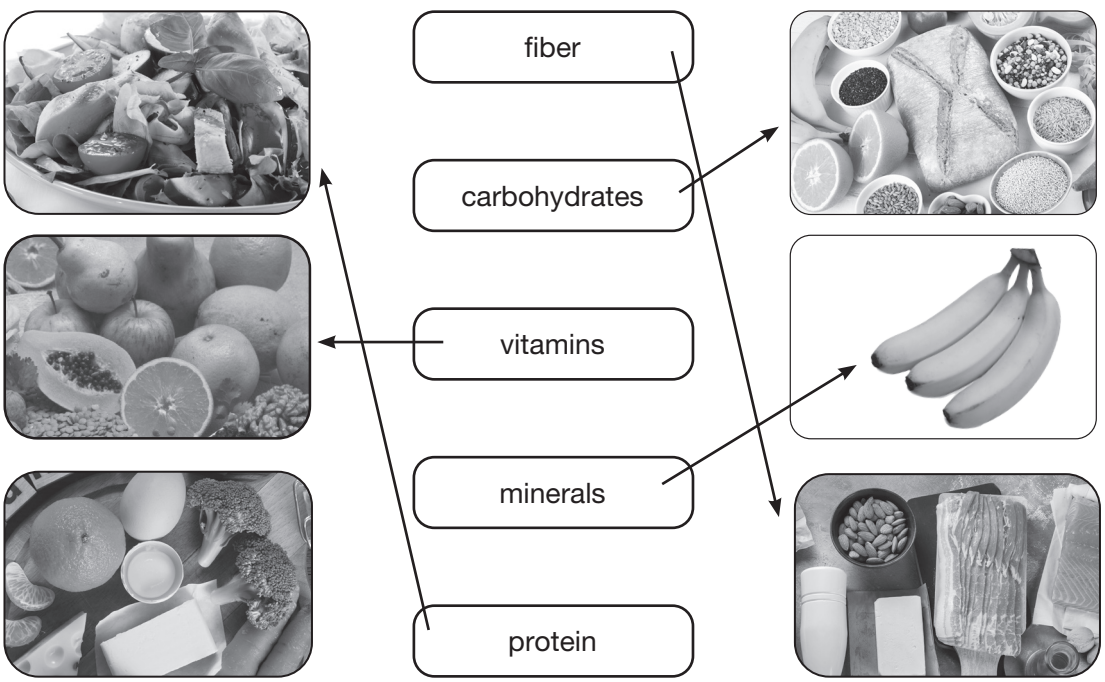
4. Fit for a Queen / King
   - Role play activity where the class participates.
   - One learner becomes the King/Queen, while others assume roles as advisors (fitness instructor, mother, doctor, etc.).
   - Candidates pitch ideal meals to the King/Queen, highlighting nutritional benefits, taste, and other features.
   - The King/Queen consults their advisors and hires the new personal chef.

Projects:

1. Collect labels from different dairy products and calculate the amount of calories consumed per week.
2. Research obesity, its definition, and causes, using reference books or the internet.
3. Find different countries where children are suffering from malnutrition.
   - Collect data from various sources about the role of UNICEF in addressing malnutrition.
   - Compile the information into a lab book.
4. Design a poster for the school canteen promoting a healthy balanced diet.
   - Include informative content and facts about the consequences of an unhealthy diet.

Workbook Answers

1.



2. B, D, F

3. i. Carbohydrates
   Fiber
   Potassium
   ii. 4.6g
   iii. No
   iv. Because it is rich of iron
   v. Because it is rich in potassium which lowers the blood pressure.
4. i. Bread and potato
   ii. Meat and lentils
   iii. Milk and cheese
   iv. Brown bread and green vegetables
   v. Apple and green vegetables
5.

Protein	Fat	Vitamin	Mineral	Carbohydrate
Meat	Butter	Orange	Spinach	Bread

6. i. Nutrients are the substances found in our food which are important for the growth of our body.
   ii. Eating a well-balanced diet can help you get the calories and nutrients you need to fuel your daily activities.
   iii. because it is not absorbed or digested by body.
7. i. water
   ii. vitamin C
   i. vitamins
   ii. proteins
   iii. vitamin A
8. Fish, salad, orange juice , beans, youghurt , bread
9. i. Water is needed to move all the nutrients around the body.
   Water helps the body cool down by sweating.
   ii. The people will get dehydrated which can lead to death.
10. i. Calcium
    ii. Milk
    iii. Hypocalcaemia
11. i. For healthy growth
    ii. Carbohydrate rich food like bread
    iii. Meat and lentils
    iv. Because he is not eating enough carbohydrates.
12. 1. Carbohydrates
    2. Fats
    3. Protein
    4. Vitamin (across) Vitamin A (down)
    5. Iron
    6. Vitamin C
    7. Minerals

CHAPTER 04

The Digestive System

Student Book Pages 49–58

Learning outcomes

- State the importance of digestion in the human body and describe physical and chemical digestion.
- Sequence the main regions of Alimentary Canal, its associated organs and describe the functions of different parts of the Alimentary Canal.
- Briefly describe the role of enzymes in digestion.
- Conclude that blood transports the products of digestion to other parts of the body and the undigested products get egested/defecated.

Overview of the Unit

- The alimentary canal, as well as your liver, pancreas, and gallbladder, make up your digestive system.
- The alimentary canal is a collection of hollow organs that connect from your mouth to your anus.
- The organs that make up your alimentary canal are, in order of connection, your mouth, oesophagus, stomach, small intestine, large intestine, and anus.
- Your digestive system is specially designed to carry out its function of converting food into the nutrients and energy you require to survive.
- After that, it neatly packages your solid waste, or stool, for disposal.
- Digestion is essential because your body requires nutrients from the food you eat and the liquids you drink to stay healthy and function properly.
- When you eat or drink something, your digestive system breaks it down and absorbs the nutrients so you can use them for vital functions like cell growth, repair, and energy.

Lesson Plan 1	Student Book pages	Time	Workbook pages
The Digestive System	49-51	45 mins	-

Student Learning Outcomes

State the importance of digestion in the human body and describe physical and chemical digestion.

Resources

Different coloured dough clay.
Chart paper
Marker
Pen and Paper

Engage (5 mins)

- You can engage students in a brief discussion to gain their attention.
- Ask them questions like,
  - Why do we chew our food when we eat?
  - What happens to the food after it is swallowed from the mouth cavity? Does it go right to your stomach?
- Introduce the terms “physical digestion” and “chemical digestion” to the students and ask if they have ever heard these terms before. Encourage them to share any initial thoughts or ideas they may have.

Explain (10 min)

- Explain that physical digestion involves the mechanical breakdown of food into smaller pieces through actions such as chewing and churning. Make a note of the definition on the board.
- Discuss the physical digestion organs, such as the mouth (with teeth and tongue), oesophagus, and stomach. Explain each organ’s specific role in the process.
- Define chemical digestion: Explain how enzymes and other substances are used to break down food into simpler molecules during chemical digestion. Make a note of the definition on the board.
- Discuss the salivary glands, stomach, and small intestine as they relate to chemical digestion. Explain each organ’s specific role in the process.

Explore (15 min)

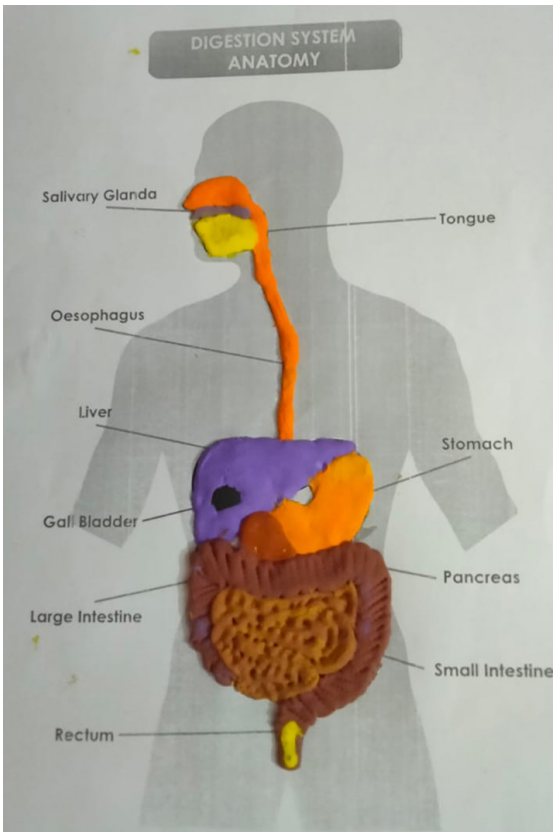
Students will make the digestive system model.

Useful Link

https://youtu.be/BgM3e8YZxuc

Procedure:

1. Draw the structure of the human digestive system on the chart paper.
2. Make the various organs with different coloured dough clay.
3. Label the organs of the system.



Elaborate: (5 min)

- Give each student a different nutrient deficiency scenario.
- Students should conduct research on the signs, symptoms, and consequences of the assigned nutrient deficiency.
- Allow students to share their personal experiences with the class, emphasizing the importance of a well-balanced diet and the role of the assigned nutrient in preventing deficiencies.

Evaluate (10 min)

Do discuss and answer page 38 of student book.

Homework

Create a nutrient chart or table with the six essential nutrient classes and examples of food sources.

Lesson Plan 2 Enzymes	Student Book pages 52	Time 45 mins	Workbook pages 24

Student Learning Outcomes

Briefly describe the role of enzymes in digestion.

Engage (5 mins)

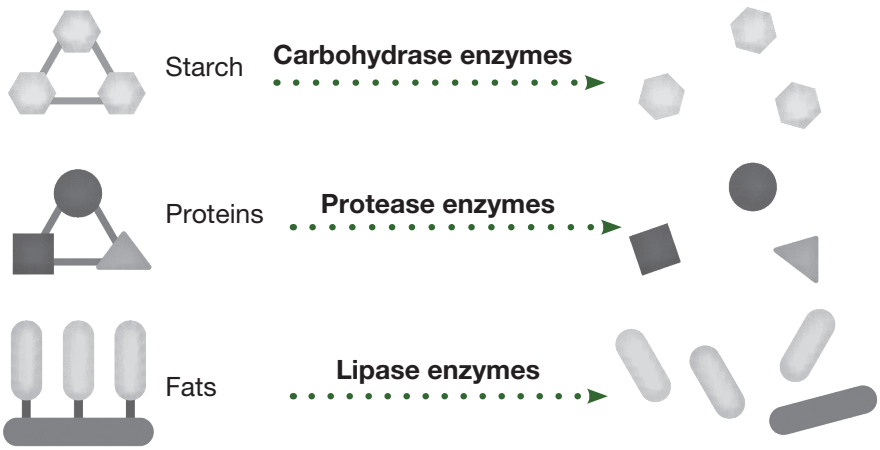
- You can begin the lesson by asking, "How would you feel if you had some superpower that empowered you to do your work very quickly?"
- Then connect this concept to the role of enzymes, which help several reactions that occur constantly in the human body to work very speedily. Similarly, enzymes help to speed up the digestion process.

Explain (10 min)

- An enzyme is a protein that acts as a biological catalyst. It accelerates a specific chemical reaction in the cell. The enzyme is not destroyed during the reaction and is reused.
- Digestive enzymes are substances that assist in the digestion of food.
- The salivary glands and the cells lining the stomach, pancreas, and small intestine secrete (release) them.
- Digestive enzymes break down large, complex molecules such as proteins, carbohydrates, and fats into smaller ones.
- Digestive Enzymes are classified into main three types.
- Amylase enzymes convert starches and carbohydrates into sugars.
- Protease Enzyme: This enzyme degrades proteins into amino acids.
- Lipase Enzyme: This enzyme converts lipids (fats and oils) into glycerol and fatty acids.

Resources

Experiment material mentioned in lesson plan



Keywords

Enzymes
Glands
Carbohydrase
Protease
Lipase

Explore (15 min)

Scientific Questions:

At what temperature the enzyme amylase is most effective?

Hypothesis:

If we increase the temperature, then amylase performance also increases.

Useful Link

https://youtu.be/Ej-WkJEaXNU

Experiment:

Material:

- Ice cubes,
- Three series of test tubes having iodine solution in each
- Water
- 15 ml 1% starch solution + 3 ml 1% NaCl,
- Saliva solution
- Test tubes
- Droppers
- Thermometer
- Bunsen burner
- Wire gauze.

Procedure:

1. Take a beaker and fill it with 15 mL of 1% starch solution and 3 mL of 1% NaCl solution.
2. Divide the solution into three test tubes and label them A, B, and C.
3. Maintain a 5°C temperature in the beaker containing the ice cubes.
4. Place a beaker containing ice cubes on the table.
5. Heat two more beakers containing water on the Bunsen burner.
6. Now, place experimental tube A in an ice-filled beaker.
7. Transfer the second experimental tube B to a 37°C water bath and the third experimental tube C to a 50°C beaker.
8. 1 mL saliva solution is transferred into test tube A using a dropper.
9. Similarly, fill test tubes B and C with 1 ml saliva solution.
10. Using a dropper, immediately transfer a few drops from experimental tube A to the first series of test tubes containing iodine solution.
11. Using fresh droppers, repeat the procedure for test tubes B and C, and transfer the solution into the second and third series of test tubes containing iodine solution.
12. Mark this time as a reading of zero minutes.
13. After 2 minutes, take a few drops from each tube and add to the iodine tubes, noting the change in iodine colour.
14. Continue the experiment every 2 minutes until the colour of the iodine does not change.

Analysis:

In nature, all enzymes consist of proteins. It takes less time to reach the achromic (end point where all starch converts into maltose) point at 37°C because the enzyme is most active at this temperature, whereas higher and lower temperatures take more time.

Conclusion:

The enzyme salivary amylase is deactivated at low temperatures and denatured at high temperatures. As a result, at lower and higher temperatures, the enzyme will take longer to digest the starch. Because the enzyme is most active at 37°C, it takes less time to digest the starch.

Elaborate: (5 min)

- Following the experiment, a discussion about ‘why only amylase enzyme breaks down starchy food’ can be carried.
- The lock and key theory is one possible explanation for this; only one type of enzyme(amylase)

can break down starch. According to the analogy, the substrate serves as the key, and the enzyme serves as the lock. Only the proper substrate (key) will fit into the keyhole (active site) of the lock (enzyme).

Evaluate (10 min)

Worksheet 4.2 will be given to solve.

Homework

Do Q4 on page 24 of workbook.

Lesson Plan 3	Student Book pages	Time	Workbook pages
Liver and Pancreas	52–53	45 mins	23

Student Learning Outcomes

Sequence the main regions of Alimentary Canal, its associated organs and describe the functions of different parts of the Alimentary Canal.

Engage (5 mins)

- Inquire if students have heard of the liver and pancreas, and what they believe these organs do in our bodies.
- Display the diagrams of the liver and pancreas on posters and ask students to share any initial thoughts or ideas about their functions.
- Explain that they will learn about the liver and pancreas in this lesson, two important organs involved in digestion and metabolism.

Explain (10 min)

- Explain that the liver is the largest glandular organ in the body and serves many functions. Make a note of the definition on the board.
- Discuss the liver's key functions, such as the production of bile to aid in fat digestion, the storage of glycogen for energy, the detoxification of harmful substances, and the production of proteins. Describe the significance of each function.
- Explain that the pancreas is an endocrine and exocrine gland that plays important roles in digestion and blood sugar regulation. Make a note of the definition on the board.
- Discuss how the pancreas produces digestive enzymes to break down carbohydrates, proteins, and fats, as well as insulin to regulate blood sugar levels. Explain why each function is important.

Explore (15 min)

- Distribute the handout containing information about the functions of the liver and pancreas.
- Request that students read the handout individually or in small groups, emphasizing the key functions of the liver and pancreas.
- Encourage them to compare and discuss their findings, making note of any questions or points of interest.

Elaborate: (5 min)

- Divide the class into small groups.
- Give each group a large sheet of chart paper and markers.
- Assign each group a specific function of the liver or pancreas (e.g., the liver's role in glycogen storage, the pancreas' role in insulin production).
- Instruct the groups to use the chart paper to create a visual representation of their assigned function. They can illustrate the process or concept with drawings, labels, and colours.

Useful Link

https://youtu.be/jqrVl4V5ttQ

- Encourage the groups to talk about and collaborate on their visual representation, making sure that it accurately represents the function to which they were assigned.
- Allow them about 5 minutes to finish their drawings.
- When the timer goes off, have each group present their visual representation to the class and explain the function they depicted.
- Facilitate a class discussion by asking clarifying questions and encouraging other students to ask questions or provide additional insights as each group presents.
- After all of the groups have given their presentations, summarize the key functions of the liver and pancreas as a class, emphasizing the importance of these organs in digestion and metabolism.

Evaluate (10 min)

Do Q3 (vi) page 56 and Concept Check page 53 of student book.

Homework

Do Q2 page 23 of workbook.

Lesson Plan 4	**Student Book pages**	**Time**	**Workbook pages**
Problems with the digestive System	53–54	45 mins	24–25

Student Learning Outcomes

Briefly describe problems related to digestive system.

Resources

Markers
Diagrams of the digestive system
Whiteboard and markers
Scenario cards
Whiteboard and markers

Engage (5 mins)

- Begin the lesson by asking students if they have ever experienced any digestive discomfort or problems, such as stomachaches, bloating, or indigestion. Encourage them to share their insights.
- You can also show the video.
- Explain that in this lesson, they will learn about common digestive system problems and how to avoid them.

Explain (10 min)

- Introduce the idea of digestive system issues: Explain that the digestive system can occasionally experience problems that cause it to malfunction. Make a note of the definition on the board.
- Talk about common digestive system issues like indigestion, acid reflux, constipation, and diarrhoea. Explain the causes, symptoms, and possible preventative measures.
- To support a healthy digestive system, emphasize the importance of eating a healthy diet, staying hydrated, and practicing good hygiene.

Keywords

Indigestion
Diarrhoea
Constipation

Explore (15 min)

- Break the class up into small groups.
- Assign a specific digestive system problem to each group (e.g., indigestion, acid reflux, constipation).
- Give each group a set of scenario cards describing a situation related to the assigned digestive problem.

- Instruct the groups to read the scenario cards and discuss how they would deal with the problem, including potential solutions or preventive measures.
- Encourage them to think critically and to consider factors such as diet, hydration, lifestyle habits, and, if necessary, seeking medical advice.
- Following the discussion, have each group share one scenario with the rest of the class, along with their proposed solutions or preventive measures.
- Facilitate a class discussion to compare and contrast the various approaches proposed by the groups.

Elaborate: (5 min)

- Facilitate a discussion about the importance of keeping a healthy digestive system and avoiding digestive problems through proper nutrition, hydration, and lifestyle habits.
- Discuss how specific foods, such as high-fiber foods, can help prevent constipation, or how avoiding trigger foods can help reduce acid reflux symptoms.

Evaluate (10 min)

Do Q5 (ii and iii) of student book page 57.

Homework

Do Q6 and Q9 page 24-25 of workbook.

Lesson Plan 5	**Student Book pages**	**Time**	**Workbook pages**
Transport of Nutrients	54	45 mins	26

Engage (5 mins)

- Begin the lesson by asking students to consider how the food they eat gets to different parts of their bodies. Encourage them to share their ideas with a partner.
- Inquire whether students have any observations or ideas about how nutrients and waste are transported in the body.
- Explain that they will learn about the transport of nutrients via blood vessels and the elimination of undigested waste via defecation in this lesson.

Explain (10 min)

- Explain nutrient transport: After digestion, the products of food breakdown are absorbed into the bloodstream and transported to various parts of the body. Make a note of the definition on the board.
- Discuss how blood vessels, specifically capillaries, transport nutrients to organs, tissues, and cells. Explain how the bloodstream acts as a nutrient delivery highway.
- Explain the concept of defecation: Explain how the body eliminates undigested waste, such as fiber and other indigestible materials, through the process of defecation. Make a note of the definition on the board.
- Discuss the large intestine and rectum's roles in waste storage and elimination, emphasizing the importance of proper waste removal in maintaining a healthy body.

Keywords

Egestion
Waste
Transport

Explore (15 min)

Show them the videos.

Elaborate: (5 min)

- Break the class up into small groups.

Useful Link

https://youtu.be/HXrl37BC3QU
https://youtu.be/lymyPXtDV3k

- Give each group a set of role cards that represent various organs involved in nutrient transport and waste elimination (for example, small intestine, liver, large intestine, rectum).
- Instruct the groups to read their role cards and discuss the specific functions and contributions of their assigned organs in the nutrient transport and waste elimination processes.
- Encourage them to consider how these organs interact and rely on one another to function properly.
- Following the discussion, ask each group to present their assigned organ and its role to the rest of the class, emphasizing the organs' interdependence.

Elaborate: (10 min)

- Facilitate a discussion about the importance of nutrient transport in terms of providing energy and building blocks for the body, as well as the importance of proper waste elimination in terms of maintaining digestive health.
- Discuss how a healthy diet, adequate hydration, and regular physical activity aid in nutrient transport and digestion.

Evaluate (10 min)

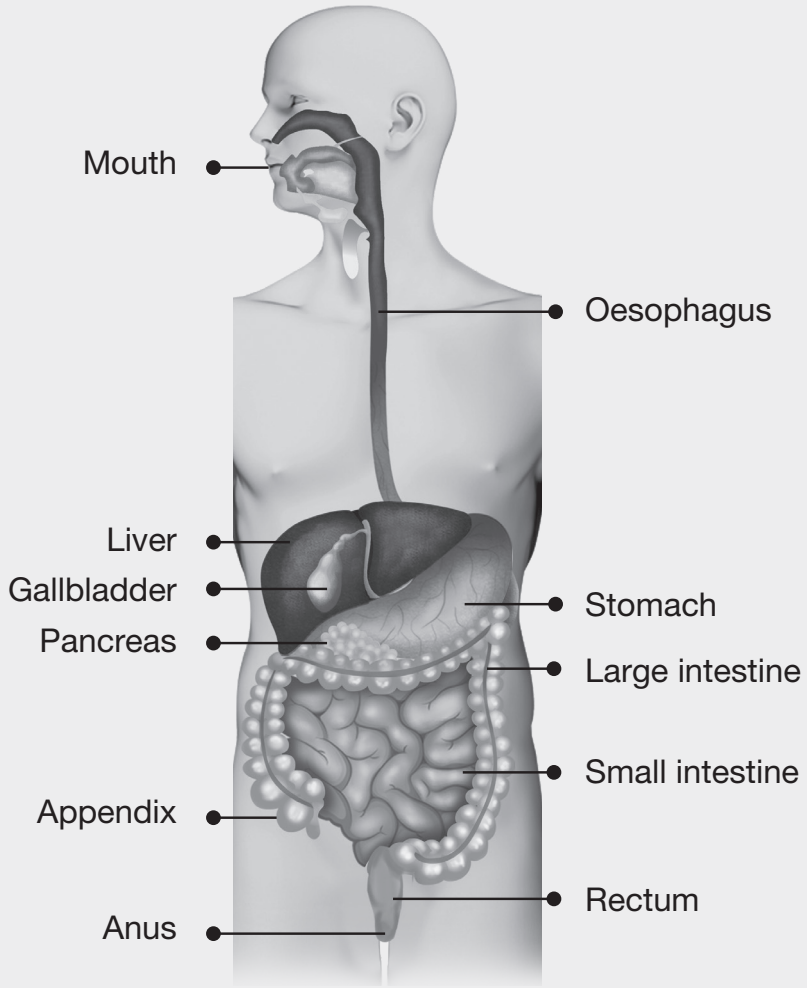
Instruct students to draw and label a diagram depicting the process of nutrient transport in the body, as well as a diagram depicting the process of defecation.

Homework

Do Q10-11 on page 26 of workbook.

Worksheet 1

Match the organ with its function:



Acids and enzymes are released to help in the chemical breakdown of food.

Cut and grind food.

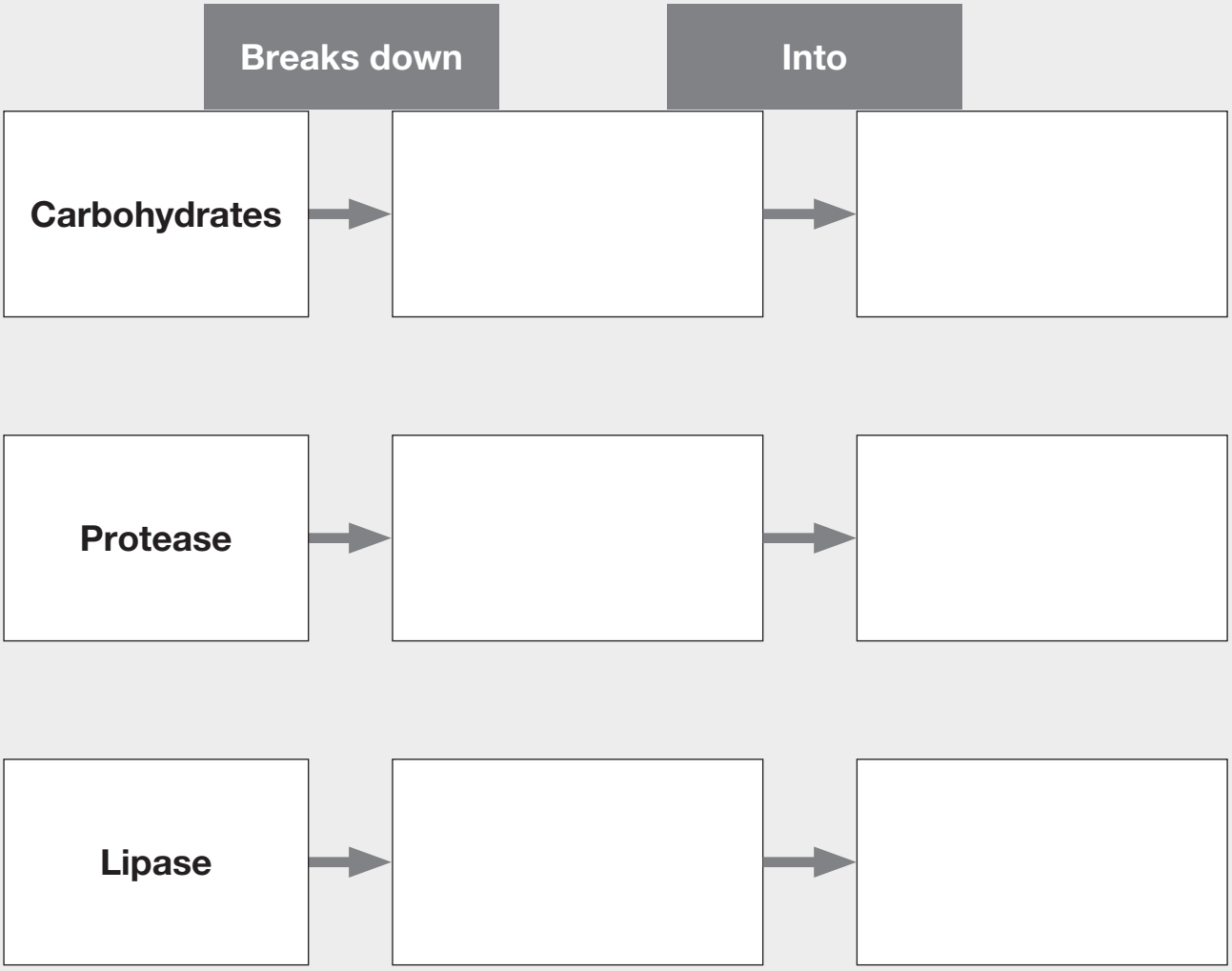
Water Absorption and Stool Formation.

With the help of muscular contractions, it transports food through the thoracic cavity.

completing the digestion of various types of food and absorption of the digested food.

Worksheet 2

Complete the following diagram:

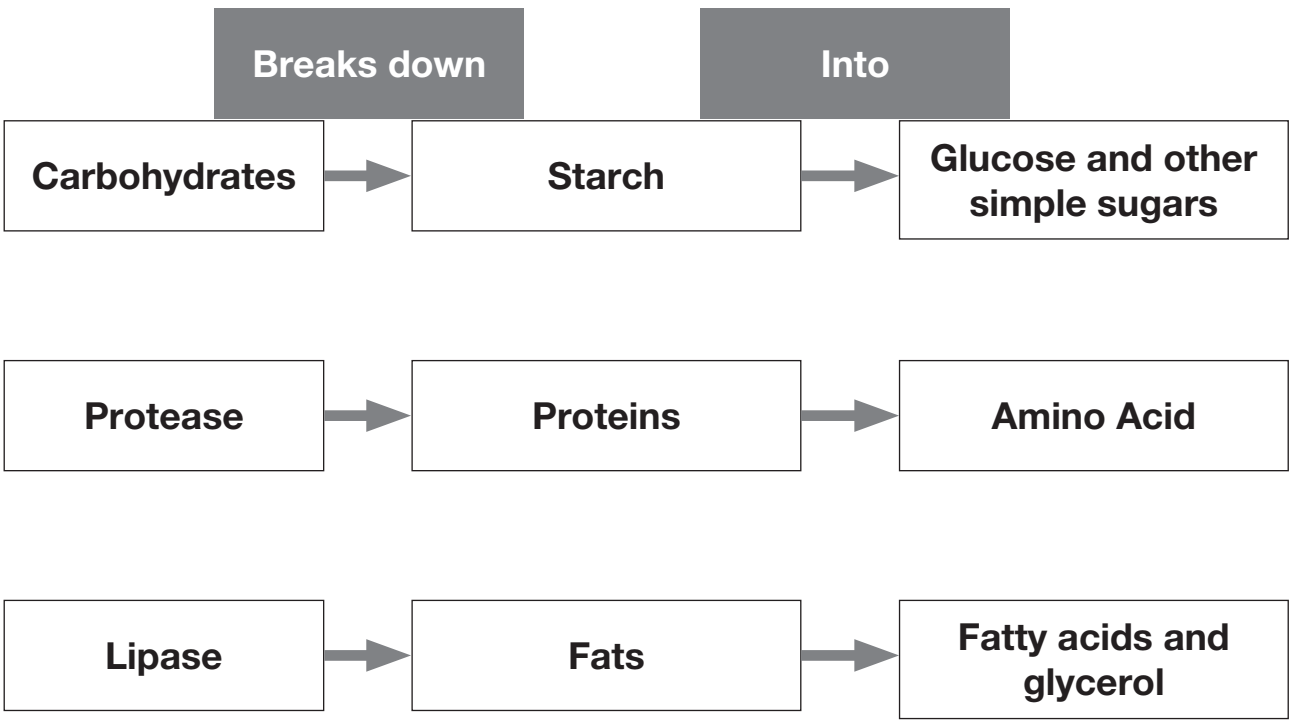


Answers for Worksheet 1

1. The teeth are used to cut and grind food.
2. With the help of muscular contractions, the esophagus transports food through the thoracic cavity.
3. Acids and enzymes are released to help in the chemical breakdown of food.
4. completing the digestion of various types of food and absorption of the digested food.
5. Water Absorption and Stool Formation.

Answers for Worksheet 2

Complete the following diagram:



Exercise Answers

1. Choose the correct answer:
   i. (b) small intestine
   ii. (d) appendix
   iii. (b) proteins
   iv. (b) acidic
   v. (c) increase the surface area

2. Fill in the blanks:
   i. Faeces is stored temporarily in the rectum.
   ii. Digestion is the breaking down of large food molecules into smaller ones.
   iii. Digestion is completed in the small intestine.
   iv. The path that food takes from the mouth to the anus is called the digestive tract or alimentary canal.
   v. The nutrients are small enough to pass into the bloodstream. This is called absorption.
3. Write the letter A to I in correct order to show process of digestion.
   i) h) Waste is passed out through it. (Anus)
   ii) f) Chewed food is pushed down by waves of muscular contraction. (Esophagus)
   iii) e) Produces three enzymes which also digest proteins, carbohydrates, and fats. (Pancreas)
   iv) c) Bile is stored here. (Gallbladder)
   v) i) Bile is made by this organ. (Liver)
   vi) a) Food is stored here for a few hours. (Stomach)
   vii) g) Water and mineral salts are removed from the undigested food. (Large Intestine)
   viii) b) Food is pushed through from the stomach. (Small Intestine)
   ix) d) Remaining undigested material is stored as faeces. (Rectum)
4. Short answer questions:
   i. The two ways in which food is broken down during digestion are mechanical digestion (chewing, mixing, and churning) and chemical digestion (enzymatic breakdown).
   ii. We need to digest our food to break it down into smaller molecules that our body can absorb and use for energy, growth, and repair.
   iii. The enzymes involved in the breakdown of food include amylase (digests starch), protease (digests proteins), and lipase (digests fats).
   iv. Physical digestion is carried out mainly in the mouth and stomach.
   v. The two jobs done by saliva are moistening and lubricating food for easier swallowing, and beginning the digestion of starches through the action of the enzyme amylase.
   vi. The organ that produces bile to break down fats is the liver.
   vii. Digestion refers to the process of breaking down food into smaller, simpler molecules that can be absorbed and used by the body. It occurs mainly in the digestive tract or alimentary canal.
   viii. Fiber (cellulose) is still important in our diet because it aids in maintaining healthy digestion, adds bulk to the feces, and helps prevent constipation.
5. Long answer questions:
   i. The three nutrients that are broken down during digestion are carbohydrates (broken down into simple sugars), proteins (broken down into amino acids), and fats (broken down into fatty acids and glycerol).
   ii. a) The most likely causes of constipation include low fiber intake, inadequate fluid intake, lack of physical activity, and certain medications.
   b) To reduce the chances of becoming constipated, one can increase fiber intake, drink plenty of fluids, engage in regular physical activity, and establish a regular bathroom routine.
   c) Constipation can be cured by making dietary and lifestyle changes such as increasing fiber, fluids, and physical activity, and in some cases, using over-the-counter laxatives as

directed by a healthcare professional.

iii. a) The most likely causes of diarrhea include viral or bacterial infections, food poisoning, and certain medications.

b) To reduce the chances of getting diarrhea, one should practice good hygiene, such as washing hands regularly, and avoid consuming contaminated food or water.

c) Diarrhea can be cured by staying hydrated, resting, and following a bland diet. In severe cases, medical treatment may be necessary.

iv. The mouth helps in the mechanical breakdown of food through chewing and mixing with saliva. The stomach performs both mechanical and chemical digestion by mixing food with gastric juices and enzymes. The small intestine is responsible for completing digestion and absorbing nutrients. The large intestine primarily absorbs water and electrolytes, and it helps in the formation and elimination of feces.

v. Glucose molecules do not have to be digested because they are already in a form that can be readily absorbed by the body. Starch molecules, on the other hand, are complex carbohydrates that need to be broken down into simpler sugars (like glucose) through the process of digestion before they can be absorbed.

vi. The villi in the small intestine are perfect for absorbing food because they greatly increase the surface area available for absorption. They have a finger-like shape and are covered in microvilli, which further increase the surface area for nutrient absorption. Additionally, the villi are rich in blood vessels and lymphatic vessels, allowing for efficient absorption and transport of nutrients.

vii. Mechanical digestion refers to the physical breakdown of food into smaller pieces through actions like chewing, mixing, and churning. Chemical digestion involves the enzymatic breakdown of complex food molecules into simpler substances that can be absorbed by the body.

viii. The liver produces bile, which is stored and concentrated in the gallbladder. Bile is released into the small intestine to aid in the digestion and absorption of fats. The pancreas produces digestive enzymes (such as amylase, protease, and lipase) that are released into the small intestine to further break down carbohydrates, proteins, and fats, respectively.

Think about it:

i. The gallbladder is involved in digestion as it stores and concentrates bile produced by the liver. When needed, the gallbladder releases bile into the small intestine to aid in the digestion and absorption of fats. Although the gallbladder is considered an accessory organ because it is not essential for survival, its role in storing and releasing bile supports the process of digestion.

ii. Saliva aids in both mechanical and chemical digestion of food. Mechanically, saliva moistens and lubricates food, making it easier to chew and swallow. It also helps in the formation of a bolus, which is a soft mass of partially chewed food. Chemically, saliva contains an enzyme called amylase, which starts the breakdown of starches into smaller sugars. The amylase in saliva initiates the chemical digestion of carbohydrates even before the food reaches the stomach.

iii. a) Based on the list of food, Faiz has eaten the most balanced lunch.

b) Faiz has a balanced lunch because his meal includes a mix of different food groups. He has vegetables (salad) for nutrients and fiber, protein (fish) for muscle development, and a source of vitamin C (orange juice) for immune support. This combination of food groups makes his lunch more balanced compared to the other brothers who have mostly indulged in foods that are higher in sugar and unhealthy fats.

Activities:

1. When chewing a piece of dry bread for a minute or two without swallowing it, you may notice that the taste and texture of the bread change. The bread becomes softer and easier to break down as saliva mixes with it. The enzymes present in saliva start to break down starches into simpler sugars, leading to a slightly sweeter taste.
2. Experiment:
    i. To prove that an enzyme will only digest one type of food, you can set up multiple test tubes or containers with different food substrates (e.g., starch, protein, fat) and add specific enzymes to each. Observe the reactions and note that each enzyme will only break down its specific substrate.
    ii. To demonstrate that finely ground food digests faster than large solid lumps with the same volume, you can prepare two samples of the same food (e.g., cracker) with one finely ground and the other in a larger solid form. Add the same enzyme to each sample and observe the rate of digestion, noting that the finely ground sample will digest faster due to increased surface area.
    iii. To investigate the effect of temperature on enzyme activity, you can set up multiple test tubes or containers with the same food substrate and enzyme solution. Place each container in a water bath at a different temperature (e.g., 10°C, 20°C, 30°C, 40°C, 50°C). Measure the time it takes for each sample to digest and record the results. You will likely observe that enzymes work best at warm temperatures (around 20°C), and their activity decreases or becomes denatured at temperatures above 60°C.
3. Obesity is a condition characterized by excess body fat accumulation, leading to negative effects on health. It is caused by a combination of genetic, environmental, and lifestyle factors. These factors include overconsumption of calories, sedentary lifestyle, genetic predisposition, hormonal imbalances, and psychological factors.
4. Herbivores can digest grass because they have specialized digestive systems and symbiotic relationships with microorganisms that can break down cellulose, the main component of grass. Humans lack the necessary enzymes and microorganisms to efficiently digest cellulose, which is why grass is not a significant part of our diet.
5. Some athletes take glucose tablets before a race to provide a quick source of energy. Glucose is a simple sugar that can be rapidly absorbed and used by the body for fuel during intense physical activity. It helps to replenish glycogen stores in the muscles and maintain blood sugar levels, supporting performance and endurance.
6. Model of the Alimentary Canal:
    i. Materials: Cardboard cut-outs (rectangular), cardboard rolls, tape, scissors, paint.
    ii. Students can use the materials provided to construct a model of the alimentary canal. They can create the different organs using cardboard cut-outs and rolls to represent the mouth, esophagus, stomach, small intestine, large intestine, and rectum. They should arrange the organs in the correct order and connect them to show the pathway of food during the process of digestion from the mouth to the rectum.
7. Pass the Parcel Role Play:
    i. Divide students into groups where one student plays the role of a human eating a certain food, and the other students play the organs involved in the digestive system (mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum).
    ii. Use a small bowl of shredded paper to represent the masticated food. The student playing the human passes the “food” to the mouth, and the other students act out the process of digestion as the “food” travels through the different organs.

iii. Each student representing an organ should explain how they process the food and discuss any challenges specific to their organ. The activity helps to illustrate the sequential process of digestion and the role of each organ in the digestive system.

8. Jigsaw for Digestive Disorders:
   i. Divide students into expert groups, with each group focusing on a specific digestive disorder such as diarrhea, constipation, gastroenteritis, ulcers, celiac disorder, or GERD.
   ii. Provide each group with a one-pager document on their assigned disorder, which includes information on causes, symptoms, and remedies/prevention strategies.
   iii. After the expert groups have discussed their assigned disorders and explored answers to guiding questions, reorganize the groups into jigsaw groups where each member represents a different expert group. Each member then presents their findings on the digestive disorder they have learned about to the rest of their group, sharing key information and insights.

Projects:

1. Collecting labels from different dairy products and calculating the amount of calories consumed per week:
   - Collect labels from various dairy products such as milk, yogurt, cheese, and butter.
   - Note down the nutritional information on each label, including the serving size, calories per serving, and the number of servings per container.
   - Calculate the total calories per serving for each dairy product by multiplying the calories per serving by the number of servings.
   - Sum up the total calories from all the dairy products to determine the weekly calorie intake.
2. Researching countries affected by malnutrition and documenting the role of UNICEF:
   - Gather information from reliable sources about countries where malnutrition is prevalent among children.
   - Compile data on the extent and impact of malnutrition in each country, including statistics on undernourishment, stunting, wasting, and micronutrient deficiencies.
   - Research the role of UNICEF (United Nations Children's Fund) in addressing malnutrition in these countries. Explore their programs, initiatives, and interventions aimed at combating malnutrition, improving nutrition outcomes, and ensuring children's well-being.
   - Create a lab book or report that highlights the countries affected by malnutrition, the specific nutritional challenges faced by children in each country, and the efforts undertaken by UNICEF to address these issues. Include data, case studies, and success stories to provide a comprehensive overview.

Workbook Answers

1.

Big molecule	Enzymes	Small molecules
Fats	Lipase	Fatty acids and glycerol
Starch	Carbohydrase	Glucose
Protease	Protease	Amino acids

2. i. Stomach
   ii. Gall bladder

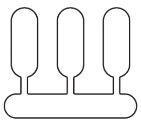
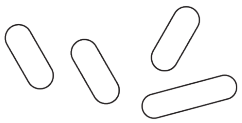
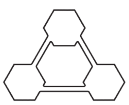
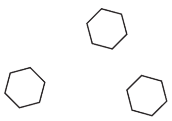
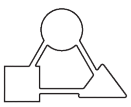
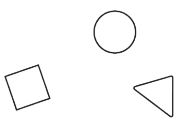
iii. Pancreas
iv. Oesophagus
v. Small intestine

3. Mouth, oesophagus, stomach, small intestine, large intestine, rectum, anus

4.

Column A	Column B
Digestion	Nutrients become small enough to pass through the intestine and mix into the blood
Absorption	A system that is made up of organs that starts from the mouth and ends at the anus
Digestive system	Molecules of food breaks down into small molecules

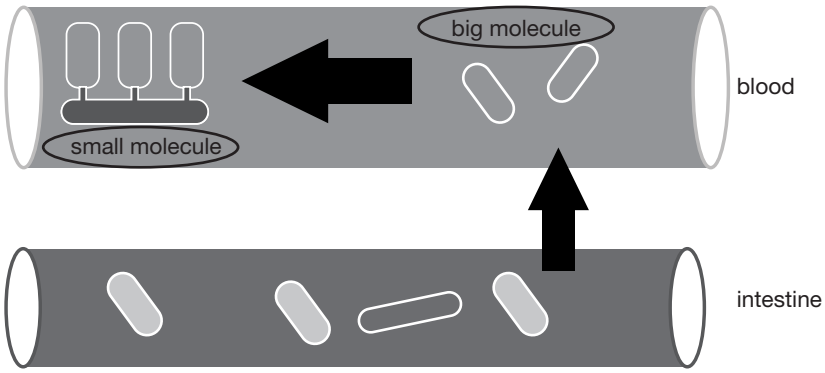
5.

Big molecule	Enzymes	Small molecule
	Lipase	
	Protease	
	Carbohydrase	

6. Refer textbook for diagram.
7. i. Chewing of the ingested food inside the mouth is called Mechanical digestion or physical digestion.
   ii. The villi absorb food.
   iii. fats
   iv. Salivary glands, the pancreas, the liver, and the gallbladder.
   v. It is caused when there is lack of water and fibre in diet which causes the faeces to become hard and dry to pass.
8.

Glands	Organs where it acts
Liver	Small intestine
Pancreas	Small intestine
Salivary glands	Mouth

8.



9. Blood pressure
10. i. mouth
    ii. gall bladder
    iii. anus
    iv. pancreas
    v. rectum
    vi. small intestine
    vii. stomach
    viii. oesophagus
11.

A: Parts of the digestive system	B: Functions
gullet or oesophagus	mixes food with saliva
tongue	absorbs water
stomach	stores bile
large intestine	pushes food into the stomach
liver	produces insulin and enzymes
pancreas	produces hydrochloric acid
salivary glands	store faeces
small intestine	produces salivary amylase
gall bladder	absorbs digested food
rectum	produces bile

12. 1. Oesophagus
    2. Small intestine
    3. Rectum
    4. Liver
    5. Mouth
    6. Stomach
    7. Pancreas

CHAPTER 05 Matter

Student Book Pages 66–76

Learning outcomes

- Explain the Particle Theory of Matter.
- Use particle model of matter to investigate the movement and arrangement of particles in three states.
- Explain why gases and liquids take the shape of their containers but solids do not, in terms of the Particle Theory of Matter
- Discuss, using the particle theory of matter, why liquids and gases can flow easily but solids cannot.
- Interpret the evidence for the existence of the particles in matter by observing daily life examples (adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water).
- Apply the particle theory of matter to explain diffusion.
- Explain the changes in states: Melting, freezing, evaporation, condensation, and sublimation, using the particle model of matter.

Overview of the Unit

- Anything with mass and physical space is considered a matter.
- There are numerous forms of matter, such as a pen, paper, clip, sand, air, ice, etc.
- A state of matter is one of the various forms that matter can take.
- The basic three states of matter are as follows:
  - Solid
  - Liquid
  - Gas
- According to the kinetic theory of matter, all matter is made up of small particles that move randomly and have space between them. This means that matter is made up of separate, moving particles regardless of its phase.
- A physical change in a matter is referred to as a change of state. When matter loses or absorbs energy, it state changes.
- These changes are reversible and do not involve any changes in the matter's chemical makeup. Examples of change in the state of matter are:
  - Melting,
  - Freezing
  - Sublimation
  - Condensation
  - Vaporization
  - Brownian motion describes the random movement of small particles suspended in fluids. It is commonly known as the Brownian movement." This motion is caused by particle collisions with other fast-moving particles in the fluid.

Lesson Plan 1	Student Book pages	Time	Workbook pages
Matter and States of Matter	66–68	45 mins	-

Student Learning Outcomes

- Explain the Particle Theory of Matter.
- Use particle model of matter to investigate the movement and arrangement of particles in three states.

Resources

Duster
Marker
Water in a cup
Ink in a bottle
A gas-filled balloon.
Images of different items
Chart paper and colourful markers

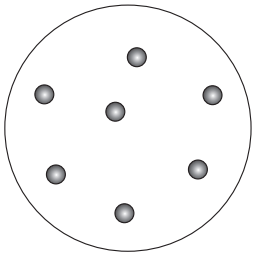
Engage: (5 min)

- Collect all three states of matter on your table, such as a duster, marker, water in a cup, ink in a bottle, and a gas-filled balloon.
- Now, ask students to explain the distinction between these items. Can they assist you in sorting them into various categories?
- They will assist you in categorizing them into three groups, solids, liquids, and gases.

Explain: (10 min)

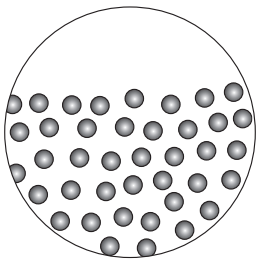
According to the kinetic theory of matter, a substance can be a solid, liquid or gas and has distinct properties in each state. Some of them are:

Gas



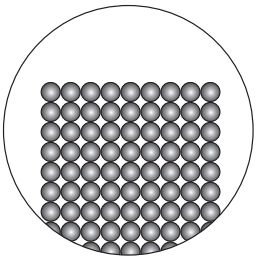
- Particles in gases are far apart from one another.
- The particles can move freely because there is little force of attraction between them.
- Gases do not have a fixed volume or shape.

Liquid



- Particles in a liquid state of matter are less tightly packed than those in a solid state.
- Liquids adopt the shape of the container in which they are stored.
- Liquids are difficult to compress because particles have less space to move in.

Solid



- Particles in solids are tightly or closely packed.
- Because the gaps between the particles are so small, compressing them is difficult.
- The volume and shape of a solid are fixed.

Keywords

Matter
Solids
Liquids
Gases

Explore: (15 min)

Activity

- Students should be divided into groups.
- Collect 8-10 items for students to use in determining the properties of each type of matter.
- Allow time for each group to determine the state of matter and its properties.

Elaborate: (10 min)

Students will make posters to take help in describing the properties of three states of matter.

Evaluate: (5 min)

- Do Concept check page 68 of student book.
- Do Q3(ii) on page 75 of student book.

Useful Link

https://youtu.be/OTksau0_VoI

Home Assignment:

Provide copies of worksheet 5.1 to complete at home.

Do Q6(ii-iv) on page 75 of student book.

Lesson Plan 2	**Student Book pages**	**Time**	**Workbook pages**
Liquids and gases can flow easily but solids can't	68	45 mins	29

Student Learning Objectives

- Use particle model of matter to investigate the movement and arrangement of particles in three states.
- Explain why gases and liquids take the shape of their containers but solids do not, in terms of the Particle Theory of Matter

Engage: (5 min)

- Begin the lesson by displaying three different containers to the students: a glass of water, an air-filled balloon, and a wooden block.
- Instruct the students to examine the shape of each material and discuss why water and air take the shape of their containers but the wooden block does not.
- Encourage students to share their observations and ideas.

Explain: (10 min)

- Introduce the concept of the particle theory of matter. Explain that all matter is made up of tiny moving particles (atoms or molecules).
- Explain how the particles in solids are tightly packed and have a fixed arrangement, which is why solids keep their shape.
- Explain how particles in liquids are still close together but have more freedom to move, allowing liquids to take on the shape of their containers.
- Explain how gases have particles that are much farther apart and have high mobility, which allows them to expand and fill any container they are placed in.

Resources

Three different containers: a glass of water, a balloon filled with air, and a wooden block.

Visual aids or diagrams to illustrate the particle theory of matter.

Whiteboard and writing materials.

Three containers for the activity: one with marbles (representing solid), one with water (representing liquid), and one with air (representing gas).

Sets of cards representing different states of matter.

Drawing materials (papers, pencils, or markers.

Images of different items

Chart paper and colourful markers

Explore: (15 min)

- To reinforce the concepts, carry out a simple activity. Provide three containers to students: one with marbles (representing solid), one with water (representing liquid), and one with air (representing gas).
- Students should notice how the marbles do not change shape, how the water takes the shape of its container, and how the air can be easily poured into another container.
- Assist students in making the connection between their observations and the particle theory of matter and its explanation for the behaviour of solids, liquids, and gases.

Keywords

Mass
Compress
Volume
Particles

Elaborate: (10 min)

- Divide the class into small groups and distribute a set of cards representing different states of matter (solid, liquid, and gas) to each group.
- Request that the groups sort the cards and explain their reasoning using the particle theory of matter.
- Encourage students to talk about real-life examples of each state of matter and how particle arrangement and movement affect their observed behaviour.

Evaluate: (5 min)

- Ask each student to draw a diagram of particle arrangement in solids, liquids, and gases, along with a brief explanation of how it relates to their behaviour, as a formative assessment.
- Engage the students in a class discussion during which they can present their diagrams and explanations.

Home Assignment:

- Sort your household materials into three categories: solids, liquids, and gases. Make a list of each category's items and describe their appearance and behaviour using the particle theory of matter. Why, for example, does ice retain its shape while water takes on the shape of its container? In a paragraph, explain your findings.
- Do Q4 on page 29 of workbook.

Useful Link

https://youtu.be/IIIEm488wxY

Lesson Plan 3	Student Book pages	Time	Workbook pages
Heat can change the state of matter	70–72	45 mins	33

Student Learning Outcomes

Explain the changes in states: Melting, freezing, evaporation, condensation, and sublimation, using the particle model of matter.

Keywords

Melting
Freezing
Boiling
Condensation
Evaporation

Engage: (5 min)

Begin your lecture with a small experiment. Place an ice cube on a plate. When the ice cube melts, ask students,

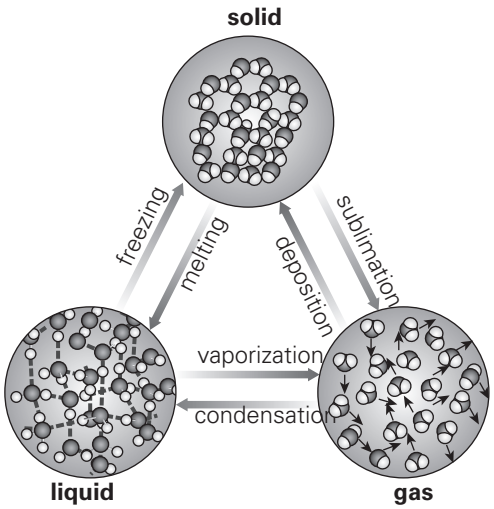
- What causes this to happen?
- Can we turn this back into ice?
- Is it possible for this water to transform into the third state, i.e. gas? If yes, then how?

Useful Link

https://youtu.be/cX4X9-f3_OA

Explain: (10 min)

Phase Changes of Matter



- Explain through everyday life examples (like making of ice-cream, baking cake, freezing ice etc.)

Explore: (15 min)

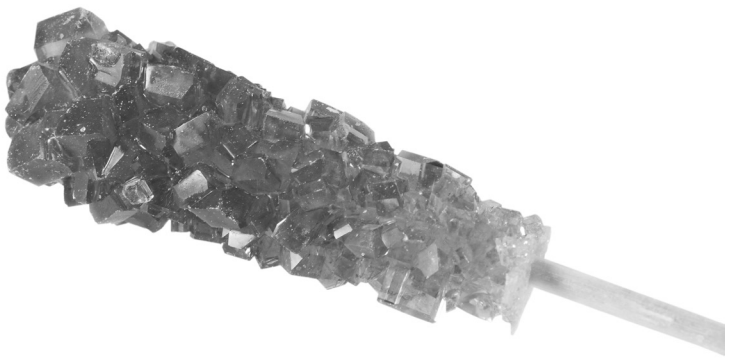
Students can see how sugar is transformed using this simple experiment.

Material:

- String
- Pencil
- Sugar
- Measuring spoon
- Scissors
- Pan
- Water
- Stove
- Glass
- Button

Procedure:

- Step 1: Turn off the heat after bringing a small pan of water to a boil.
- Step 2: Stir in one tablespoon of sugar until it dissolves.
- Step 3: Add sugar one tablespoon at a time, letting each tablespoon completely dissolve before adding the next. Allow the saturated solution to cool when no more sugar will dissolve in the water.
- Step 4: Tie a string around the center of a pencil and place it across the rim of a glass. Cut the string so that it just touches the glass's bottom. Attach a button to the string's bottom.
- Step 5: Fill the glass with the cooled sugar water. Place the pencil across the rim of the glass, so the string and button are sunk in the solution.
- Step 6: Leave the glass alone in a warm place for several days to allow the water to evaporate. Sugar crystals will form on the string as the water evaporates, making a rock candy.



Elaborate: (10 min)

Describe the various methods for changing the state of matter that were used in this experiment.

Evaluate: (5 min)

- Provide worksheet 5.2 and ask the students to solve it by themselves.
- Do Concept Check pg. 72

Home Assignment:

- Observe and document a real-life example of a state change caused by heat. Explain the process and draw a before-and-after diagram showcasing the change in the arrangement of particles.

Do Q11 on page 33 of workbook.

Lesson Plan 3	Student Book pages	Time	Workbook pages
Brownian motion Diffusion	70	45 mins	33-34

Student Learning Outcomes

Apply the particle theory of matter to explain diffusion.

Engage: (10 min)

- Begin by asking students if they've ever noticed how smells can travel and spread throughout a room.
- Bring in something with a distinct odour, such as a piece of fruit or a scented candle.
- In order to pique their interest, ask them how they believe the smell spreads and fills the room.

Resources

A scented candle.
A container of hot water
Whiteboard and board marker

Explain: (10 min)

- Give a brief explanation of diffusion, defining it as the movement of particles from a high-concentration area to a low-concentration area.
- Explain how the small particles move and mix with the air particles, gradually spreading throughout the room, to illustrate the concept of diffusion.

Keywords

Diffusion
Brownian motion

Explore: (10 min)

- Set up a demonstration using a container of hot water or a hot plate for producing steam.
- Allow the steam to rise and spread by placing the container on one side of the room.
- Instruct students to observe how the steam particles move and spread.
- Encourage them to take notes and record their observations, paying special attention to how the steam particles move and fill the space.

Elaborate: (10 min)

- Ask students to share their observations and discuss the evidence for diffusion they gathered during the steam activity.
- Write down their responses on the board or chart paper, emphasizing key points about particle movement and steam particle spread.
- Connect their findings to the idea that diffusion occurs because matter particles are constantly moving and tend to spread out to achieve a more even distribution.

Useful Link

https://youtu.be/LUPHohqlPTU

Evaluate: (5 min)

- To test student comprehension, give each student a scenario involving diffusion and ask them to explain what is happening and why.
- Ask them to describe what happens when a drop of food colouring is added to a glass of water or when a fragrance is sprayed in one corner of a room, for example.
- Allow students to explain their ideas, emphasizing their understanding of diffusion and its relationship to the particle theory of matter.
- Do Q3(v) on page 75 of student book.

Home Assignment:

- Walk around your house and find at least three examples of diffusion in various areas.
- Take note of where diffusion is taking place and what substances are involved (for example, scents, gases, and liquids).
- Draw a simple diagram or write a brief description of each example to demonstrate how diffusion occurs in the situation.
- Do Q5 on page 76 of student book. Do Q13 and 14 on page 33-34 of workbook.

Lesson Plan 4	Student Book pages	Time	Workbook pages
Evidence for the Existence of Particles of Matter	70	45 mins	-

Student Learning Outcome

Interpret the evidence for the existence of the particles in matter by observing daily life examples (adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water).

Resources

White board and board marker

Different set of materials, such as a basketball, a syringe, sugar, water, and salt.

Engage: (10 min)

- Begin by asking students if they have ever wondered what different materials around them, such as air, water, or sugar, are made of.
- Write the word "particles" on the board and ask students if they have ever heard of it and what they think it means.
- Discuss their responses before providing a brief explanation of the concept of particles in matter, using examples such as sand, salt, or sugar.

Explain: (10 min)

- Write the word "particles" on the board or on chart paper and ask students if they have ever heard of it and what they think it means.
- Explain the concept of particles in matter briefly, using relatable examples such as sand, salt, or sugar.
- Explain that air is made up of tiny particles that move and fill up the space inside the basketball, causing it to expand.

Keywords

Smoke
Dust
Clusters
Evidence

Explore: (10 min)

- Divide the class into small groups and give each one a different set of materials, such as a basketball, a syringe, sugar, water, and salt.
- Instruct each group to examine and interact with the provided material, observing its behaviour.
- Encourage students to talk about and record their observations, paying special attention to any changes in volume, shape, or state.

Elaborate: (10 min)

- Reassemble the students as a whole group.
- Request that each group share their observations and discuss the evidence gathered for the existence of particles in matter.
- Write down their responses on the board or on chart paper, emphasizing key points about particle behaviour like expansion, compression, dissolution, and evaporation.
- Connect their observations to the idea that these changes occur as a result of matter's particles constantly moving and interacting with one another.

Useful Link

https://youtu.be/_tbgGgxA29s

Evaluate: (5 min)

- To assess student comprehension, give each group a scenario involving particle behaviour and ask them to discuss and explain their findings.

- For example, ask them to describe what happens when a spoonful of salt is added to a glass of water or what happens when air is compressed with a syringe.
- Allow students to share their findings with the class, emphasizing their understanding of particle behaviour and its relevance to the examples.

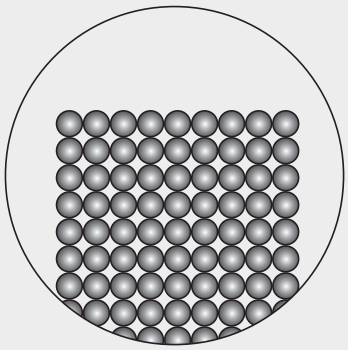
Home Assignment:

Observe your home or immediate surroundings carefully and identify at least three different pieces of evidence that support the existence of particles of matter.

Record your findings by either drawing a labeled diagram or writing a short description for each piece of evidence. For example: Crush a piece of paper into small bits and then uncrumple it, noticing how the paper retains its shape due to the arrangement and interaction of particles in a solid.

Worksheet 1

1. Identify the state of matter and give three examples for each.



State of matter:

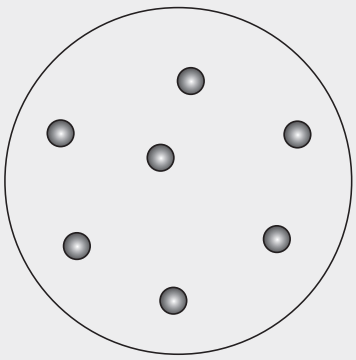
_____

Examples:

_____

_____

_____



State of matter:

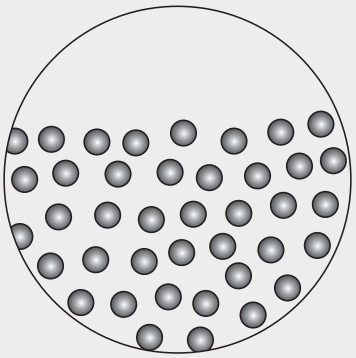
_____

Examples:

_____

_____

_____



State of matter:

_____

Examples:

_____

_____

_____

2. Describe the movement of particles in the following states:

Solid:

_____

Liquid:

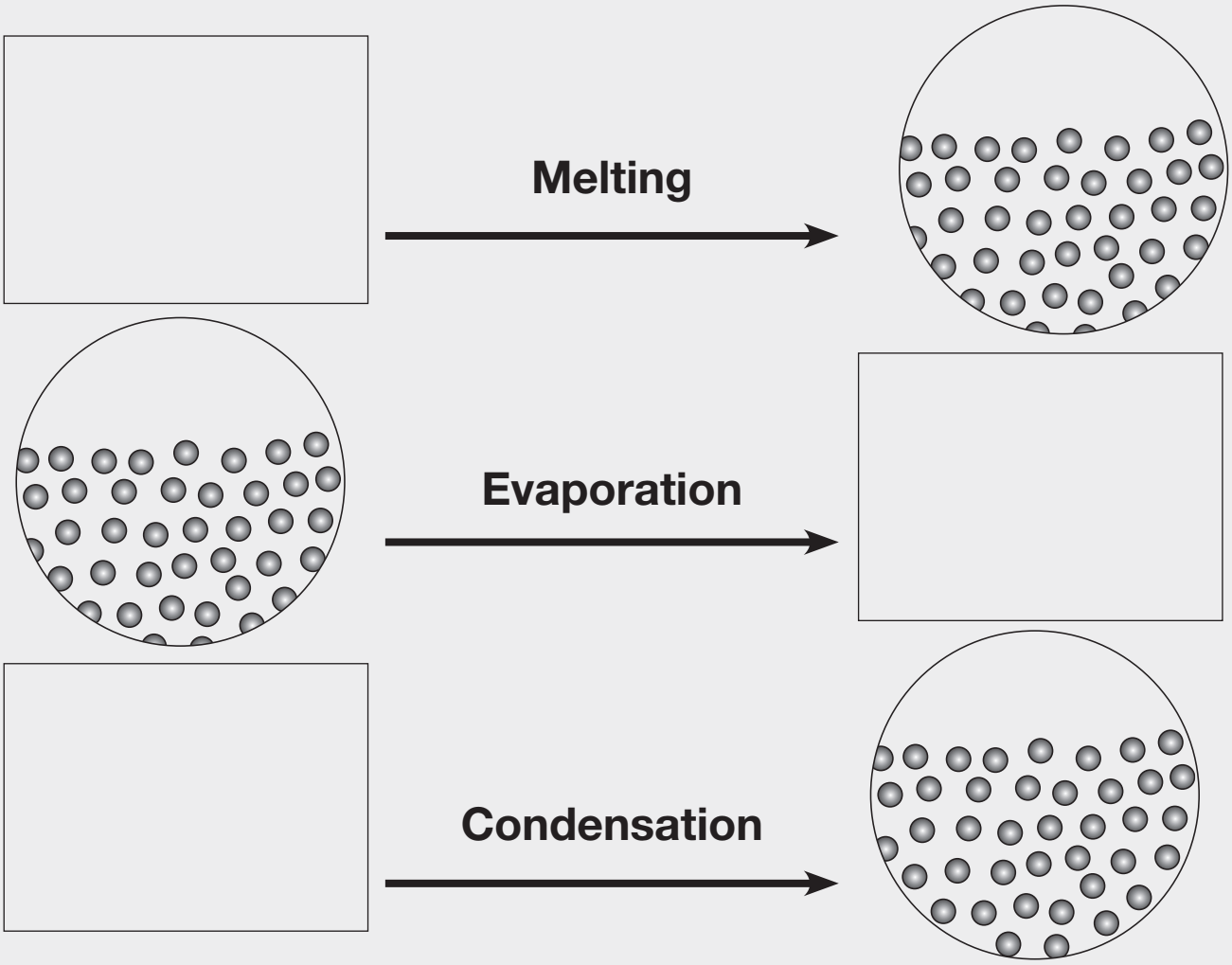
_____

Gas:

_____

Worksheet 2

1. Complete the diagrams below:



2. Which two changes are the most common in the water cycle?

_____

3. Which state change causes the hot tea to cool over time?

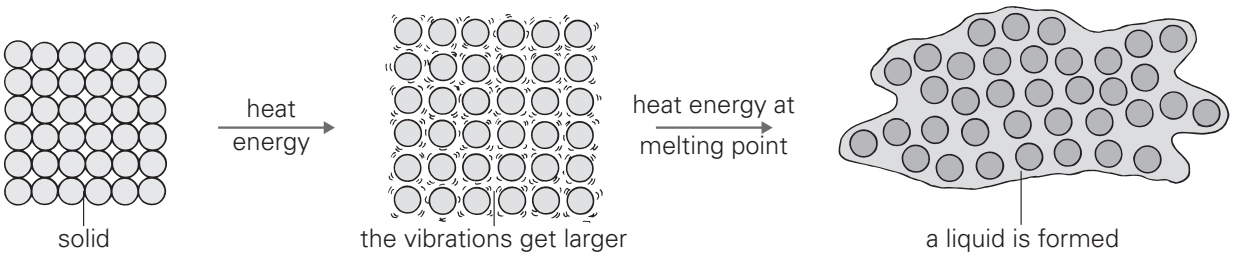
_____

4. In the winter, dew can be seen on objects in the morning; what type of change causes this dew to form?

_____

Answers for Worksheet 1

1. Identify the state of matter and give three examples for each.



State of matter:	**State of matter:**	**State of matter:**
Solid	Gas	Liquid
Examples:	**Examples**:	**Examples**:
1. Brick	1. Oxygen	1. Water
2. Paper	2. Carbon Dioxide	2. Milk
3. Pen	3. Nitrogen	3. Juice

1. Describe the movement of particles in the following states:

Solid:

Only vibrate about a fixed position.

Liquid:

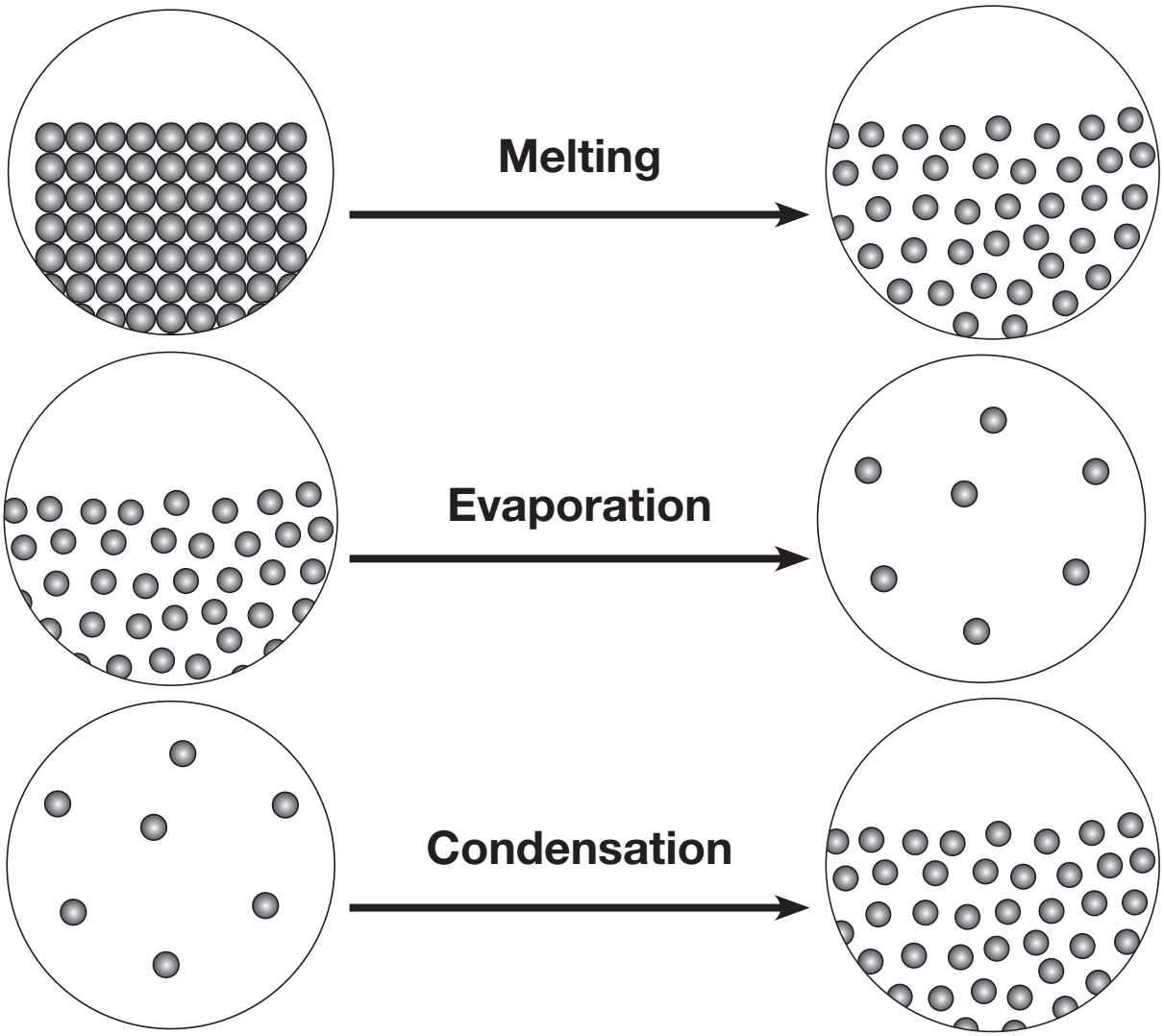
Particles are close together and move randomly.

Gas:

rapidly in all directions.

Answers for Worksheet 2

1. Complete the diagrams below:



2. Which two changes are the most common in the water cycle?

   Evaporation and condensation.

3. Which state change causes the hot tea to cool over time?

   Evaporation

4. In the winter, dew can be seen on objects in the morning; what type of change causes this dew to form?

   Condensation.

Exercise Answers

1. Choose the correct answer:
   i. c) Condensation
   ii. b) Particles are fixed
   iii. c) Changing the temperature of a substance
   iv. a) Sublimation
   v. c) Diffusion
2. Fill in the blanks:
   i. Matter ii. Solids iii. Solid iv. Sublimation
   v. Gases vi. Diffusion
4. When a drop of ink is added in water after some time the colour is changed.
   a) c) Diffusion
   b) The colour changes slowly because the ink particles spread and mix with the water particles gradually over time, leading to a uniform color throughout the water.
   c) This experiment explains the particle theory as it demonstrates how particles in a liquid (water) are in constant motion and can mix with other substances (ink) through the process of diffusion.
   d) Students will represent the results as a labeled diagram showing the uniform color of the water after 10 hours.
5. Short answer questions:
   i. Liquids can be poured from one container to another because the particles in liquids have the ability to flow and move past each other, allowing them to take the shape of the container they are poured into.
   ii. Matter is anything that has mass and occupies space. It can exist in different states - solid, liquid, or gas.
   iii. Melting and condensation need different amounts of heat because they involve different changes in the state of matter. Melting is the change from a solid to a liquid state, requiring the addition of heat to break the intermolecular forces holding the particles together. Condensation, on the other hand, is the change from a gas to a liquid state, and it involves the release of heat as gas particles come together to form a liquid.
   iv. Sublimation is the process where a solid directly changes into a gas without going through the liquid state. It occurs when the substance's vapor pressure exceeds the atmospheric pressure at a specific temperature.
   v. Diffusion is the movement of particles from an area of higher concentration to an area of lower concentration. It happens due to the random motion of particles and is responsible for the mixing of substances in gases and liquids.
6. Long answer questions:
   i. Liquids contract when they freeze because as the temperature decreases, the particles in the liquid lose energy and move slower. When they slow down, the attractive forces between the particles become stronger, causing them to come closer together and form a more ordered arrangement, leading to a decrease in volume.
   ii. Students will draw the diagram according to the following phenomenon:
   In ice, the particles are arranged in a regular pattern with each water molecule forming

hydrogen bonds with four neighboring water molecules, resulting in a hexagonal lattice structure. When ice melts, the hydrogen bonds break, and the water molecules become less ordered, forming a random arrangement characteristic of a liquid.

iii. The particle theory explains the changes between states of matter based on the movement and arrangement of particles. In a solid, particles are tightly packed and vibrate in fixed positions. In a liquid, particles are closer together but can move past each other. In a gas, particles are far apart and move freely in all directions.

iv. When a gas changes into a liquid, the particles come closer together and lose energy, forming a more ordered arrangement. The attractive forces between the particles increase, leading to a decrease in kinetic energy and the formation of a liquid state.

v. Students will draw the diagram according to the following phenomenon:

When food color is added to water, the particles of food color disperse and mix with the water particles through the process of diffusion. Over time, the food color particles spread uniformly throughout the water, demonstrating the random motion and interaction of particles in a liquid.

7. Think about it:

The diffusion process can explain this phenomenon. When you steep a tea bag in hot water, the tea leaves contain coloured pigments such as tannins. When hot water comes into contact with the tea bag, the coloured pigments in the tea leaves begin to diffuse into the surrounding water.

The diffusion process continues as time passes, and the concentration of coloured pigments in the water rises. As a result, the tea darkens in colour. The longer the tea bag is immersed in hot water, the more time the pigments have to diffuse into the water, resulting in a stronger and darker brew.

Activities:

1. (Mind Map)
   - Solids:
   - Definite shape and volume
   - Particles tightly packed and vibrating in fixed positions
   - Cannot flow or change shape

   - Liquids:
   - Indefinite shape but definite volume
   - Particles closer together and able to move past each other
   - Can flow and take the shape of the container

   - Gases:
   - Indefinite shape and volume
   - Particles far apart and move freely in all directions
   - Can fill any container they are in

2. (Discussion)
   - Particle Theory:
   - Introduction to the concept that all matter is made up of tiny, discrete particles.

- Discussing the characteristics of particles, their motion, and their arrangement in different states of matter (solids, liquids, and gases).
- Highlighting that particles are present everywhere, and they interact with each other to create the various properties of matter.

3. (Demonstration and Discussion)
   - Conduct a demonstration with an air freshener to show how the scent diffuses and spreads in the air.
   - Encourage students to share examples from daily life where diffusion occurs, such as perfume spreading in a room or the aroma of cooking food filling the kitchen.
   - Discuss real-life instances of diffusion, such as ink mixing in water, soda's CO2 dissolving in the air, and tea diffusing in hot water. Relate it to natural phenomena like air pollution, where small particles diffuse into the air.
4. (Discussion and Experiment)
   - Discuss how wet clothes dry on a line outside due to the process of evaporation.
   - Identify factors that can affect the drying process, such as temperature, humidity, air circulation, and surface area.
   - Devise an experiment to test these factors by placing wet clothes in different locations (control cloth on a bench, others near the radiator, window, door, fan, etc.) and measure the time it takes for each cloth to dry. Record and compare the results.

Projects:

1. Collect five pictures of solid, liquid, and gas from your daily life and make a chart.
   - Students collect pictures of solids, liquids, and gases from magazines, newspapers, or online sources.
   - Create a chart displaying the pictures under the respective categories of solids, liquids, and gases.
2. Draw the poster of the phase change diagram.
   - Students draw a phase change diagram that illustrates the different transitions between states of matter (solid to liquid, liquid to gas, etc.).
   - Include labels and explanations for each phase change and the underlying concepts of particle behavior during these transitions.

Workbook answers

1. i. Solid
   ii. Liquid and gas
   iii. solid
   iv. solid
   v. Gas
   vi. Gas
2. i. Solid
   ii. Liquid
   iii. Melting
   iv. Freezing

v. Condensation
vi. Evaporation
vii. Boiling
viii. Diffusion

3. i. The random movement of particles is termed as Brownian movement.
   ii. Solids have fixed shape and volume. The particles are tightly packed together.
   iii. According to kinetic molecular theory, the particles of a gas are always in random motion. They move at a faster rate thus can escape a container.
   iv. Particles of solid are tightly packed together thus they have fixed shape. That's why we are able to hold solids in our hands.
   v. The distance between the particles of solids increases and they are not arranged properly.
4. Students will draw themselves.
5. i. Because particles come close and volume decreases.
   ii. The distance between the particles decreases and their movement slows down.
   iii. Students will draw particles themselves.
6. When the metal ball was heated, the particles vibrated **more / less**. This made the ball **smaller / bigger**. The ring was not heated, so its size **increased / decreased / stayed the same**. The ball could no longer fit through the ring. When the metal ball was cooled, the particles vibrated **more / less**. This made the ball **smaller / bigger.**

   The ring was not heated, so its size **increased / decreased / stayed the same**.

   The ball could fit through the ring.

   i. When the metal ball was heated, the particles vibrated **more.**
   ii. She can heat the ring or cool down the ball.
7.

Solid	Liquid	Gas
Ice	Juice	Oxygen
sand	Milk	Carbon dioxide
pencil	Lemonade	Helium

8. i. True
   ii. False
   iii. False
   iv. True
   v. True
   vi. False
   vii. False
   viii. False
   ix. False
   x. True
9. Students will draw themselves

10. Liquid: petrol, juice
    Solid: paper, ice, iron nail, book
    Gas: carbon dioxide, air, oxygen
11. Gas: Particles are far apart and move very fast.
    Liquid: Particles can move about and slide past each other.
    Solid: Particles are tightly packed.
12. A. Freezing
    B. Condensation
    C. Melting
    D. Evaporation
    E. Sublimation
13. 2, 1, 3
14. The ink particles before diffusion will be concentrated in one place while after diffusion they will spread evenly.
15. Brownian
    Colliding
    Directions
    More
    Less
    Evenly
16. a. boiling
    b. 100°c
17. 1. Solid
    2. Brownian-movement
    3. Gas
    4. Liquid
    5. Diffusion
    6. Freezing
    7. Evaporation
    8. Condensation
    9. Melting

CHAPTER 06

Elements and Compounds

Student Book Pages 66–76

Learning outcomes

- Describe the structure of matter in terms of particles (i.e., atoms and molecules).
- Describe molecules as a combination of atoms (e.g., H_2O, O_2 and CO_2).
- Recognize the names and symbols for some common elements (first 10 elements of the Periodic Table) and recognise their physical
- properties.
- Differentiate that some elements are made of atoms and some elements exist as molecules and have different properties to a single atom of the element.
- Explain that compounds are formed by different types of elements joining together chemically forming a new substance.
- Illustrate the formation of a compound with the help of a word equation.
- Distinguish between elements and compounds.
- Explore the common elements and compounds in our daily life (Carbon, Nitrogen, Hydrogen, Aluminum, Water, Common salt, Sugar).
- Categorize elements into metals and non-metals of first 10 elements based on their physical properties.

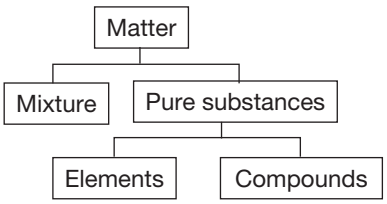
Overview of the Unit

- Elements are the simplest chemical substances in which all of the atoms are identical.

For Example: Nitrogen(N), Hydrogen (H) and Carbon (C).

- Compounds are chemical substances composed of two or more elements chemically bound together in a specific ratio.

For example: Table salt (NaCl) has 1 atom of sodium and one atom of chlorine.



- Molecules are the basic building blocks of chemical compounds. They are formed when two or more atoms combine via chemical bonds. Molecules can be made up of atoms from the same element (for example, an oxygen molecule, O_2) or atoms from different elements (for example, a water molecule, H_2O).

Lesson Plan 1	Student Book pages	Time	Workbook pages
Atoms and Elements	77	45 mins	39

Student Learning Objectives

- Use particle model of matter to investigate the movement and arrangement of particles in three states.
- Explain why gases and liquids take the shape of their containers but solids do not, in terms of the Particle Theory of Matter

Resources

Handouts with the names and symbols of the first ten elements

A container of water

Pen and Paper

Engage: (5 min)

- Begin the lesson by displaying or providing handouts with the names and symbols of the first ten elements: hydrogen (H), helium (He), lithium (Li), beryllium (Be), boron (B), carbon (C), nitrogen (N), oxygen (O), fluorine (F), and neon (Ne).
- Ask students if they have heard of any of these elements or if any of the symbols are familiar to them.
- In order to pique their interest, ask them what they believe the physical properties of these elements are.

Keywords

Atoms
Elements
Symbols

Explain: (10 min)

Introduce elements and explain that they are substances made up of only one type of atom.

- Discuss the physical properties of the first ten elements, emphasizing their states at room temperature and other distinguishing features.
- Highlight how physical properties such as appearance, colour, texture, and conductivity can differ between elements.

Explore: (15 min)

- Conduct a steam activity to investigate the various physical properties and behaviours of elements.
- Heat a container of water until it reaches boiling point and then watch the steam that forms.
- Explain to students that steam is made up of water molecules, which are composed of two hydrogen atoms and one oxygen atom (H_2O).
- Ask students to identify the elements and symbols used in the steam activity.
- Encourage students to make observations about steam's behaviour, such as its ability to diffuse and occupy a greater volume than liquid water.

Elaborate: (10 min)

- Talk about the concept of atoms and molecules. Explain how some elements, such as hydrogen (H) and helium (He), are made up of single atoms, whereas others, such as oxygen (O) and nitrogen (N), are made up of diatomic molecules (O_2 and N_2, respectively).

Useful Link

https://youtu.be/DkAXO--BYEw

- Explain how the properties of a molecule can differ from those of its constituent atoms. For instance, oxygen gas (O_2) is a colourless gas, as is a single oxygen atom.
- Connect the previous activity's concept of atoms and molecules to the behaviour of steam, emphasizing that steam is composed of water molecules (H_2O) with different properties than its individual constituent atoms.
- Discuss other examples of molecule-forming elements, such as hydrogen gas (H_2) and nitrogen gas (N_2).

Evaluate: (5 min)

Do Q3 on pg. 84 of student book.

Home Assignment:

- Find and describe one practical application for each of the first 10 elements in everyday life or industrial processes. Explain how their physical properties contribute to their usefulness in these applications.
- Do Q9 on 39 of Workbook.

Lesson Plan 2	**Student Book pages**	**Time**	**Workbook pages**
Metals and non-metals Using metals	78–80	45 mins	36-39

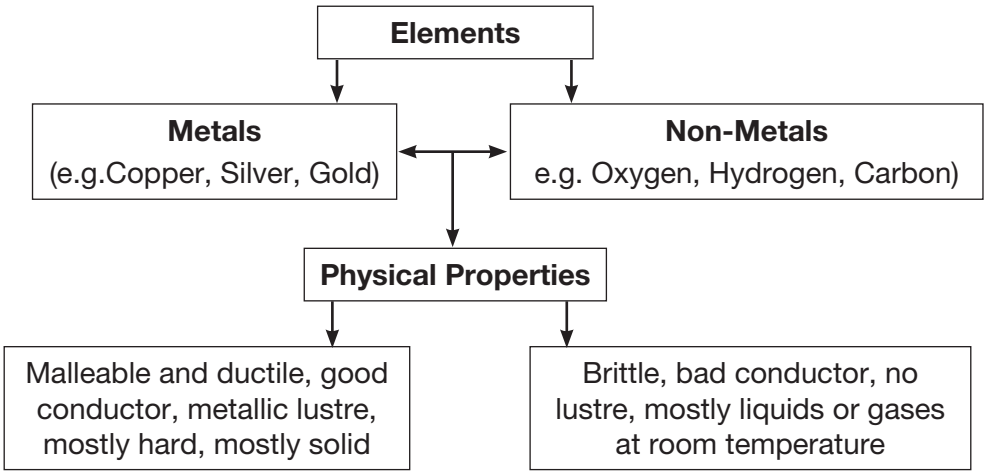
Student Learning Outcomes

Categorize elements into metals and non-metals of first 10 elements based on their physical properties.

Engage: (5 min)

Pick up any two items from the classroom and make a list of their physical properties with the help of students on the board.

Explain: (10 min)



Keywords

Luminosity
Malleable
Ductile
Tensile strength

Explore: (15 min)

Useful Link

https://youtu.be/BowQcGw9IYk

Materials:

- Sulphur powder
- Iron nails
- Copper wire
- Piece of coal
- a small electric circuit with a bulb.
- Hammer

Procedure:

- Students will classify objects into metals and non-metals based on their observations of a few physical properties.
- Students will use the following 'observation worksheet' (given at the end of the lesson plans) to note down their findings.

Elaborate: (10 min)

- Discuss the activity with the students and ask them questions such as:
  Which of the following materials will cause the bulb to glow in the given circuit?
  (a) Aluminium (b) Wood (c) Sulphur

Evaluate: (5 min)

- Do Q6 (i, ii, and vi) on pg. 85 of student book.
- Do Q3 on pg. 36 of Workbook.

Home Assignment:

- Provide copies of worksheet 6.1 to complete at home.
- Do Q2-3 and 11 on pg. 36 and 39 of Workbook.

Lesson Plan 3	**Student Book pages**	**Time**	**Workbook pages**
Combining Elements	81	45 mins	38

Student Learning Outcomes

Differentiate that some elements are made of atoms and some elements exist as molecules and have different properties to a single atom of the element.

Resources

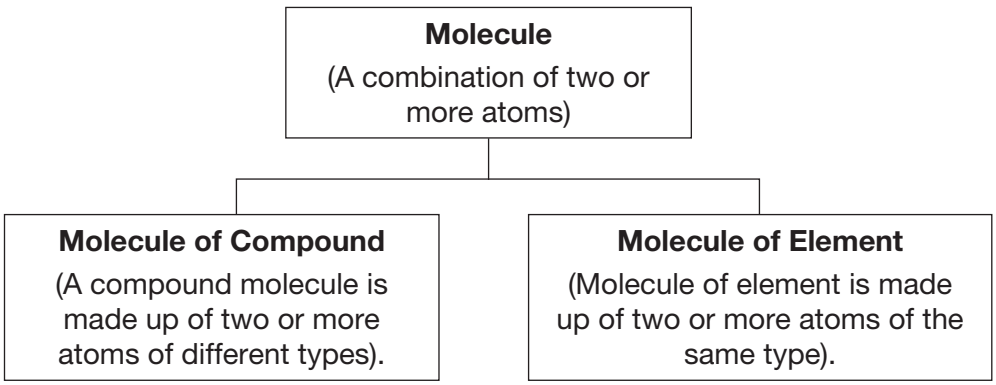
White board and marker
Colourful Ping-Pong balls
Colourful Play dough
Straws
Paper and pen

Engage: (5 min)

Think Pair Share! Write some questions on the board and ask students to discuss them in pairs before answering the questions in front of the entire class.

- What is the smallest component of a matter?
- Give an example of an element that consists of more than one atom?
- How do we know what a molecule is?
- Water has the chemical formula H_2O. What does the formula tell us?
- Is every part of water composed of water molecules?

Explain: (10 min)



Keywords

Molecule of atom
Molecule of compound
Chemical formula

- You can use colourful ping pongs to explain the concept of 'Molecule of Element' and 'Molecule of Compound.'

An Element Molecule:

- Select an element, such as oxygen (O).
- Take a set of ping pong balls of the same colour (e.g., red ping pong balls) to represent the atoms of that element.
- Explain that an element molecule is made up of two or more atoms of the same element that are bonded together.
- Tape or string two or more ping pong balls together to represent the bonds between the atoms.
- Emphasize that the atoms in the molecule are identical, and their arrangement determines the properties of the molecule.
- For example, you can use tape to connect two red ping pong balls to represent an oxygen molecule (O_2).

Select a compound such as water (H_2O).

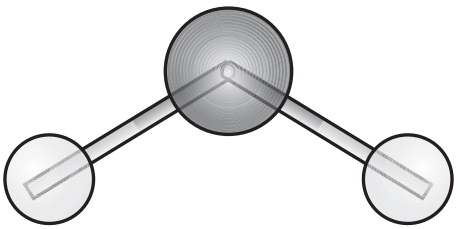
- Take ping pong balls of various colours that represent different elements (for example, blue for hydrogen and green for oxygen).

- Explain that a compound molecule is made up of atoms of different elements that are bonded together.
- To represent the bonds, connect the ping pong balls using tape or string.
- For example, to represent a water molecule (H_2O), connect two blue ping pong balls with a green ping pong ball.
- Emphasize how the composition and arrangement of various elements in the compound molecule give it distinct properties.

Explore: (15 min)

Use colourful play dough and straws to create models for the following formulas.

- HCl
- O_2
- H_2O
- NaCl



Elaborate: (10 min)

Label the model and indicate whether it is an element molecule or a compound molecule.

Evaluate: (5 min)

- Worksheet 6.2 will be given.
- Do Q6 (iii and iv) on pg. 85 of student book.

Useful Link

https://youtu.be/0d6Mhm5t8eM

Home Assignment:

- Choose five elements from the Periodic Table, at least two of which are molecules.
- Investigate and document the properties of single atoms of the chosen elements (for example, state of matter, density, melting and boiling points).
- Investigate and document the properties of the selected elements' molecules (for example, state of matter, density, melting and boiling points).
- Do Q7 and 8 on page 38 of workbook.

Lesson Plan 4	Student Book pages	Time	Workbook pages
Compounds	81–83	45 mins	37

Student Learning Outcome

Explain that compounds are formed by different types of elements joining together chemically forming a new substance.

Resources

magnesium ribbon,
a Bunsen burner or lighter,
paper or a notebook.

Engage: (5 min)

- Begin the lesson by displaying a visual representation of a compound, such as water (H_2O) or table salt (NaCl).
- Ask students if they understand what a compound is and if they have any examples.
- Get their curiosity by asking, "How do compounds form?" "What happens when elements combine chemically?"

Keywords

Compound
Chemical reaction
Word equation

Explain: (10 min)

- Introduce the concept of compounds and explain how they are formed by the chemical combination of different types of elements.

- In particular, emphasize that a compound is a new substance with properties distinct from the elements that comprise it.
- To demonstrate the formation of compounds through chemical reactions, use examples such as burning magnesium in air or oxygen.
- Explain how the elements (for example, magnesium) combine with oxygen to form a new compound (for example, magnesium oxide, MgO) during these reactions.
- Write a word equation on the board to illustrate the formation of the compound, such as "magnesium + oxygen ⟶ magnesium oxide."

Explore: (15 min)

- Divide the students into small groups and give each group a set of materials, which should include magnesium ribbon, a Bunsen burner or lighter, and paper or a notebook.
- Instruct the groups to conduct the experiment safely by lighting the magnesium ribbon with a Bunsen burner or lighter.
- Encourage students to observe and record their findings throughout the experiment, taking note of any changes in the appearance, behaviour, or properties of the magnesium ribbon.
- Assist students in identifying the compound (magnesium oxide) formed as a result of the chemical reaction.

Elaborate: (10 min)

- Discuss each group's observations during the experiment, focusing on the formation of the compound (magnesium oxide) and the chemical reaction that occurred.
- Encourage students to discuss the word equation "magnesium + oxygen magnesium oxide" and its significance in representing the compound's formation.
- Explain that the word equation represents the compound's chemical formula, displaying the elements involved and the proportions in which they combine.

Useful Link

https://youtu.be/zRiEecfWuSQ
https://youtu.be/gS3kmdp4t_0

Evaluate: (5 min)

- Give your students various word equations and ask them to identify the elements involved and the compounds formed.
- Do Q4 and 5 on pg. 36 of Workbook.

Home Assignment:

- Pick five compounds that are commonly found in everyday life. Table salt (NaCl), water (H_2O), carbon dioxide (CO_2), methane (CH_4), and ammonia (NH_3) are some examples.
- Identify the elements in the chemical formula of each compound you've chosen. Make a note of them in your notebooks.
- Do Q6 on pg. 37 of Workbook.

Lesson Plan 5	Student Book pages	Time	Workbook pages
Difference between Elements and Compounds	82	45 mins	36-37

Learning Objectives

Distinguish between elements and compounds.

Engage: (10 min)

- Start the lesson by asking students to name some substances they come into contact with on a daily basis.
- Write down their responses and sort them into two columns: elements and compounds.
- Initiate a discussion with the students by asking them questions such as, "What do you think is the difference between elements and compounds?" as well as "Can you provide examples of elements and compounds?"

Explain: (10 min)

- Introduce the concept of elements and explain that they are substances that cannot be broken down chemically into simpler substances.
- Give examples of elements that we encounter in our daily lives, such as carbon, nitrogen, hydrogen, and aluminium.
- Explain that compounds are formed when two or more elements combine chemically in fixed proportions.
- Introduce examples of everyday compounds such as water (H_2O), common salt (NaCl), and sugar ($C_{12}H_{22}O_{11}$).
- Distinguish between elements and compounds, emphasizing that elements are made up of only one type of atom, whereas compounds are made up of different types of atoms bonded together.

Explore: (10 min)

- Divide the students into small groups and give each group a collection of common household items such as carbon (charcoal), nitrogen (air), hydrogen (hydrogen gas), aluminium (foil), water, common salt, and sugar.
- Instruct the groups to examine and classify the substances into elements and compounds based on what they learned in the previous discussion.
- Encourage students to think critically and analyze the composition of each substance, taking into account whether it is made up of only one type of atom (element) or a combination of multiple types of atoms (compound).
- Allow the groups to share their classifications and discuss any disagreements or uncertainties that arise.

Resources

carbon (charcoal),
nitrogen (air),
hydrogen (hydrogen gas),
aluminium (foil), water
common salt, and
sugar.
White board and marker

Elaborate: (10 min)

- Discuss each group's categorization of substances, comparing and contrasting their choices.
- Display the correct classification of each substance on the board, explaining why the classifications were made.

Useful Link

https://youtu.be/EiXqBva238A

- Involve students in a discussion about the importance of elements and compounds in our daily lives, emphasizing their roles, uses, and significance in various contexts.

Evaluate: (5 min)

- Do Concept Check on pg. 83.
- Do Q6 (ii) on pg. 85 of student book.

Home Assignment:

Do Q1, 3, and 4 on page 36 and 37 of Workbook.

Worksheet 1

Inference:

Metals are lustrous, hard, good conductor and malleable, sonorous.

Non-metals are dull, bad conductor, brittle, not sonorous.

Observation Table:

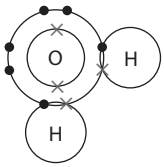
Physical Property	Lustrous / Dull	Good Conductor/Bad Conductor	Malleable/ Brittle	Texture	Sonorous/Not Sonorous
Sulphur powder					
Iron nails					
Copper wire					
Piece of coal					

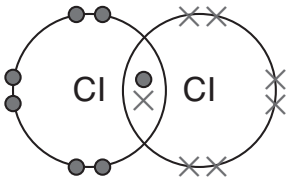
Conclusion:

Worksheet 2

Write ‘Yes’ in the box that correctly describes a molecule, otherwise write ‘NO’.

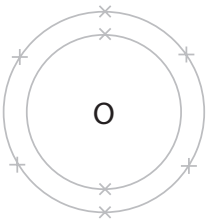
Consists of two or more atoms.



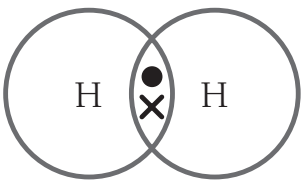


Can be made up of the atoms of same element.

They are lack of protons.



Sharing of electrons in their outer most shell.



Answers for Worksheet 1

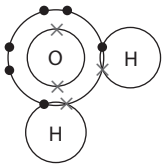
Students will complete it after making observations.

Answers for Worksheet 2

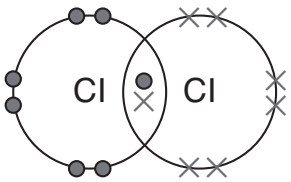
Write ‘Yes’ in the box that correctly describes a molecule, otherwise write ‘NO’.

Consists of two or more atoms.

Yes



Yes



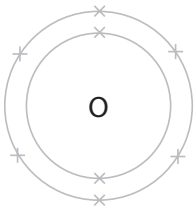
Yes

Can be made up of the atoms of same element.

Yes

They are lack of protons.

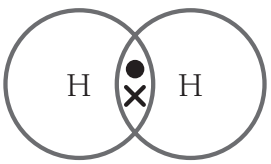
No



No

Sharing of electrons in their outer most shell.

Yes



Yes

Exercise Answers

1. Choose the correct answer.
   i. (a) an element
   ii. (d) a compound
   iii. (c) is formed when hydrogen combines with oxygen
   iv. (d) cannot be broken down into two or more substances
   v. (c) brittle
2. Fill in the blanks.
   i. The smallest particle that makes up a substance is called an atom.
   ii. Atoms can combine to make a bigger particle called a molecule.
   iii. Each different type of atom is called an element.
   iv. Each element has its own chemical symbol.
   v. The largest number of elements are metals.
   vi. A smaller number of elements are non-metals, which are usually gases.
   vii. Atoms of different elements can join together to form a new substance called a compound.
3. The diagram shows candles burning in two gas jars. Candle is made up of carbon while the air that is there in the gas jar has oxygen. The jars are inverted over water.
   i. Carbon and oxygen will react together in the above reaction.
   ii. Word equation for the above reaction: Carbon (from the candle) + Oxygen (from the air) ⟶ Carbon dioxide.
   iii. The candle in the jar with limited oxygen will go out first.
   iv. Reason: The candle in the jar with limited oxygen will burn until the oxygen in the jar is consumed. Once the oxygen is used up, the flame will go out as combustion requires oxygen.
   v. The level of water in the jar increased because the burning of the candle produced carbon dioxide gas, which dissolved in the water, forming carbonic acid and increasing the water level.
   vi. Oxygen gas helps in burning.
4. Short answer questions
   i. An element is a substance that consists of only one type of atom. It cannot be broken down into simpler substances by chemical means.
   ii. Examples of things made using single elements:
      a) Aluminum foil (made from the element aluminum)
      b) Copper wire (made from the element copper)
   iii. The described properties indicate that the element is a metal.
   iv. Hydrogen and oxygen are different because hydrogen is highly flammable and is used as a fuel, while oxygen supports combustion but does not burn.
   v. Compound: A compound is a substance composed of two or more different elements chemically bonded together in a fixed ratio.

vi. Two uses of oxygen gas:
a) Supporting combustion and respiration
b) Medical applications and in industrial processes like steelmaking.

5. Long answer questions

i. General properties of metals:
- Good conductors of heat and electricity
- Shiny (lustrous) appearance when freshly cut
- Malleable (can be hammered into thin sheets)
- Ductile (can be drawn into wires)
- Generally solid at room temperature

Five metals and their symbols:
1 Copper (Cu)
2. Iron (Fe)
3. Gold (Au)
4. Aluminum (Al)
5. Silver (Ag)

Five non-metals:
1. Oxygen (O)
2. Carbon (C)
3. Nitrogen (N)
4. Sulfur (S)
5. Hydrogen (H)

ii. Differences between a compound and an element:
- Compound: Composed of two or more elements chemically bonded. Can be broken down into simpler substances by chemical means.
- Element: Composed of only one type of atom and cannot be broken down into simpler substances by chemical means.

Examples of compounds:
1. Water (H_2O)
2. Carbon dioxide (CO_2)
3. Sodium chloride (NaCl)

Examples of elements:
1. Oxygen (O)
2. Carbon (C)
3. Hydrogen (H)

iii. Differences between metals and non-metals:
- Metals: Generally good conductors of heat and electricity, shiny (lustrous) appearance, malleable, ductile, and solid at room temperature.
- Non-metals: Poor conductors of heat and electricity, may exist in various states (solid, liquid, gas), and lack the typical metallic properties.

iv. Comparing water (H_2O) and glucose ($C_6H_{12}O_6$) molecules:
- Water (H_2O): Composed of two elements (hydrogen and oxygen), and the ratio of hydrogen to oxygen atoms is 2:1. It is a simple compound.
- Glucose ($C_6H_{12}O_6$): Composed of three elements (carbon, hydrogen, and oxygen), and the ratio of hydrogen to oxygen atoms is 2:1, similar to water. It is also a compound but more complex than water.

6. Activities
   1. Experiment to separate salt and sand:
      - Apparatus: A beaker, filter paper, funnel, and a glass rod.
      - Procedure: Mix the salt and sand with water to form a mixture. Use the funnel with filter paper to filter the mixture. The sand will be retained on the filter paper as the saltwater passes through. Evaporate the water to obtain the separated salt.
   2. Experiment to find pigments in a spinach leaf:
      - Apparatus: A mortar and pestle, filter paper, funnel, test tubes, and a solvent (e.g., alcohol).
      - Procedure: Grind the spinach leaf in a mortar with alcohol to extract pigments. Use the funnel with filter paper to separate the liquid extract from solid parts. The pigments will be retained in the liquid. Observe the colors and record the findings.
   3. Heat conduction in different spoons:
      - Apparatus: Metal spoon, plastic spoon, wooden spoon, heat source (e.g., Bunsen burner), and a thermometer.
      - Procedure: Apply heat to one end of each spoon using a Bunsen burner. Use a thermometer to measure the temperature at different points along each spoon to show the rate of heat conduction. Metal will conduct heat more efficiently than plastic and wood. The point where the heat reaches the end of each spoon can be observed by touching it gently.

Projects:

Make a collection of 'everyday' materials, find out their elemental composition, and present the findings on a display board.

Workbook Answers

1. i. a. Nitrogen
      b. Oxygen
      c. Aluminium
      d. Iron
   ii. Compound
2. Gold in jewellery _____ Beauty and scarcity copper for water pipes _____ It does not react very much and _____ can be easily bent iron for bridges _____ It is strong and hard.aluminium for aeroplanes _____ It is lightweight.
3. i. Hydrogen, iron, gold, nitrogen
   ii. Water, carbon dioxide
   iii. Water and carbon dioxide

iv. Hydrogen, iron, gold, nitrogen

4. i. Atom
   ii. Molecule
   iii. Symbol
   iv. Metals, iron
   v. Gases
   vi. Compound
5. i. Compound
   ii. Because different elements are combined together
   iii. Carbon, hydrogen, nitrogen and oxygen
   iv. 11
6. i. Compound
   ii. 3 iii. 4 iv. 1 v. 1
7. Student will draw themselves.
8. Sodium: Na
   Aluminum: Al
   Chlorine: Cl
   Boron: B
   Oxygen: O
   Hydrogen: H
   Calcium: Ca
   Sulphur: S
   Iodine: I
   Carbon: C
9. i. Compound
   ii. 3 iii. 1 iv. 1 v. 3
10. Metals: Iron, copper, aluminium
    Non-metals: Hydrogen, nitrogen, oxygen
11. a. Carbon monoxide
    b. 1:1 in CO and 1:2 for CO_2
    c. CO is a molecule of compound while O_2 is molecule of element.
    d. Same as in b
    e. Students will draw themselves.
12: i. A molecule that is made up of two or more same kind of atoms is called a molecule of element.
    ii. A compound is a substance formed when atoms of two or more elements join together through chemical reaction in fixed proportion.
    iii. A material that is made up of only one type of atoms is called an element.
    iv. A molecule that is made up of two or more different kind of atoms is called a molecule of compound.
    v. A change that occurs when two or more substances combine to form a new substance.

CHAPTER 07 Mixtures

Student Book Pages 86–93

Learning outcomes

- Demonstrate that mixtures are formed when two or more substances mix with each other without the formation of a new substance.
- Identify different types of mixtures.
- Describe the difference between elements, compounds, and mixtures.
- Differentiate between pure substances and mixtures on the basis of their formation and composition.
- Describe alloys as mixtures of metals and some other elements.
- Identify and explain examples of common mixtures from daily life.
- Justify why air is considered as a mixture of gases.
- Demonstrate ways of separating different mixtures.
- Demonstrate the process of solution formation (using water as universal solvent).

Overview of the Unit

- When two or more substances mix without undergoing any chemical change, the resulting substance is known as a Mixture.
- The following are the properties of mixtures.
  - Each component of a mixture retains its original properties.
  - The separation of components is simple.
  - The proportion of each component varies.
- Examples of a mixture are:
  - Seawater is a salt and water mixture.
  - Air is a gas mixture that contains oxygen, carbon dioxide, nitrogen, argon, neon, and other gases.
- They can be either heterogeneous or homogeneous.
- Heterogeneous mixtures have different properties and compositions in different parts. For example: ice in soda, oil and vinegar, cereal in milk.
- Homogeneous mixtures are those that have the same properties and combinations throughout their mass. For example: air, rain, steel and so on.
- The substances that comprise the mixture can be separated in a variety of ways.
  - Filtration
  - Evaporation
  - Paper Chromatography
  - Distillation
  - Sublimation
- Homogeneous mixtures of two or more pure substances are known as solutions.
- The total mass of a solute that can be dissolved in 100g of a solvent at a specific temperature and pressure is known as its solubility.

Lesson Plan 1	Student Book pages	Time	Workbook pages
Mixtures and Types of mixtures	86–87	45 mins	41

Student Learning Objectives

- Demonstrate that mixtures are formed when two or more substances mix with each other without the formation of a new substance.
- Identify different types of mixtures.

Engage: (5 min)

- Start the lesson by asking any student from your class to define a mixture.
- What material are they made of?
- Ask any of the students to explain how to determine whether an item is a mixture or not.
- Now ask whether they are aware of the various types of mixtures that exist.
- Tell your students that today's lesson will focus on the various types of mixtures that exist.

Resources

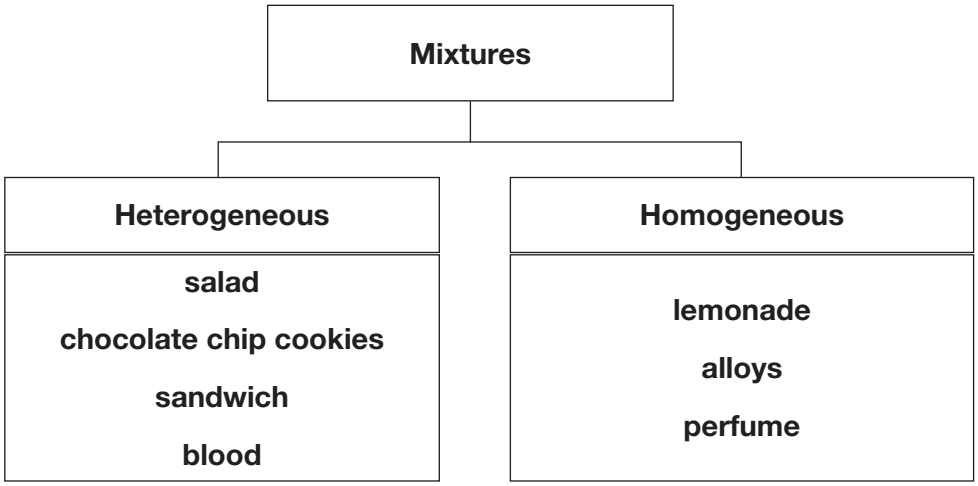
Homogeneous Mixtures

1. Saltwater
2. Air
3. Vinegar
4. Brass
5. Ethanol Solution

Heterogeneous Mixtures

1. Trail Mix
2. Pizza
3. Soil
4. Granite
5. Salad

Explain: (10 min)



Explore: (15 min)

- Set up an inquiry station on a table.
- Arrange various mixtures. (Some are homogeneous, while others are heterogeneous).
- Make labels for homogeneous and heterogeneous mixtures.
- Tell the class to put the appropriate label on the mixture at the inquiry table.

Homogeneous Mixtures	Heterogeneous Mixtures

Keywords

Substance
Mixtures
Homogenous
Heterogenous

Elaborate: (10 min)

Discuss the types of mixtures placed on the inquiry station.

Evaluate: (5 min)

- Worksheet 7.1 will be given.
- Do Concept Check pg. 88

Useful Link

https://youtu.be/dW1Vn6cbTRE

Home Assignment:

Do Q1 on page 41 of workbook.

Lesson Plan 2	Student Book pages	Time	Workbook pages
Difference between elements, compounds and mixtures	87	45 mins	-

Student Learning Outcomes

Describe the difference between elements, compounds, and mixtures.

Engage: (5 min)

- Begin by displaying or providing samples of various substances such as iron nails, water, air, sugar, and salt.
- Instruct students to observe the substances and discuss what they notice. Prompt them by asking, “What are these substances made of?” and “Are they all the same?”

- In order to spark their interest, ask them, "How do you think these substances differ from one another?"

Explain: (10 min)

- Introduce elements and explain that they are pure substances made up of only one type of atom.
- Discuss elements such as iron (Fe) and oxygen (O) and explain why they cannot be broken down chemically into simpler substances.
- Introduce the concept of compounds and explain that they are substances formed by the chemical combination of two or more elements in fixed proportions.
- Give examples of compounds, such as water (H_2O) and salt (NaCl), and explain how compounds differ from the elements from which they are composed.
- Introduce the concept of mixtures and explain that they are composed of two or more physically combined but not chemically bonded substances.
- Discuss mixtures such as air (a gas mixture) and sugar dissolved in water, and explain how mixtures can be separated physically.

Resources

iron nails
water
air
sugar
salt

Keywords

Element
Compound
Mixture

Explore: (15 min)

- Divide the students into small groups and give each group a sample of a different substance, such as an element, a compound, or a mixture.
- Instruct the groups to investigate the substances and classify them as elements, compounds, or mixtures.
- Encourage students to discuss their reasoning for categorizing things and to identify the characteristics that set each category apart.
- Allow the groups to share their classifications and participate in a class discussion to compare and contrast their choices. Divide the students into small groups and give each group samples of various substances, such as elements, compounds, and mixtures.

Useful Link

https://youtu.be/BTJH0O9xRjg

Elaborate: (10 min)

- Examine each group's classification of substances, discussing any differences or uncertainties that arise.
- Display on the board a chart or diagram that depicts the differences between elements, compounds, and mixtures.
- Engage students in a discussion about the properties, composition, and behaviour of each category, emphasizing the key differences.

Evaluate: (5 min)

- Ask students to make a list of substances and categorize them as elements, compounds, or mixtures.
- Examine their answers to see how well they understand the distinctions between elements, compounds, and mixtures.

Home Assignment:

- Find and describe one practical application in everyday life or industry for element, compound, and mixture. Describe how their distinct properties enable them to be useful in these applications.
- Do Q5(iii) on page 96 of student book.

Lesson Plan 3	Student Book pages	Time	Workbook pages
The Composition of Air	88	45 mins	45

Student Learning Outcomes

Justify why air is considered as a mixture of gases.

Engage: (5 min)

- Begin the lesson by asking the students if they understand what a mixture is and if they have any examples of mixtures in their daily lives.
- Display photographs or actual samples of various mixtures, such as trail mix, salad, or sand and water.
- Facilitate a class discussion in which students share their examples of mixtures and explain why they believe these examples are mixtures.

Resources

Photographs or actual samples of various mixtures, such as trail mix, salad, or sand and water.

Diagrams, charts, or articles

Chart paper and markers

Explain: (10 min)

Explain what a mixture is: a combination of two or more substances that are not chemically bonded together but can be separated physically.

- Explain that mixtures can be found in everyday items such as food, drinks, and household products.
- Introduce the concept of air as a gas mixture, naming and describing the primary components of air (nitrogen, oxygen, carbon dioxide, and so on).

Keywords

Composition
Mixture
Oxygen
Nitrogen
Carbon dioxide

Explore: (15 min)

- Divide the students into small groups and give them a variety of common substances and materials, both pure and mixed.
- Instruct the groups to categorize the substances into two groups: pure substances and mixtures, and to identify the components of each mixture.
- Assist them in identifying and discussing the examples of mixtures they find, as well as their characteristics.

Elaborate: (10 min)

- In the same small groups, have the students concentrate on air as a gas mixture.
- Give them resources such as diagrams, charts, or articles that explain the composition of air and the various gases found in it.
- Instruct the groups to create a visual representation (e.g., a poster or an infographic) explaining why air is considered a gas mixture, including the percentages of each gas in the air.

Evaluate: (5 min)

- Allow small groups to present their findings and visual representations to the rest of the class.

- Examine their explanations and justifications for why air is classified as a gas mixture, making sure they can accurately describe the components of air and how they are physically combined.
- Do Discuss and Answer on page 88 of Student Book.
- Do Q11 on page 45 of workbook.

Useful Link

https://youtu.be/iEjuCyb9kAA

Home Assignment:

Do Q5 (iii) on page 96 of student book.

Lesson Plan 4	Student Book pages	Time	Workbook pages
Difference between Pure substances and Mixtures	89	45 mins	-

Student Learning Outcome

Differentiate between pure substances and mixtures on the basis of their formation and composition

Resources

a glass of water, a piece of iron, sugar, or a sand-salt mixture.

small containers

a chart or diagram that depicts the differences in formation and composition between pure substances and mixtures.

Pen and paper

Engage: (5 min)

- Start the lesson by displaying or providing samples of various substances, such as a glass of water, a piece of iron, sugar, or a sand-salt mixture.
- Instruct students to observe the substances and discuss what they notice. Ask them questions like, “What do you think these substances are made of?” and “Do you think they’re the same or different?”
- Ask them, “How do you think these substances can be classified or categorized?”.

Explain: (10 min)

- Develop the idea of pure substances and explain that they are materials made up of just one kind of substance or matter.
- Discuss examples of pure substances, such as water (H_2O) and iron (Fe), and explain how their compositions are definite and consistent.
- Introduce the concept of mixtures and explain that they are composed of two or more physically combined but not chemically bonded substances.
- Give examples of mixtures, such as sand and salt or a glass of lemonade, and explain how mixtures can have different compositions and be separated physically.

Explore: (15 min)

- Prepare a variety of small containers or dishes filled with various substances, both pure and mixtures. Water, sugar, sand, iron filings, baking soda, and a salt and pepper mixture are some examples.
- Distribute the containers to students or groups of students.
- Instruct each student or group to carefully examine and analyse the substances in their respective containers.
- Encourage them to make detailed observations about the substances’ appearance, texture, colour, and any other physical characteristics.

Keywords

Pure

Mixed

Properties

- Request that they take notes on their observations and try to determine whether the substance is pure or a mixture based on their observations.
- After analyzing their assigned substance, students or groups should share their findings with the rest of the class.

Elaborate: (10 min)

- Display a chart or diagram on the board that depicts the differences in formation and composition between pure substances and mixtures.
- Involve students in a discussion about the formation and composition of pure substances and mixtures, emphasizing the key differences.

Evaluate: (5 min)

- Instruct students to write a brief reflection or essay on how they can apply their knowledge of elements, compounds, and mixtures in their daily lives.
- Students should provide specific examples of how they encounter these concepts in their surroundings, such as household products, food, or the environment, in their reflection.
- Encourage students to consider the properties and behaviour of the elements, compounds, and mixtures in these examples critically, and explain how their understanding can help them make informed decisions or solve problems.

Useful Link

https://youtu.be/2kIIC79RQPw

Home Assignment:

- Think about at least five different examples of mixtures.
- List the components or substances that make up each mixture.

Lesson Plan 5	Student Book pages	Time	Workbook pages
Alloys	89	45 mins	45

Learning Objectives

Distinguish between elements and compounds.

Resources

Alloy-made objects or materials, such as jewellery, kitchen utensils, or automotive parts.

Metal strips, such as copper, aluminium, and zinc

Sulphur, carbon, or silicon, in the form of powders or small pieces.

Engage: (5 min)

- Give students a variety of alloy-made objects or materials, such as jewellery, kitchen utensils, or automotive parts.
- Instruct students to closely examine the objects and to share any observations or thoughts they have about them.
- Prompt the students with questions like, “What do you think these objects are made of?” and “Why do you think these objects are made from specific materials?”
- Ask them: “What do you think makes these materials different from other materials like pure metals or non-metals?”

Explain: (10 min)

- Explain the concept of alloys and explain that they are metal-element mixtures.
- Discuss common alloys such as brass, bronze, and steel, and explain how alloys are formed by combining different metals and, in some cases, non-metal elements.

- Explain how alloys frequently have properties that differ from those of their constituent elements, such as increased strength, corrosion resistance, or improved electrical conductivity.
- Show how the atoms of different elements arrange themselves in alloys using simple molecular models or diagrams.

Explore: (15 min)

Keywords

Mixtures
Pure
Stainless steel

- Share following information with the students.

1. Gold can exist in nature as a pure metal, but most of the gold you encounter is an alloy. The amount of gold in the alloy is expressed in terms of karats, so 24-karat gold is pure gold, 14-karat gold is 14/24 parts gold, and 10-karat gold is 10/24 parts gold or less than half gold. Any of several metals can be used for the remaining portion of the alloy.
2. Amalgam is an alloy made by combining mercury with another metal. Almost all metals form amalgams, with the exception of iron. Amalgam is used in dentistry and in gold and silver mining because these metals readily combine with mercury.
3. Solder is an alloy used to bond metals to each other. Most solder is an alloy of lead and tin. Special solders exist for other applications. For example, silver solder is used in the manufacture of sterling silver jewelry. Fine silver or pure silver is not an alloy and will melt and join to itself.

Elaborate: (10 min)

Divide the class into two groups and give each a different application area, such as construction or transportation. Instruct each group to conduct research and prepare arguments for why alloys are beneficial in their respective fields. Encourage students to think about the specific properties of alloys that make them appropriate for their intended application. Hold a debate in which each group presents its arguments and responds to the opposing group's points. Students are graded on their understanding of alloys as well as their ability to articulate and defend their points of view.

Evaluate: (5 min)

Do Q4(iii) and 5(ii) on page 96 of student book.

Useful Link

https://youtu.be/vrJhuQ2LMp8

Home Assignment:

- Investigate and identify at least three alloys used in everyday life, such as brass, stainless steel, and bronze. Describe the metals involved in each alloy and explain how their specific properties and advantages make them suitable for various applications. Submit your findings and insights in the form of a scientific report or presentation.
- Do Q11 and 12 on page 45 of workbook.

Lesson Plan 6	**Student Book pages**	**Time**	**Workbook pages**
Separating Mixtures	90–92	45 mins	41-42 and 46

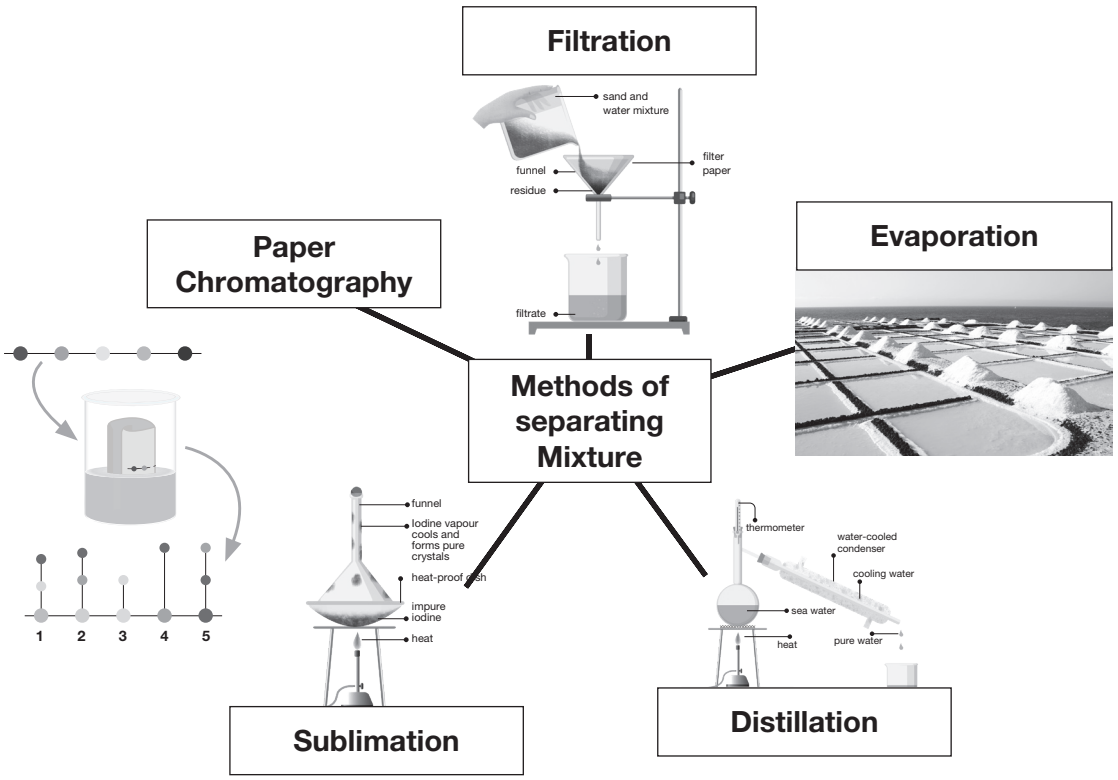
Learning Objectives

Demonstrate ways of separating different mixtures.

Engage: (5 min)

Pour some sand in a glass of water and mix it well. Now, ask the students if they think we can separate the ingredients of this mixture.

Explain: (10 min)



Explore: (15 min)

Students will investigate and find out the separation method for different mixture.

Materials:

- Sand
- Gravel
- Different sized rocks
- Water
- Plastic bowls
- Funnels
- Empty two-liter plastic bottles (cut off the top so you will have a big container with a funnel)
- Salt
- Spoons
- tweezers
- sieves (like a spaghetti strainer)
- coffee filters
- and anything else that comes to mind to help you separate the follow

Procedure:

- Make different type of solutions and allow the students to separate the substances of the mixture using any method that works for that mixture.

Resources

Alloy-made objects or materials, such as jewellery, kitchen utensils, or automotive parts.

Metal strips, such as copper, aluminium, and zinc

Sulphur, carbon, or silicon, in the form of powders or small pieces.

Keywords

Mixtures

Pure

Stainless steel

- Students will write down all the methods of separating mixtures on the paper.
- Choose any of the method and try it for separating the solution.
- At the end they will write their findings and draw conclusion.
- Students will make the following solutions with the given material.
    - o Mix several handfuls of different sized rocks, gravel, and sand in a large plastic bowl or a 2 litre plastic bottle with the top cut off.
    - o Fill the bottle halfway with dirt, gravel, sand, grass, and water.
    - o In a cup, combine equal parts sand and salt.

Useful Link

https://youtu.be/vrJhuQ2LMp8

Elaborate: (10 min)

Students will discuss the methods they chose to separate different solutions and come with the reason to explain why the particular method worked.

Evaluate: (5 min)

- Do Concept Check page 92 of student book.
- Do Q13 on page 46 of workbook.

Home Assignment:

- Copies of Worksheet 7.2 will be given.
- Do Q3, 4 and 13 on page 41-42 and 46 of workbook.

Lesson Plan 7	**Student Book pages**	**Time**	**Workbook pages**
Water, the Universal Solvent	93	45 mins	42-43

Learning Objectives

Demonstrate that mixtures are formed when two or more substances mix with each other without the formation of a new substance.

Identify different types of mixtures.

Engage: (5 min)

- Display a variety of everyday items such as sugar, salt, oil, and sand.
- Request that students observe the substances and discuss their findings. Ask them questions such as, “What do you notice about these substances?” and “Do you think they can be mixed together?”
- In order to pique their interest, ask them, “What do you think will happen if we try to mix these substances with water?”

Keywords

Solution
Solute
Solvent

Explain: (10 min)

- Introduce the concept of solution formation and explain that a solution is a homogeneous mixture formed when one or more substances dissolve in another.
- Discuss water’s properties, emphasizing its role as a universal solvent due to its polarity.
- Explain how, when a solute (such as sugar or salt) is added to a solvent (such as water), the solute particles disperse and form a solution.

Resources

Everyday items such as sugar, salt, oil, and sand.

A cup of water

- Use visuals or demonstrations to show how the solute particles interact with the solvent molecules during the solution formation process.

Explore: (15 min)

- Organize a group activity and divide the students into small groups and give each group a different set of solutes and water.
- Instruct each group to select one solute and predict whether or not it will dissolve in water.
- Students should add the solute to a cup of water and watch what happens.
- Encourage them to stir the mixture and take note of any changes in the solute's or water's appearance or properties.
- Instruct the groups to keep track of their findings and to discuss whether their predictions were correct.

Elaborate: (10 min)

- Instruct each group to share their findings and observations about the solute's ability to dissolve in water.
- Discuss with the students the factors that influence solubility, such as temperature and the nature of the solute and solvent.

Useful Link

https://youtu.be/eTe0a61IohE

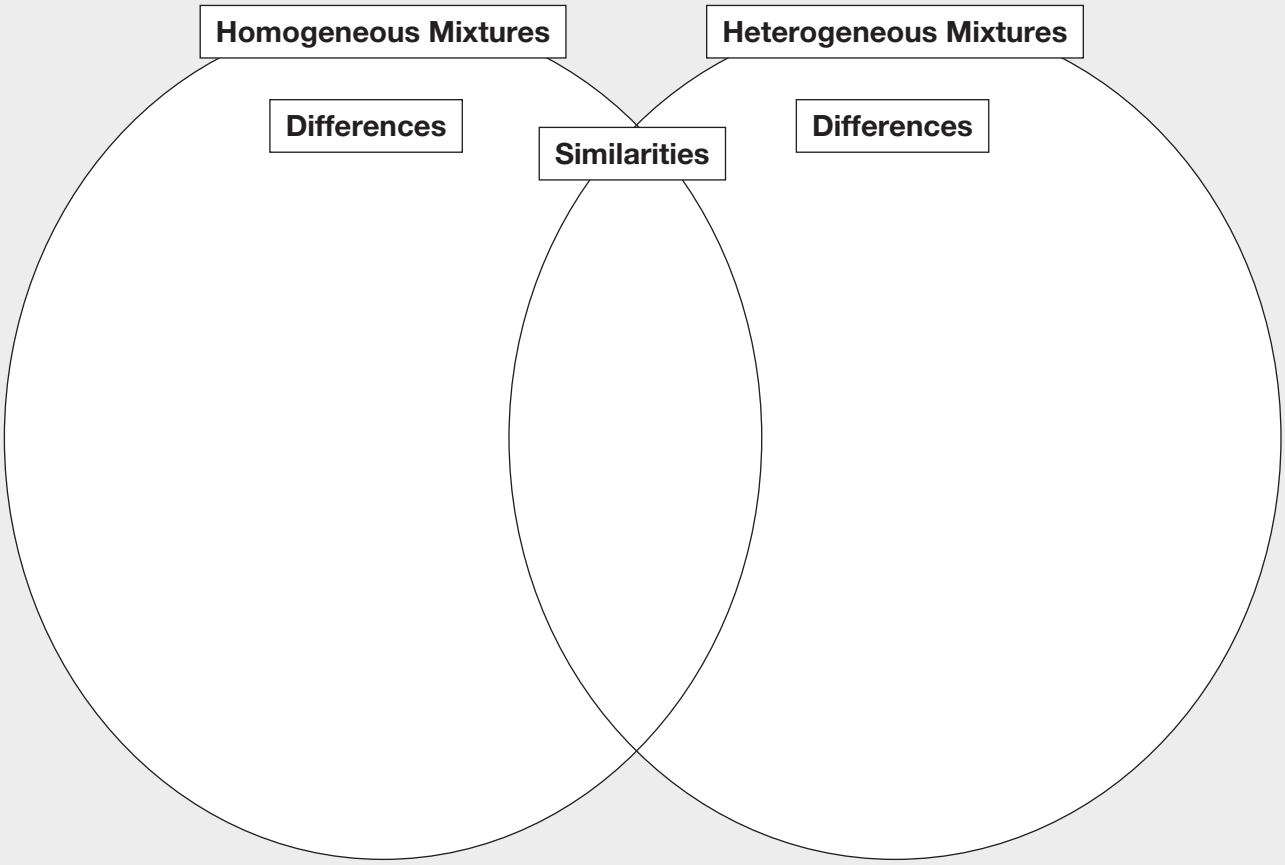
- Encourage students to consider how the solution formation process can be applied in real-life situations or industries.
- To assess students' understanding, conduct a small activity in which they are given various solute-solvent combinations and asked to predict whether the solute will dissolve in the given solvent or not.
- Do Discuss and Answer on page 93 of student book.
- Do Q1 and 2 on page 42 of workbook.

Home Assignment:

- Do Q7 on page 43 of workbook.

Worksheet 1

1. Write down the differences and similarities of homogeneous and heterogeneous in the following Venn diagram.

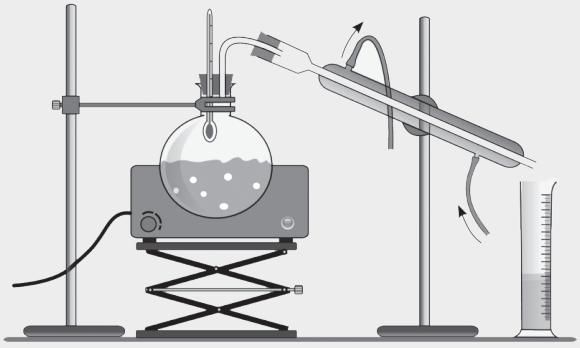


2. Write down the type of mixture:

Mixture	Type
Salt Water	
Salad bowl	
Bag of different coloured balls	
Sugar Water	
Instant Coffee in milk	

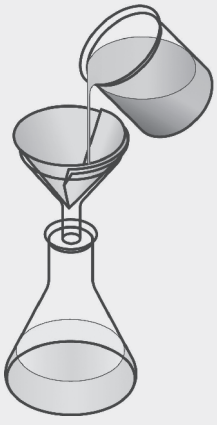
Worksheet 2

1. Which method of mixture separation is shown below:



2. If we want to separate the mixture of salt and sand, which method we will choose for this purpose?

3. Explain why the method depicted in the image below is ineffective for a sugar and water mixture.



Answers for Worksheet 1

Difference between homogeneous and heterogeneous mixtures:

1. Homogeneous mixtures cannot be physically separated. Heterogeneous mixtures can be physically separated.
2. 'Homo' refers to the 'same' whereas 'hetero' refers to 'different'.
3. Homogeneous mixtures possess the same physical properties as one another. Heterogeneous mixtures, on the other hand, do not have the same physical properties.
4. A homogeneous mixture is one in which the solute and solvent are completely dissolved. The particles in a heterogeneous mixture are not uniform because they are completely visible.

Similarity between homogeneous and heterogeneous mixtures:

They both are mixtures.

2. Write down the type of mixture:

Mixture	Type
Salt Water	Homogeneous
Salad bowl	Heterogeneous
Bag of different coloured balls	Heterogeneous
Sugar Water	Homogeneous
Instant Coffee in milk	Homogeneous

Answers for Worksheet 2

1. Distillation.
2. First both will dissolve in water, then filter out sand. Use the evaporation method to separate salt from water.
3. Sugar dissolves in water and it would be in the solution that passes through the filter paper.

Exercises Answer

1. Choose the correct answer.

i. (b) a compound

ii. (b) an alloy

iii. (c) is formed when hydrogen combines with oxygen
iv. (d) cannot be broken down into two or more substances
v. (d) decomposition
vi. (d) liquid air can be fractionally distilled
vii. (b) nitrogen

2. Fill in the blanks.
   i. Element
   ii. Mixture
   iii. Nitrogen
   iv. Oxygen
   v. Evaporation
   vi. Solute
3. A) Amna used the apparatus below to distil 100 cm3 of water-soluble ink.
      i. (b) evaporation then condensation
      ii. Water
      iii. It will be the boiling point of water, which is 100°C at sea level.
      iv. The temperature of the water will remain the same at 15°C. The condenser cools down the water vapor, but it does not freeze it, so the temperature remains constant.
      v. The water vapor changes from a gas to a liquid as it loses heat and condenses in the glass tube.

   B) Imran used the apparatus below to distil 100 cm3 of water-soluble ink.

   The condenser in Apparatus A is better because it provides a more efficient cooling surface for condensing the vapor back into a liquid. The glass tube and beaker of water in Apparatus B may not cool the vapor as effectively.
4. Short answer questions
   i. An element is a substance that consists of only one type of atom. It cannot be broken down into simpler substances by chemical means.
   ii. Examples of things made using single elements:
      • Aluminum foil (made from the element aluminum)
      • Copper wire (made from the element copper)
   iii. The described properties indicate that the element is a metal.
   iv. An alloy is a mixture of two or more elements, at least one of which is a metal, that are combined to create a new material with specific properties.
   v. Compound: A compound is a substance composed of two or more different elements chemically bonded together in a fixed ratio.
   vi. Sublimation is the process in which a solid directly transitions into a gas without passing through the liquid phase.
5. Long answer questions
   i. The composition of air is approximately 78% nitrogen, 21% oxygen, 0.9% argon, and traces of other gases such as carbon dioxide, water vapor, and noble gases.
   ii. An alloy is considered to be a mixture and not a compound because its constituent elements are not chemically bonded together. The atoms of the elements in an alloy retain their individual properties and positions within the structure of the alloy.

iii. Differences between a compound and a mixture:
- Compound: Composed of two or more elements chemically bonded. Can be broken down into simpler substances by chemical means.
- Mixture: Composed of two or more substances physically mixed. Retains the properties of its constituents and can be separated by physical means.

Examples of compounds:

1. Water (H_2O)
2. Carbon dioxide (CO_2)

Examples of mixtures:

1. Saltwater (sodium chloride + water)
2. Air (nitrogen + oxygen + other gases)

iv. The process of separation of salt from water is evaporation. The water is heated, and as it evaporates into steam, the salt is left behind. The steam can be collected and condensed back into liquid form to obtain pure water.

v. Differences between a compound and an element:
- Compound: Composed of two or more different elements chemically bonded.
- Element: Composed of only one type of atom.

Examples of compounds:

1. Water (H_2O)
2. Sodium chloride (NaCl)

Examples of elements:

1. Oxygen (O)
2. Carbon (C)

vi. A molecule of limestone ($CaCO_3$) is different from glucose ($C_6H_{12}O_6$) in terms of their chemical composition and structure. Limestone is a compound composed of calcium, carbon, and oxygen atoms, whereas glucose is also a compound made up of carbon, hydrogen, and oxygen atoms. The ratio of these elements in the molecules is different.

vii. Chromatography is carried out by placing a mixture on a porous material (e.g., filter paper) and allowing a solvent to move through it. As the solvent moves through the material, it carries the different components of the mixture along with it. The components separate based on their solubility and affinity to the solvent and the material.

6. Think about it

a. The best conclusion about the ink is that it is a mixture of different pigments. The concentric rings of color observed during the experiment suggest that the ink contains multiple components that have different solubilities in ethanol.

Activities

1. Experiment to separate salt and sand:

Apparatus:
- Beaker
- Funnel
- Filter paper
- Stirring rod
- Heat source (e.g., Bunsen burner)

- Tripod and wire gauze
- Evaporating dish

Procedure:

1. Mix the salt and sand thoroughly in the beaker to create a homogenous mixture.
2. Place the funnel with filter paper over the empty beaker.
3. Pour the mixture into the funnel, allowing the sand to be trapped by the filter paper while the saltwater passes through.
4. Collect the saltwater in the empty beaker.
5. Set up the heat source (Bunsen burner) with a tripod and wire gauze.
6. Place the beaker containing the saltwater on the wire gauze and heat it gently. The water will evaporate, leaving the salt behind in the evaporating dish.

Expected outcome:

The sand will be separated from the mixture by filtration, and the salt will be obtained by evaporating the water from the saltwater.

1. Experiment to find pigments (colours) in a spinach leaf:

Apparatus:

- Mortar and pestle
- Filter paper
- Funnel
- Test tubes
- Solvent (e.g., alcohol)
- Glass rod
- Light source

Procedure:

1. Crush the spinach leaf in the mortar and pestle to extract the pigments.
2. Place the funnel with filter paper over a test tube.
3. Pour the crushed spinach onto the filter paper, and use a glass rod to press and extract the pigments into the test tube.
4. Add a small amount of alcohol (solvent) to the test tube containing the pigments and mix gently.
5. Observe the pigments separate and migrate up the filter paper due to capillary action.
6. Shine a light source on the filter paper to visualize the different pigments.

Expected outcome:

- The experiment will show the separation of pigments present in the spinach leaf. Different pigments will move at different rates up the filter paper, producing concentric rings of color.
- These items have in common that they are all mixtures. Salad dressing is a mixture of oil, vinegar, and various spices. Cough mixture is a mixture of different medicines and flavors. Soil is a mixture of minerals, organic matter, water, and air. Sand is a mixture of small rock particles and minerals.

Discussion of mixtures and examples:

- A mixture is a combination of two or more substances that are physically mixed but not chemically bonded. Mixtures can be separated using various physical methods.

Demonstration:

- Mix salt and water to create a saltwater solution. Show how salt can be separated by evaporation, leaving the water behind.
- Mix talcum powder with water to form a suspension. Allow it to settle and demonstrate the separation of talcum powder from water by decantation or filtration.
- Mix sand and salt, then separate them by using filtration or evaporation.
- Mix sand and iron filings, then use a magnet to separate the iron from the sand.

Examples of mixtures from everyday life:

1. Trail mix (nuts, dried fruits, and chocolates)
2. Coffee with milk (coffee and milk)
3. Air (a mixture of gases)
4. Lemonade (water, lemon juice, sugar)
5. Muesli (oats, nuts, seeds, dried fruits)

5. Learners' group activity: Making mixtures

   Groups can create and present the following mixtures:

   1. Homogeneous mixture: Sugar dissolved in water (sugar water).
   2. Homogeneous mixture: Salt dissolved in water (saltwater).
   3. Heterogeneous mixture: Rice grains mixed with corn.
   4. Heterogeneous mixture: Salt mixed with rice grains.

6. Demonstration of separation methods:

   The teacher can demonstrate the following separation methods with appropriate apparatus:

   - Evaporation: Separating salt from saltwater.
   - Distillation: Separating alcohol from a solution.
   - Condensation: Separating water vapor from air.
   - Sieving: Separating small particles from larger particles.
   - Chromatography: Separating pigments from ink.

Projects:

1. Collection of 'everyday' materials:

   Learners can collect various everyday materials (e.g., plastic, metal objects, fabrics, etc.) and arrange them on a bulletin board. They should research the elements that make up these items and display their findings.

2. Preparation of constituents from mixtures:

   Learners can plan and carry out the separation of constituents from mixtures like sand and sugar, sand and salt, or salt and iron filings. They can use appropriate methods like sieving, filtration, and evaporation to obtain clean, dry samples of the separated components.

Workbook Answers

1. Solute: describe as a substance that dissolves in a solvent
   Solution: the mixture having solute and solvent
   Solvent: the liquid that a solid dissolves in to form a solution
   Soluble: a solid that dissolves in a liquid to form a solution
2. i. Saturated
   ii. Soluble
   iii. Insoluble
   iv. Evaporate
3. i. Correct order: c, b, a, d
   ii. china dish
   magnet
   beaker
   funnel
   filter paper
   glass rod
   burner
4. i. From left to right: chromatography, filtration, distillation
   ii. a. Chromatography
   b. Distillation
   c. Filtration
5. i. More amount of solute is dissolved at higher temperature.
   ii. C
   iii. C
6. i.

Scientific Term	Substance
Solute	Salt
Solvent	Water
Solution	Salt water

   ii. a b
   iii. 136g
7. i. F
   ii. T
   iii. F
   iv. T
   v. T
8. i. Amount of solute and solvent
   ii. and iii Students will draw themselves.

iv. how quickly the jelly dissolves depends on the temperature of water as the jelly dissolves quickly at higher temperatures.

9. Copper, nickel, iron
10. i. Nitrogen
    ii. Oxygen
    iii. It can vary depending on the amount of pollution in the area.
    iv. Carbon dioxide
11. i. Carbon and chromium
    ii. Copper and tin
    iii. Copper and zinc
    iv. When other elements are added in a metal, this forms alloy.
    v. Alloys
12. Students will label themselves

CHAPTER 08 Energy

Student Book Pages 104–117

Learning outcomes

- Recognize energy as a physical quantity.
- Relate potential energy and kinetic energy.
- Demonstrate an energy transfer such as a bouncing ball by energy transfer diagram, e.g., gravitational potential energy → kinetic → elastic potential energy + thermal + sound → kinetic → gravitational potential energy, etc.
- State the Law of Conservation of Energy and explain how the law applies to different situations.
- Compare the Renewable Energy Sources (wind, water, Sun and plants) and Non -Renewable Sources of energy (coal, natural gas, crude oil).
- Identify the advantages of using renewable energy resources.
- Assemble and demonstrate a solar panel to operate a small fan. (STEAM)
- Design and make a solar water heater. (STEAM)

Overview of the Unit

- Anything with mass and physical space is considered a matter.
- There are numerous forms of matter, such as a pen, paper, clip, sand, air, ice, etc.
- A state of matter is one of the various forms that matter can take.
- The basic three states of matter are as follows:
  - Solid
  - Liquid
  - Gas
- According to the kinetic theory of matter, all matter is made up of small particles that move randomly and have space between them. This means that matter is made up of separate, moving particles regardless of its phase.
- A physical change in a matter is referred to as a change of state. When matter loses or absorbs energy, it state changes.
- These changes are reversible and do not involve any changes in the matter's chemical makeup. Examples of change in the state of matter are:
  - Melting,
  - Freezing
  - Sublimation
  - Condensation
  - Vaporization
- Brownian motion describes the random movement of small particles suspended in fluids. It is commonly known as the Brownian movement." This motion is caused by particle collisions with other fast-moving particles in the fluid.

Lesson Plan 1	Student Book pages	Time	Workbook pages
Energy and Forms of Energy	104– 107	45+45 mins	47-52

Student Learning Objectives

- Recognize energy as a physical quantity.
- Relate potential energy and kinetic energy.

Keywords

Physical quantity
Form
Kinetic energy
Potential energy

Engage: (5 min)

- Begin the lesson by asking students what they know about the concept of "energy." Make a list of their responses on the board.
- Conduct an energy scavenger hunt around the classroom or school premises. Divide the class into groups and assign them the task of locating and identifying energy-related objects or processes (e.g., a moving fan, a battery-powered device, a light bulb, etc.).

Explain (10 min)

- Give a detailed explanation of energy as a physical quantity and its significance in our everyday lives.

- Introduce potential and kinetic energy and explain the distinction between the two concepts.
- Use visual aids and real-life examples to help students easily grasp concepts.
- To demonstrate the relationship between potential and kinetic energy, use a simple equation (PE + KE = Total Energy).

Explore (15 min)

- Set up stations around the classroom where students can participate in hands-on activities related to potential and kinetic energy conversion.
- Station 1: Pendulum Swing - Students test the potential energy of a pendulum at various heights and observe its kinetic energy while in motion.
- Station 2: Elastic Potential - Students investigate how potential energy is stored and converted into kinetic energy using rubber bands or springs.
- Station 3: Roller Coaster Simulation - In order to understand energy transformations, students design and test small-scale roller coaster models.
- Station 4: Marble Run - Students construct a marble run and investigate changes in potential and kinetic energy as the marble moves through the course.

Elaborate: (10 min)

- Have a group discussion with the students about various everyday scenarios and the energy transformations that occur in those scenarios.
- Encourage students to think critically and to look for examples in their surroundings, such as a ball rolling down a hill, a car moving, or a person jumping.

Useful Link

https://youtu.be/IqV5L66EP2E

Evaluate: (10 min)

- Finish the lesson with a brief reflection activity in which students write down one thing they learned about energy and one unanswered question.
- Do Q2 (i and iv) of student book page 115.
- Do Concept Check and Discuss and Answer on pages 104-107 of student book.

Home Assignment:

- Assign students the task of finding examples of potential and kinetic energy in their homes or neighbourhoods and writing a brief paragraph describing each scenario. They can also research and investigate other types of energy not covered in class and present their findings in the next session.
- Do Q1 and Q10 on page 47 and 52 of workbook.

Lesson Plan 2	**Student Book pages**	**Time**	**Workbook pages**
Energy Transfer	108–110	45 mins	49

Student Learning Objectives

Demonstrate an energy transfer such as a bouncing ball by energy transfer diagram, e.g., gravitational potential energy → kinetic → elastic potential energy + thermal + sound → kinetic → gravitational potential energy, etc.

Resources

A cup of hot tea
Ruler with a groove in the middle
Small marble balls

Engage: (5 min)

- Set a cup of hot tea on the table. Inquire the students about the energy present in the hot tea cup. Students will recognize it as thermal energy. Allow it to cool for a few minutes after that. What happened to the energy? - Ask the students.
- The “law of thermodynamics” states that it cannot both create and destroy itself. So, how do you explain the cooling effect of hot tea in a cup? How did the hot tea become cold? Did the tea’s heat content, or thermal energy, fade or vanish? This is a continuation of the first law; while energy cannot be created or destroyed, it can transform and transfer itself from one form to another and from one system to another. So, what happened with the tea cup? Its thermal energy (heat) was released into the environment. It did not simply vanish, but rather flowed to a different medium.

Explain: (10 min)

Keywords

Transform
Conserve
Converter

- Explain the concept of energy transfer and the various types of energy involved in the bouncing ball process, including gravitational potential energy, kinetic energy, elastic potential energy, thermal energy, and sound energy.
- Show a complete energy transfer diagram for a bouncing ball, such as:
- Gravitational potential energy → Kinetic energy (as the ball falls)
- Kinetic energy → Elastic potential energy + Thermal energy + Sound energy (as the ball compresses upon impact)
- Elastic potential energy → Kinetic energy (as the ball bounces back up)
- Kinetic energy → Gravitational potential energy (as the ball rises again)
- Explain how energy is not lost but rather transforms from one form to another during the process.

Useful Link

https://youtu.be/PKm4ZVNmJyQ

Explore: (15 min)

This simple science experiment is an excellent way to demonstrate how energy is transferred from one object to another.

Procedure:

- First, we arranged three marbles in the center and one marble on the edge. Before you start flicking the marbles, ask the students what they think will happen. They’d probably assume that the marbles in the center would roll away.
- We’ll repeat the experiment with different marble configurations (like shooting 2 at 3) until we see a pattern emerge: the number of marbles we flick equals the number of marbles that roll away. In other words, the rolling marble can only transfer its energy to the marble with which it collides, and then to the next marble, and so on.

Elaborate: (10 min)

Ask students to share any examples of energy transfer from their daily lives.

Evaluate: (5 min)

- Worksheet 8.1 will be given.
- Do Concept Check page 109 of student book.

Home Assignment:

- Make a clear and labelled energy transfer diagram that depicts energy transformation in a bouncing ball.
- The diagram should include three major stages: initial height (potential energy), downward motion (kinetic energy), and return to initial height (potential energy).
- Do Q4 on page 49 of workbook.
- Do Q2 (v) of student book page 115.

Lesson Plan 3	**Student Book pages**	**Time**	**Workbook pages**
Sources of Energy	110–112	45 mins	-

Student Learning Outcomes

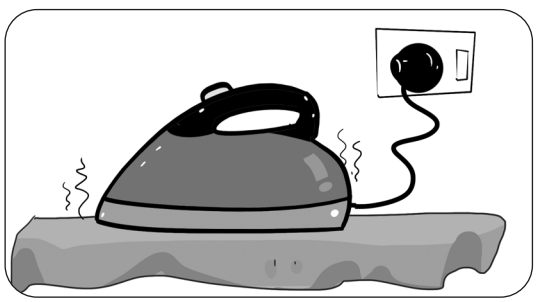
- Compare the Renewable Energy Sources (wind, water, Sun and plants) and Non -Renewable Sources of energy (coal, natural gas, crude oil).
- Identify the advantages of using renewable energy resources.

Resources

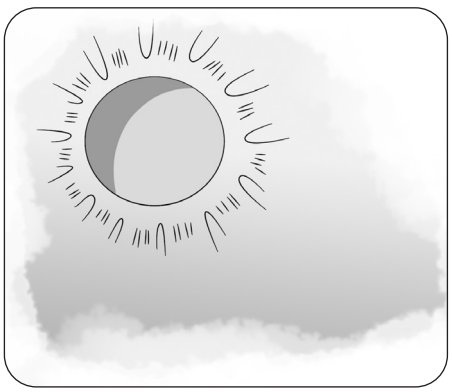
Material for creating a wind mill

Engage: (5 min)

Write the names of various types of energy on the board. Using heat energy as an example, have the students explain where the energy comes from. In front of the energy name, write or draw its possible sources.



Heat Energy



Explain: (10 min)

Keywords

Renewable
Non- renewable
Fossil fuels

- Energy is primarily obtained from natural sources such as the sun, oceans, fossil fuels, wind, and so on, and is converted into electrical energy that we use for our daily needs and benefits.
- There are two types of energy:
  - renewable and
  - non-renewable.
- Non-renewable energy resources are in short supply and take a long time to regenerate. Examples include coal, nuclear power, and oil.
- Renewable energy sources, also known as clean energy, are sources of energy that are constantly generated. Solar and wind energy are two examples of renewable energy sources.
- Explain the benefits of using renewable energy resources, such as lower greenhouse gas emissions, increased energy sustainability, and environmental benefits.

Explore: (Creating a Wind Mill) (15 min)

Useful Link

https://www.youtube.com/watch?v=ViXtT8c4z-c

Material:

- Paper clips
- Cardstock
- String (cotton or twine)
- Rubber bands
- Scissors
- Tape
- Large disposable cups (rec 16oz) or round oatmeal container
- Small disposable cups (rec 6oz)
- Large straws
- Small straws or wood skewer or a pencil

Procedure:

- Make a 6.5” by 6.5” square with the cardboard.
- Mark the center of your square and cut diagonally from the corners to the center, stopping about 1.5” from the center point.
- Make a hole in the center and at the ends of each of your eight corners with scissors or a hole punch. The hole should be sufficient to fit the small straw.
- Insert the small straw through the center of your square, then bend (not fold) each corner onto the straw.
- To keep the pinwheel together, secure the front and back with tape, a paper clip, or rubber bands. There should be about an inch of space between the pinwheel’s front and back.
- Cut the large straw to be the same length as the bottom of your large cup and tape it in place.
- Insert the small straw end into the large straw on your base. There should be about 1.5 inches of small straw sticking out past the base. If necessary, trim the small straw.
- Cut two holes in opposite sides of your small cup and tie a small piece of string between the two holes to make a bucket handle.
- Tie one end of your string to the end of the small straw and the other end to the handle of the small cup.
- To keep the pieces together, use tape or a binder clip on the end of the small straw.
- Watch your pinwheel lift the tiny cup as you blow on it now!

Elaborate: (10 min)

- Explain the working of wind mills.
- The wind blows against the blades, turning a central shaft. Initially, the shaft was linked to a pump or a millstone used to grind grain.
- However, in the future, wind is likely to account for a larger portion of our power production because it is a renewable energy source, as opposed to fossil fuels such as coal.

Evaluate: (5 min)

- Worksheet 8.2 will be given.
- Do Concept Check page 113 of student book.

Home Assignment:

- Create a comparison chart or table that highlights the differences between Renewable Energy Sources (wind, water, sun, and plants) and Non-Renewable Energy Sources (coal, natural gas, crude oil) in terms of availability, environmental impact, and sustainability.
- Do Q4 on page 116 of student book.

Lesson Plan 4	Student Book pages	Time	Workbook pages
Make a solar water heater	110–112	45 mins	-

Student Learning Outcome

Design and make a solar water heater. (STEAM)

Resources

Cardboard
Aluminium foil
Plastic bottles
Black paint
Glue

Engage: (5 min)

- Ask students to think about different energy sources they are familiar with, such as fossil fuels, wind, solar, hydroelectric, and so on.
- In order to pique their interest, discuss the concept of renewable energy resources and ask them, "What do you think are the advantages of using renewable energy sources compared to non-renewable sources?"
- Organize a class discussion in which students can share their thoughts and prior knowledge about the benefits of renewable energy resources.

Explain: (10 min)

- Establish the concept of renewable energy resources and explain how they can be naturally replenished and do not deplete over time.
- Discuss various forms of renewable energy, such as solar energy, wind energy, hydroelectric power, and geothermal energy.
- Explain the benefits of using renewable energy resources, such as lower greenhouse gas emissions, increased energy sustainability, and environmental benefits.
- Concentrate on solar energy and its use in solar water heaters.

Explore: (15 min)

- Divide students into small groups and give them the materials they need to design and build a solar water heater (cardboard, aluminium foil, plastic bottles, black paint, glue, and so on).
- Instruct each group to design and build a solar water heater while adhering to specific guidelines or criteria, such as maximizing heat absorption and retention.
- Assist students in designing mechanisms for collecting and transferring solar energy.
- Allow students time to test their solar water heaters by placing them in sunlight and observing how the water temperature changes over time.
- Encourage students to evaluate and compare the effectiveness of their designs, and to make changes as needed.

Elaborate: (10 min)

- Have each group present their solar water heater designs, explaining the principles behind them and how they use solar energy.
- Facilitate a discussion about the benefits of using solar energy for water heating and the potential applications of solar water heaters in real-world scenarios.

- Encourage students to think creatively about how to improve the efficiency and effectiveness of solar water heaters.

Evaluate: (5 min)

Examine students' comprehension by asking them questions about the benefits of renewable energy resources, the principles underlying solar water heaters, and the factors influencing their performance.

Home Assignment:

Write a short paragraph explaining the principle behind solar water heating and how this system utilizes solar energy to provide hot water for daily use.

Lesson Plan 5	Student Book pages	Time	Workbook pages
Assemble and Demonstrate a Solar Panel	110–112	45 mins	

Student Learning Outcome

Assemble and demonstrate a solar panel to operate a small fan. (STEAM)

Resources

Wires
Connectors
Small fans

Engage: (5 min)

- Ask students questions about energy, such as "What is energy?" as well as "Where do we encounter energy in our daily lives?"
- Show them a small fan and ask, "How do you think this fan works?" "Where does the energy come from to make it work?"
- Facilitate a class discussion in which students share their thoughts and prior knowledge about energy sources and how they can be used to power devices.

Explain: (10 min)

- Introduce energy as a physical quantity and explain that it is the ability to do work or effect change.
- Examine various types of energy, such as solar energy, electrical energy, and mechanical energy.
- Explain the concept of solar energy and how it is obtained from the Sun through the use of solar panels.
- Explain how solar panels convert sunlight into electrical energy, which is then used to power devices such as the small fan.

Explore: (10 min)

- Distribute solar panel kits, small fans, and other necessary materials (wires, connectors, etc.) to students in small groups.
- Instruct each group to assemble the solar panel according to the instructions provided.
- Show students how to use wires and connectors to connect the solar panel to the small fan.
- Allow students time to test their solar panel setups by exposing them to sunlight and observing whether or not the fans begin to operate.
- Encourage students to experiment with the angle and intensity of the sunlight to see how it affects the fan's operation.

Elaborate: (10 min)

- Discuss each group's observations and experiences, paying special attention to how the solar panel converts solar energy into electrical energy to power the fan.
- Encourage students to consider the benefits and drawbacks of solar energy as a renewable energy source.
- Facilitate a discussion about other solar panel applications and their role in sustainable energy solutions.

Evaluate: (10 min)

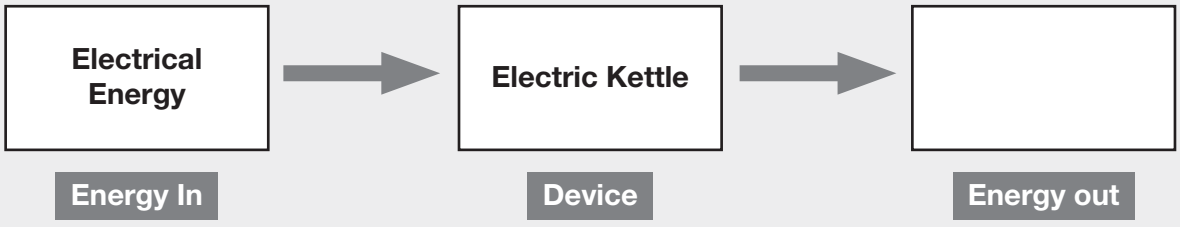
- Students should present their assembled solar panels and show how they power the small fans.
- Examine their comprehension by asking questions about the principles underlying solar panel operation and the role of solar energy.
- Encourage students to think about their learning experience and solicit feedback on the activity and their understanding of energy.

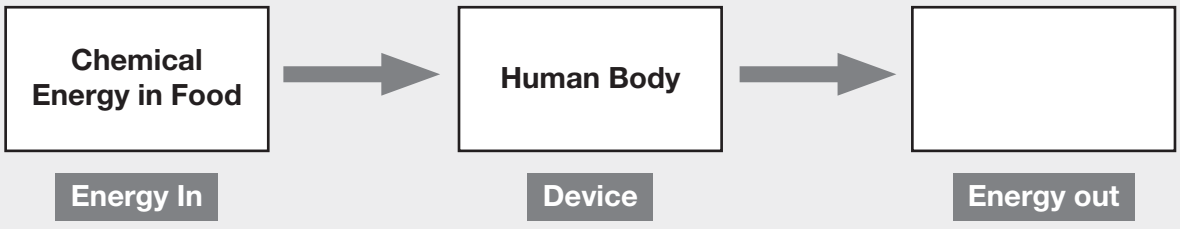
Home Assignment:

Explain how solar panels work, their benefits as a renewable energy source, and their potential impact on reducing carbon emissions. Include at least three real-life examples of solar panel applications to support your points.

Worksheet 1

Complete the following:





Worksheet 2

Draw the source in front of the energy form:

SOUND

MECHANICAL

ELECTRICAL

HEAT AND LIGHT

CHEMICAL

Answers for Worksheet 1

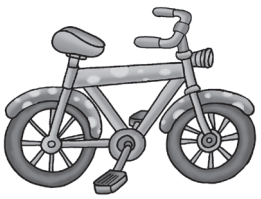
1. Electrical energy ⟶ Television ⟶ Sound and light energy
2. Electrical energy ⟶ Electric Kettle ⟶ Heat energy
3. Chemical energy of food ⟶ Human Body ⟶ Heat and Kinetic
4. Electrical energy ⟶ Radio ⟶ Sound energy

Answers for Worksheet 2

Draw the source in front of the energy form:

SOUND

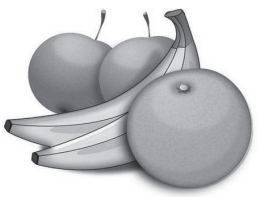
MECHANICAL



ELECTRICAL

CHEMICAL

HEAT AND LIGHT



Exercise Answers

1. i) b ii) b iii) d iv) d v) d
2. i) Energy is the capacity to do work. The main forms of energy are mechanical, thermal, chemical, electrical, nuclear, and electromagnetic energy.
   ii) In machines, energy is often wasted as heat due to friction.
   iii) a) Mechanical and sound energy.
   b) Electrical energy.
   c) Kinetic energy is converted into electrical energy.
   d) Potential energy is converted into kinetic energy.
   iv) a) Kinetic energy.
   b) Chemical energy.
   c) Potential energy.
   d) Potential energy.
   v) The water gets its potential energy from its position at the top of the hill, which is higher than its resting position, and gravity is responsible for this potential energy.
   vi) Biomass refers to organic materials, such as wood, agricultural waste, and animal manure, that can be used as fuel. Examples of biomass fuels include wood pellets, biogas, and bioethanol.
   vii) Six ways to save energy in the home are using energy-efficient appliances, sealing gaps and leaks in windows and doors, insulating walls and attics, using LED or CFL light bulbs, turning off lights and appliances when not in use, and adjusting thermostat settings.
   viii) Renewable energy is known as clean energy because it does not produce harmful emissions or pollutants during its generation and use, unlike non-renewable sources like coal and oil.
3. i) Heat energy is the energy associated with the movement of atoms and molecules in a substance. It helps us do work by providing thermal energy that can be converted into other forms of energy, such as mechanical or electrical energy.
   ii) Hydroelectric power is produced in a power station by harnessing the energy of flowing water. Water flows through turbines, which convert the water's kinetic energy into mechanical energy, and then a generator converts this mechanical energy into electrical energy.
   iii) The greenhouse effect is a natural process that helps maintain the Earth's temperature by trapping heat from the Sun in the atmosphere. However, human activities, such as burning fossil fuels, release additional greenhouse gases, leading to enhanced greenhouse effect and global warming.
   iv) Methane is produced in a biodigester through the anaerobic digestion of organic matter, such as animal manure or food waste. Microorganisms break down the organic matter in the absence of oxygen, producing methane gas as a byproduct.
   v) Coal and oil are formed from ancient plant and animal remains that were subjected to high pressure and heat over millions of years. The energy from the Sun was captured by these organisms through photosynthesis, and this stored energy is released when coal or oil is burned.
4. i) It is important to find new ways of generating electricity to meet the growing energy demand, reduce reliance on fossil fuels, and mitigate the environmental impact of energy production.

ii) Cars cause problems such as air pollution, traffic congestion, noise pollution, and contribute to greenhouse gas emissions and climate change.

iii) Wind farms built on land may cause visual and noise disturbances for nearby residents, while offshore wind farms may have higher installation and maintenance costs.

iv) The most suitable renewable sources of energy for a school would depend on factors like location, available resources, and energy needs. Possible options could include solar panels, wind turbines, or biomass systems.

v) a) Yes, the use of renewable energy resources is more advantageous as they are sustainable, produce minimal or no greenhouse gas emissions, and reduce our dependence on finite fossil fuels.

b) Biomass is considered renewable as it comes from organic materials that can be replenished, but it may not be considered "clean" because its combustion releases carbon dioxide and other pollutants, albeit at lower levels than fossil fuels.

vi) a) Electricity is versatile and can be easily converted into other forms of energy.

b) Chemical energy represents stored energy in the arrangement of atoms and molecules.

c) Burning fossil fuels, such as coal, oil, and natural gas, releases carbon dioxide and contributes to global warming.

d) The Sun's energy is the primary source of energy for life on Earth through photosynthesis.

Activities:

1. The energy supplied while rubbing the finger on the desk is mechanical energy. After doing this for some time, the fingers may feel warm or slightly hot. The energy produced is primarily thermal energy due to the friction between the finger and the desk.
2. When the streamers are held above a hot radiator or heater, they start to move and flutter. The energy changes that have taken place are as follows:
   - The heat from the radiator transfers to the air surrounding it, creating convection currents.
   - The streamers are carried upward by the rising warm air due to convection.
   - The potential energy of the streamers (position above the heater) is converted into kinetic energy as they move with the air currents.
3. When speaking with the blown-up balloon held near the mouth, the balloon vibrates. The energy change taking place is as follows:
   - The sound produced when speaking causes vibrations in the air.
   - The vibrations are transferred to the balloon, causing it to vibrate as well.
   - The sound energy produced by the speaker's vocal cords is converted into mechanical energy in the form of balloon vibrations.
4. To compare the chemical energy of two different makes of torch batteries, follow these steps:
   - Precautions: Use new batteries of the same size and type from reputable manufacturers to ensure accuracy and safety.
   - Testing: Connect each battery to an identical electrical circuit with a load (e.g., a resistor) that draws a constant current from the battery.
   - Fairness: Make sure the testing conditions are the same for both batteries, including the load, connection, and duration of the test.
   - Measurements: Measure the time it takes for each battery to discharge completely (or until it reaches a specific voltage).

- Record: Record the voltage drop and the time taken for each battery to discharge completely. Use a data table to organize the results.

Projects:

1. Display Project:

   Create a classroom display titled ‘Our Lives Depend on the Sun’ incorporating posters, newspaper and magazine articles, photographs, diagrams, books, models, experiments, and charts. The display will highlight the significance of solar energy in our daily lives, such as solar power generation, solar heating, and solar technologies for renewable energy. It will also showcase the environmental benefits of using solar energy and its potential for reducing carbon emissions.

2. Waterwheel or Water Turbine Model:

   Design and construct a simple waterwheel or water turbine using recyclable materials like cardboard, popsicle sticks, and plastic bottle caps. Test the model under a slowly running tap to observe its rotational motion due to the flowing water’s kinetic energy. This hands-on project will demonstrate the principle of hydropower and how it can harness the energy from moving water to perform mechanical work.

3. Solar Water Heater:

   Create a solar water heater using readily available materials like a cardboard box, aluminum foil, plastic bottles, and black paint. Set up the solar water heater outside in direct sunlight and measure the increase in water temperature over time. This project will illustrate how solar energy can be used for heating water and its potential as a renewable energy source for everyday use.

4. Book Report on Harmful Effects of Fossil Fuels:

   Research and write a book report discussing the adverse impacts of fossil fuel consumption on the environment and human health. Include information on air pollution, greenhouse gas emissions, climate change, and the depletion of non-renewable resources. The report should also propose alternative solutions and renewable energy sources to mitigate the harmful effects of fossil fuels.

5. Energy Resources Misuse Survey:

   Conduct interviews with people in your community to identify energy resource misuse in daily life. Prepare a concise report with data on common energy wastage practices like leaving lights on, inefficient appliance use, unnecessary heating or cooling, and excessive water consumption. Suggest practical ways to raise awareness and encourage energy conservation in the community.

Workbook Answers

1. Here is a list of some of the forms that energy can take. Write the correct one in each box.

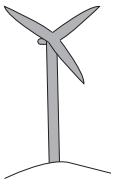
light , heat , sound , electrical, kinetic , chemical

useful energy light bulb gives out

Light and heat

the energy that comes from a radio

Sound



energy that makes a wind turbine turn

Kinetic and sound

the energy that a plant needs to grow

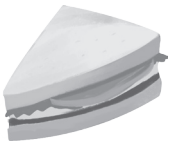
Light and chemical

the energy used for cars

Kinetic

the energy that works this fire

Heat and light



the energy in this sandwich

Chemical

the wasted energy this torch gives out

Heat

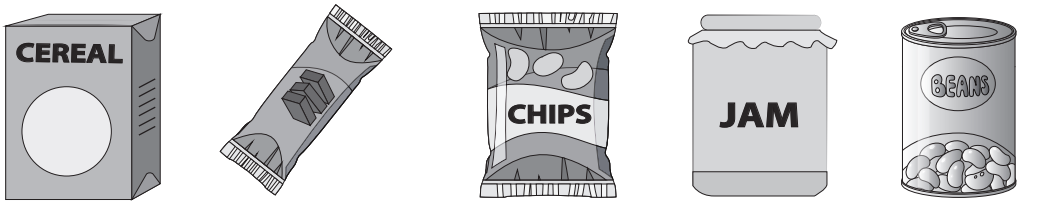
2. Match each key word with its meaning:

Key word	Meaning
chemical energy	heating of the Earth as a result of polluting gases
renewable energy	the type of energy possessed by moving objects
insulation	coal, oil, and natural gas are examples
energy	this cannot be created or destroyed, only changed
fossil fuels	the energy stored in food and fuels
generator	type of energy resource that can be easily replaced
geothermal energy	can reduce the amount of heat energy lost from a building
kinetic energy	in a power station, it changes kinetic energy into electrical energy
global warming	energy from hot rocks deep inside the Earth's crust

3. i. Potential energy
   ii. Kinetic energy
   iii. Potential energy
4. C . the string in a bow
   i. Because it has potential energy stored in it.
   ii. Chemical energy
5. i. True
   ii. True
   iii. True
   iv. True
   v. True
6. i. Fossil fuels
   ii. Burning fossil fuels leads to pollution which causes global warming.
   iii. They are called fossil fuels because they were formed from the remains of animals and plants which lived millions of years ago.
   iv. Fossil fuels are non-renewable because they cannot be replaced easily.
   v. Carbon dioxide and carbon monoxide.
   vi. Green house effect
   vii. It is causing global warming.
7. i. Coal
   ii. They might last longer if proper measures are taken to conserve them such as using less electricity and relying more on renewable energy resources.
   iii. All energy resources that once used, can be replaced easily and readily, are known as renewable energy resources.
   iv. It is important to make greater use of them because there is no danger of them running out.

8. i. The advantages of using these energy resources are that there is no danger of them running out.
   ii. Sun is the main source of energy because it is the source of almost all energies on Earth. Plants use solar energy for photosynthesis which are consumed by animals. Sun also causes weather conditions.
   iii. Devices that can change or convert energy from one form to the other are called energy converters.
   iv. The law of conservation of energy states that 'Energy can neither be created nor destroyed'.
   v. Energy stored in compressed or stretched springs of elastic or rubber.

9.



1080 KJ / 100g	1000 KJ / 100g	750 KJ / 100g	80 KJ / 100g	293KJ / 100g
5	4	3	1	2

10. i. Kinetic
    ii. Potential
    iii. Gravitational
    iv. Wind energy

11. 1. Fossil fuels
    2. Chemical energy
    3. Kinetic energy
    4. Insulation
    5. Geothermal energy

CHAPTER 09

Electricity

Student Book Pages 118–129

Learning outcomes

- Explain the phenomena of static electricity in everyday life.
- Recognize electric current as a flow of charges.
- Describe a simple circuit as a path for flow of charges.
- Differentiate between open and closed circuits.
- Draw and interpret simple circuit diagrams (using symbols).
- Describe the characteristics of series and parallel circuits.
- Draw and construct a series and parallel circuits.
- Identify the use of series and parallel electric circuits in daily life.
- Investigate the factors that affect the brightness of bulbs or speed of motors
  - Number of batteries
  - Number of Bulbs
  - Type of wire
  - Length of wire
  - Thickness of wire
- Assemble and operate a trip wire security alarm system using simple items. (STEAM)

Overview of the Unit

- Any phenomenon associated with stationary or moving electrons, ions, or other charged particles is referred to as electricity.
- An electric current is the movement or flow of electric charges from one location to another.
- An electric current transports energy along a definite path or circuit from an electron source (battery or solar cell) to an electrical device (a load).
- An electric circuit consists of four major components:
  - Conducting wires (typically copper) that transport charge throughout the circuit.
  - Batteries or a solar cell are examples of electron sources.
  - A load, such as a lamp, converts electron energy into a useful form, such as light.
  - The flow of electrons is controlled by a switch. A closed switch allows electrons to flow through the entire circuit, inferring that the energy from the electrons is received by the load or loads. An open switch creates an air gap across which electrons cannot flow, resulting in the load or loads not receiving energy from the electrons and failing to function.

Lesson Plan 1	**Student Book pages**	**Time**	**Workbook pages**
Electric Current	118-120	45+45 mins	-

Student Learning Objectives

Recognize electric current as a flow of charges.

Resources

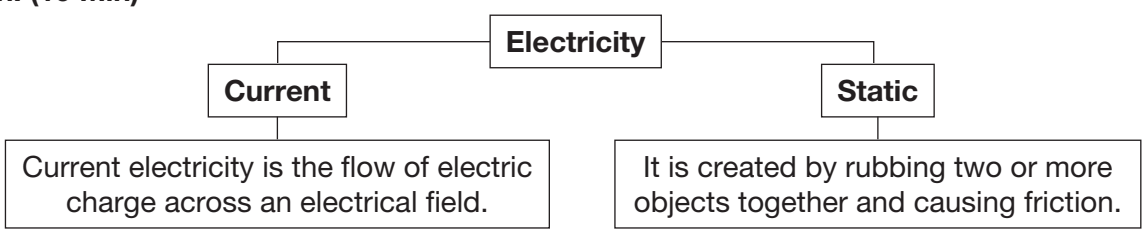
Bobby pin
eraser
Button
key
Coin
Basic circuit with a small bulb

Engage: (5 min)

Rub a plastic comb across hairs and hold it over the small pieces of tissue paper on the table. The tissue paper pieces will be attracted to the comb.

Students should be asked, “Does anyone know why this happens?” If any student knows the answer, appreciate him or her and start the explanation.

Explain: (10 Min)



Explore: (10 min)

Investigate which material is best for moving current.

Material:

- Bobby pin
- Eraser
- Button
- Key
- Coin
- Basic circuit with a small bulb

Keywords

Static electricity
Dynamic electricity
Electric current

Useful Link

https://youtu.be/iqVtGNQAC2E

Procedure:

- Students apply their knowledge of electricity, static charge, current, conductors, and insulators from the lesson to real-world engineering by determining the best material for moving current in a solar panel.
- While posing as engineers, students investigate the properties of various materials by testing their ability to see which item will allow the bulb to illuminate.
- Discuss the results with the students that which item can be the best option for using in the solar panel.

Elaborate: (15 min)

The activity can be elaborated by asking students to classify materials that conduct electricity as conductors and materials that hold a static charge as insulators.

Evaluate: (5 min)

Ask students:

- How would engineers manage the electricity in a device, such as a television? What if they want more electricity? (By increasing current.)
- How can we save ourselves from electrocution? (By using insulator.)

Home Assignment:

Distribute copies of worksheet 9.1 to complete at home.

Lesson Plan 2	Student Book pages	Time	Workbook pages
Electric Circuit	119–120	45 mins	-

Student Learning Objectives

Describe a simple circuit as a path for flow of charges.

Engage: (5 min)

- Begin the lesson by leading students on a circuit hunt around the classroom or school. Divide the class into groups and give each group a checklist of circuit-related items (e.g., light switches, battery-operated toys, extension cords, etc.).
- Instruct the students to look for and identify circuit-related items while discussing how they work and what they have in common.

Resources

A cup of hot tea
Ruler with a groove in the middle
Small marble balls

Explain (10 min)

- Introduce the concept of a simple circuit, emphasizing that it is a closed loop or path for electric charges to flow through.
- Discuss the elements of a simple circuit, such as a power source (such as a battery), conducting wires, and a load (such as a light bulb or buzzer).
- Explain the difference between open and closed circuits, stating that an open circuit has a break in the path, whereas a closed circuit allows charges to flow.

Keywords

Circuit
Components
Open circuit
Close circuit

Explore (15 min)

- Give students materials (such as batteries, bulb holders, bulbs, wires, and switches) to create their own simple circuits on a circuit board or with snap-together components.
- Allow them to experiment with making open and closed circuits and observing the effects of each.

Elaborate: (10 min)

- Introduce circuit symbols (for example, battery, bulb, and switch) and how they are used to represent components in circuit diagrams.
- Direct students to draw simple circuit diagrams using the symbols they created in the previous activity.
- Discuss the significance of using clear and accurate circuit diagrams when communicating circuit designs.

Useful Link

https://youtu.be/Ij4dVhprZIw

Evaluate: (10 min)

Do Concept Check on page 121 of student book.

Home Assignment:

- Locate an example of an open circuit in your home and explain why it is not working.
- Do Q3 (i-iii and vi) on page 127 of student book.

Lesson Plan 3	Student Book pages	Time	Workbook pages
Series and Parallel Circuits	121	45 mins	56

Student Learning Outcomes

- Describe the characteristics of series and parallel circuits.
- Draw and construct a series and parallel circuits.
- Identify the use of series and parallel electric circuits in daily life.

Resources

Batteries
Bulbs
Wires

Engage: (10 min)

- Play a game with the students to make them understand the working of parallel and series circuits.
- Begin by having the entire group stand in a large circle. Give two small balls to a student. After that, the student should pass the balls around the circle to demonstrate a closed series circuit. Next, separate two students in the circle so that they cannot reach each other. Pass the balls again to show an open circuit that comes to a stop due to a break. Make it clear that when there is a break in a series circuit, current cannot flow through it.
- Place two rows of students in the center of the circle, with students on either side of the circle

connecting them. Pass three balls to students, noting that they can divide the balls when they reach a break in the path (circle path and center line paths). Explain this is how a closed parallel circuit works.

- Finally, ask two students in one of the center line paths to move away from one another to demonstrate a circuit break. Pass the balls again, noting that when they reach the break, the other circuit is still intact and active.

Keywords

Series circuit
Parallel circuit
Voltage
Current

Explain: (10 min)

Series Circuit	All components in a series circuit are connected end-to-end, forming a single path for current flow.

Parallel Circuit	All components in a parallel circuit are connected across each other, forming exactly two sets of electrically common points.

- Give real-world examples of series and parallel circuits, such as household wiring (parallel) and string lights (series).
- You can also display images or provide real-world examples of devices or systems that use series or parallel electric circuits, such as Christmas lights or home electrical wiring

Explore: (15 min)

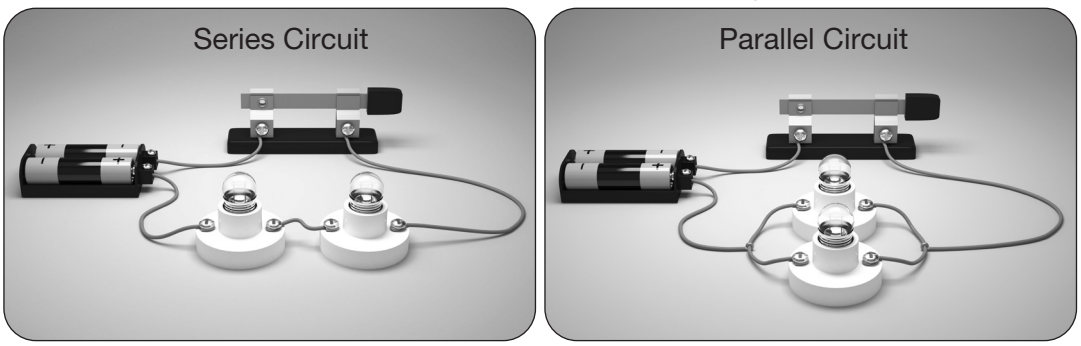
Material:

For Series Circuit:
Two batteries
Two bulbs
Three wires

For Parallel Circuit
Two batteries
Two bulbs
Four wires

Procedure:

Students will make a series and parallel circuits with the teacher's guidance.



Elaborate: (5 min)

- You can extend the activity by including an observation for the students.
- Remove one bulb from a series circuit and observe if the other bulb remains lit.
- Take out one bulb from a parallel circuit. Is the other bulb still lit?

Evaluate: (5 min)

- Give students a variety of real-world examples and ask them to explain how using series or parallel circuits affects the functionality and reliability of the devices or systems.
- Do Concept Check and Discuss and Answer on page 122 of student book.

- Do Q5(i-ii) page 56 of workbook.

Home Assignment:

- Complete worksheet 9.2.
- Do Q4 and 5 on page 56 of student book.

Lesson Plan 4	**Student Book pages**	**Time**	**Workbook pages**
Factors That Affect the Brightness of Bulbs or Speed of Motors	123–124	45 mins	56

Student Learning Outcomes

Investigate the factors that affect the brightness of bulbs or speed of motors.

- Number of batteries
- Number of Bulbs
- Type of wire
- Length of wire
- Thickness of wire

Resources

Different types of bulbs
batteries
wires
motors

Engage: (5 min)

- Start the lesson by having students brainstorm and discuss what they believe influences the brightness of bulbs or the speed of motors. Encourage them to share their thoughts and knowledge.
- Show student different types of bulbs and motors and ask them to observe and predict how different factors may affect their brightness or speed.

Explain: (10 min)

- Explain briefly the factors that can affect the brightness of bulbs or the speed of motors.
- Introduce the specific variables to be studied: a) The number of batteries, b) the number of bulbs, c) the type of wire, d) the length of the wire, and e) the thickness of the wire.
- Discuss concepts such as voltage, current, resistance, and their impact on electrical circuits to explain the relationship between these factors and the brightness of bulbs or the speed of motors.

Explore: (15 min)

- Make small groups of students and give them materials to build circuits and motors, such as batteries, bulbs, and wires of various types, lengths, and thicknesses.
- Instruct each group to investigate one factor and design an experiment to investigate its effects on the brightness of bulbs or the speed of motors.
- Before conducting experiments, encourage students to make predictions and develop hypotheses.
- As students set up their circuits, vary the chosen factor, and collect data on the resulting changes in brightness or speed, provide guidance and support.
- During the exploration phase, instruct students to record their observations, measurements, and

any additional notes.

Elaborate: (10 min)

- Allow each group to present their results and discuss the relationship between the chosen factor and the observed changes in brightness or speed.
- Facilitate a class discussion to assist students in analyzing and comparing data from various groups, identifying patterns, trends, and potential explanations.
- Encourage students to connect their observations to the scientific concepts discussed during the explanation phase.

Keywords

Brightness
Speed
Length
Thickness

Evaluate: (5 min)

- Assign a task or question that requires students to apply their knowledge and comprehension of the factors being investigated.
- For example, based on their findings and understanding of the factors involved, you can ask students to explain how they would increase the brightness of a bulb or the speed of a motor.
- Do Q6 on page 126 of student book.

Home Assignment:

Propose a hypothetical scenario where you have a limited power source and need to optimize the brightness of bulbs and speed of motors simultaneously. Create a plan outlining the best combination of components and factors to achieve the desired results efficiently and effectively.

Useful Link

https://youtu.be/SqtEbjDHlLs

Lesson Plan 5	Student Book pages	Time	Workbook pages
Make a solar water heater	123–124	45 mins	-

Student Learning Outcome

Design and make a solar water heater. (STEAM)

Engage: (5 min)

- Ask students to think about different energy sources they are familiar with, such as fossil fuels, wind, solar, hydroelectric, and so on.
- In order to pique their interest, discuss the concept of renewable energy resources and ask them, “What do you think are the advantages of using renewable energy sources compared to non-renewable sources?”
- Organize a class discussion in which students can share their thoughts and prior knowledge about the benefits of renewable energy resources.

Resources

Cardboard
Aluminium foil
Plastic bottles
Black paint
Glue

Explain: (10 min)

- Establish the concept of renewable energy resources and explain how they can be naturally replenished and do not deplete over time.
- Discuss various forms of renewable energy, such as solar energy, wind energy, hydroelectric power, and geothermal energy.
- Explain the benefits of using renewable energy resources, such as lower greenhouse gas emissions, increased energy sustainability, and environmental benefits.

- Concentrate on solar energy and its use in solar water heaters.

Explore: (15 min)

- Divide students into small groups and give them the materials they need to design and build a solar water heater (cardboard, aluminium foil, plastic bottles, black paint, glue, and so on).
- Instruct each group to design and build a solar water heater while adhering to specific guidelines or criteria, such as maximizing heat absorption and retention.
- Assist students in designing mechanisms for collecting and transferring solar energy.
- Allow students time to test their solar water heaters by placing them in sunlight and observing how the water temperature changes over time.
- Encourage students to evaluate and compare the effectiveness of their designs, and to make changes as needed.

Elaborate: (10 min)

- Have each group present their solar water heater designs, explaining the principles behind them and how they use solar energy.
- Facilitate a discussion about the benefits of using solar energy for water heating and the potential applications of solar water heaters in real-world scenarios.
- Encourage students to think creatively about how to improve the efficiency and effectiveness of solar water heaters.

Evaluate: (5 min)

Examine students' comprehension by asking them questions about the benefits of renewable energy resources, the principles underlying solar water heaters, and the factors influencing their performance.

Home Assignment:

Write a short paragraph explaining the principle behind solar water heating and how this system utilizes solar energy to provide hot water for daily use.

Lesson Plan 6	**Student Book pages**	**Time**	**Workbook pages**
Assemble and Operate a Trip Wire Security Alarm System		45 mins	-

Student Learning Outcome

Assemble and operate a trip wire security alarm system using simple items. (STEAM)

Engage: (5 min)

- Begin by asking the students if they are familiar with security alarm systems and how they operate.
- Introduce the concept of a trip wire security alarm system, demonstrating how it can be constructed with simple materials.
- To pique their interest and curiosity, show an image or video of a basic trip wire security alarm system.
- Ask the students to brainstorm and discuss in pairs or small groups how they believe such a system might work.

Explain: (10 min)

- Explain the concepts of series and parallel electric circuits.

Resources

String or thin wire

A small battery-powered buzzer or a sound-making device

Clothespins or clips

Tape

A small cardboard box or similar structure to mount the buzzer and secure the wire

- Explain how series circuits are made up of components connected in a single path, with current flowing sequentially through each component. Explain how if a single component fails, the entire circuit is disrupted.
- Explain how parallel circuits are made up of multiple branches connected by separate paths, allowing current to flow independently through each branch. Discuss how, if one component fails, the remaining branches can continue to function.
- Give real-world examples of series and parallel circuits, such as household wiring (parallel) and string lights (series).

Explore: (15 min)

Resources:

- String or thin wire
- A small battery-powered buzzer or a sound-making device
- Clothespins or clips
- Tape
- A small cardboard box or similar structure to mount the buzzer and secure the wire
- Divide the students into small groups and give them the above materials to build their trip wire security alarm systems:
- Instruct the groups to experiment with and build their trip wire alarm systems using the materials provided.
- Encourage them to experiment with different trip wire configurations and placements.

Elaborate: (10 min)

- After the students have built their trip wire security alarm systems, each group should present their designs to the class.
- Encourage them to explain how their systems operate, including the circuitry and how the buzzer is activated when the trip wire is disturbed.
- Perform a demonstration in which one group sets up their alarm system and another group attempts to trigger it by carefully crossing the trip wire.

Evaluate: (5 min)

Assess the success of each group's alarm system based on its ability to detect intrusion and effectively trigger the alarm.

Worksheet 1

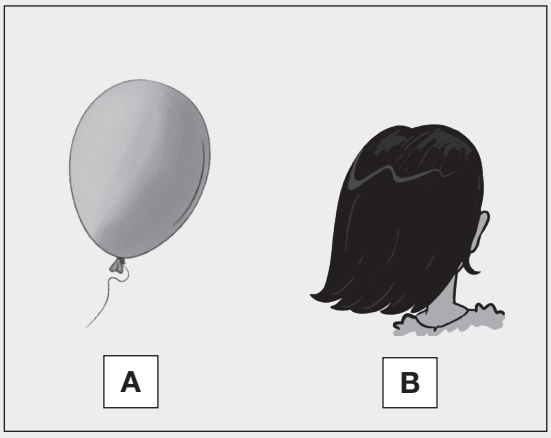


Image 1

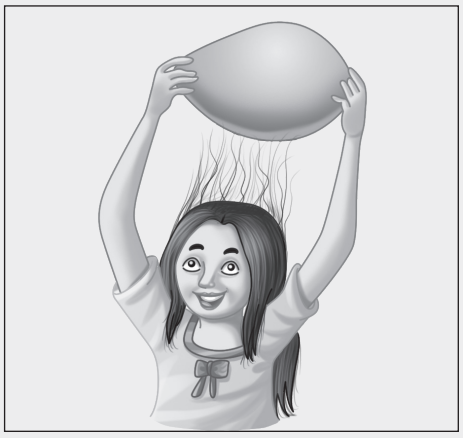


Image 2

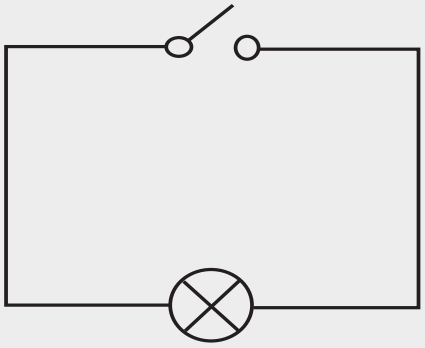
1. What is the charge of object A in image 1?

2. What is the charge of object B in image 1?

3. How did the object A change its charge after rubbing with object B in image 2?

4. If we place small pieces of paper near the object A in image 2, Will the papers be attracted to it ? If so, please explain why.

Worksheet 2



1. What type of circuit is this?

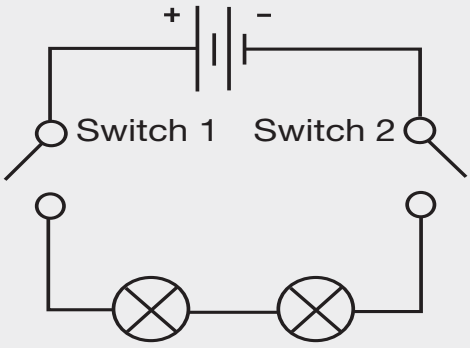
_____

_____

2. What should be added to the circuit to make the lamp glow?

_____

_____

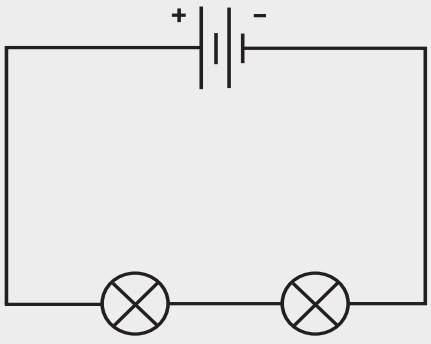


3. What should be done in the circuit so both the lamps will be lightened?

_____

_____

_____

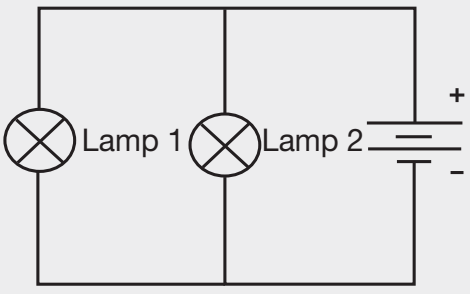


4. What would happen to lamp 2 if we unplugged lamp 1 from this circuit?

_____

_____

_____



5. What would happen to lamp 2 if we unplugged lamp 1 from the circuit?

_____

_____

_____

Answers for Worksheet 1

1. Neutral
2. Neutral
3. When two neutral objects are rubbed together, electrons are transferred between them, causing object A to become negatively charged.
4. A negatively charged object A will attract small pieces of paper due to charge transfer on the paper. Even though paper is non-conductive, when a heavily charged body is placed near it (but not touching), some of the surface electrons on the paper "migrate" away from the side of the paper closest to the charged body.

Answers for Worksheet 2

1. Series
2. Battery must be added.
3. Switches 1 and 2 must be closed.
4. It will be brighter.
5. It will continue to lit with the same brightness

Exercise Answers

1. i) d, ii) a, iii) c, iv) b, v) b
2. Fill in the blanks:
    1. Insulators do not let electrons flow through them.
    2. Adding more bulbs in a circuit reduces the flow of current.
    3. Switch in the on position means current flows through the circuit.
    4. If one bulb is removed from the circuit, there is still a complete circuit.
    5. The electrons are spending the energy when they flow through the bulb.
3. Short Answer Questions:
    - A circuit is a closed loop or path through which electric current flows.
    - The cell or battery provides the energy source for the circuit, supplying the voltage to drive the current through the components.
    - A circuit diagram is a visual representation of an electrical circuit using symbols to represent the components and their connections.
    - We use circuit diagrams instead of drawing the real thing every time because they are simpler, more standardized, and easier to understand.
    - We use an ammeter to measure current in a circuit.
    - The unit used to measure current is the ampere (A).

4. Long Answer Questions:

Differentiate between parallel and series circuits:

- Parallel Circuit: In a parallel circuit, components are connected in separate branches, and each branch has its own path for the flow of current. The voltage across each component is the same, and the total current from the power source divides among the branches. If one component is removed or fails, the others continue to operate independently. Parallel circuits have lower total resistance and can draw more total current compared to series circuits with the same components.
- Series Circuit: In a series circuit, components are connected in a single path or loop, forming a chain. The same current flows through all components in series, and the total resistance is the sum of the individual resistances. If one component is removed or fails, the entire circuit is interrupted, and all components stop functioning. Series circuits have the same current flowing through each component, but the voltage across each component depends on its resistance.

Factors that affect the brightness of bulbs:

- Voltage: Increasing the voltage across a bulb increases its brightness, as more electric current flows through the filament, emitting more light.
- Wattage: Bulbs with higher wattage produce more light because they consume more power.
- Type of Bulb: Different types of bulbs, such as incandescent, LED, and fluorescent, have varying efficiencies and light output.

Characteristics of the series circuit:

1. Components connected in a single path or loop.
2. The same current flows through all components.
3. Total resistance is the sum of individual resistances.
4. If one component fails or is removed, the entire circuit is interrupted.
5. Voltage divides among the components based on their resistances.

Characteristics of the parallel circuit:

1. Components connected in separate branches.
2. Voltage across each component is the same.
3. Total current divides among branches based on resistance.
4. Components operate independently; if one fails, others continue to function.
5. Total resistance is less than the resistance of individual branches.

What is a switch?

A switch is an electrical device used to control the flow of electric current in a circuit. It acts as a gate that can be opened or closed to either allow or interrupt the flow of electrons. When a switch is in the “on” position, it completes the circuit, allowing current to flow through the connected components. In the “off” position, it breaks the circuit, preventing current from flowing. Switches are commonly used in various electrical devices and systems to control the power supply and turn them on or off as needed.

5. Think About It:
   a) Which circuit’s bulb would have the BRIGHTEST light?
      - The circuit with the brightest light would be (f) with one bulb and one battery. In this simple series circuit, the single bulb receives the full voltage from the battery, resulting in the maximum brightness for that bulb.

b) Which bulb's circuit would not light at all?

- The circuit that would not light at all is (c) with two bulbs and two batteries. If both bulbs are connected in series, the total resistance would be higher, leading to a reduced current flow. As a result, both bulbs might appear dim or not light up at all due to insufficient current.

c) In which THREE circuits would the bulbs light with the same brightness? Explain your answer.

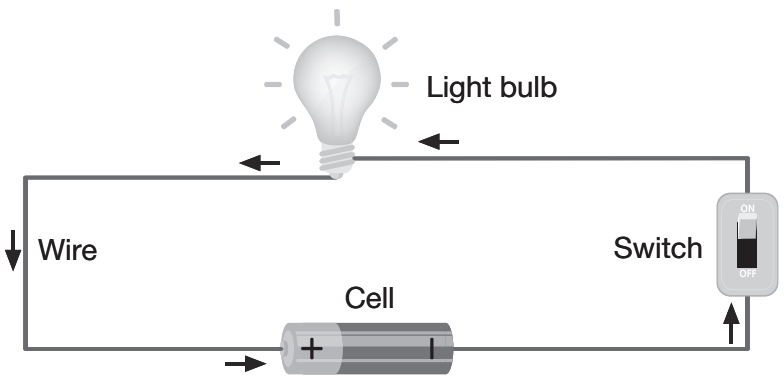
- The bulbs would light with the same brightness in circuits (a), (b), and (f).
- In (a), the single bulb is connected to two batteries in parallel. Both batteries provide the same voltage, resulting in the bulb's full brightness.
- In (b), two batteries are connected in parallel, providing the same voltage to the single bulb, similar to the circuit (a).
- In (f), one bulb is connected to one battery in series, so the bulb receives the full voltage from the battery, resulting in its maximum brightness.

6 and 7 (open-ended questions).

Students will answer these questions by themselves.

Workbook Answers

1.

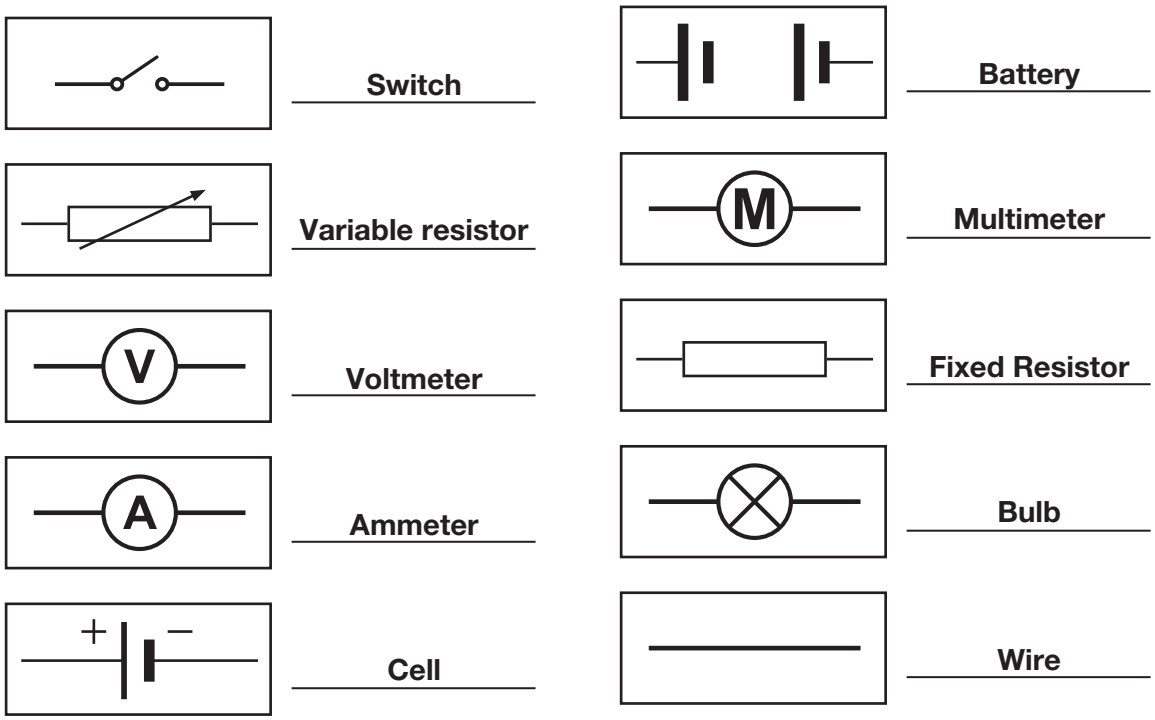


2. Maria connected different materials to the circuit to check if the bulb glows. If the bulb glows it means that the material can conduct electricity or it is a conductor.

3.

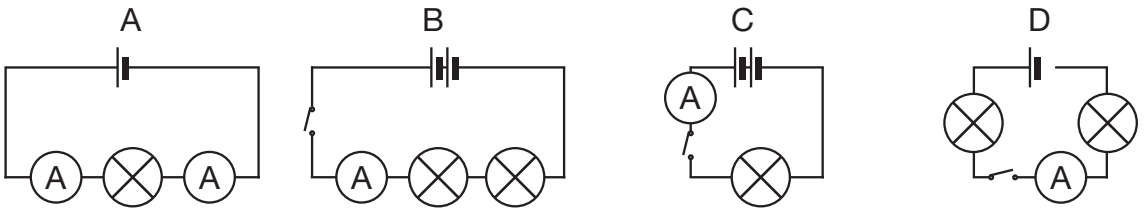
Material	Conductor	Insulator
Copper	✓	
Iron	✓	
Paper		✓
Plastic		✓
Tin	✓	
Graphite	✓	

4.



5. i. He should complete the circuit by closing the switch.
   ii. Parallel
   iii. A and e

6. i.



   ii A: Parallel
   B: Series
   C: Parallel
   D: Series
   Iii 2, 1, 3

7. i. A closed circuit is one that is complete, and the current can easily flow. An open circuit is the one where the path of the current is incomplete and so, the current cannot flow.
   ii. it Is useful for simple circuits the same current flows throughout the circuit
   iii. increasing the number of batteries increases the voltage in a series circuit
   iv. Some metals are good conductor of electricity which allows the bulb to glow brighter. Silver, copper and aluminium are good conductors of electricity and will allow the bulb to glow brighter as compared to brass, iron, and tin.It can open or close a circuit.

8. i. Series
   ii. Parallel

9.

Series circuit	Parallel circuit
It is used in where simple circuits are required such as in fairy lights.	The electricity supply in our homes uses parallel circuits, as do almost all electrical appliances.

CHAPTER 10 Magnetism

Student Book Pages 130–138

Learning outcomes

- Recognize that electric current has a magnetic field around it using a magnetic compass.
- Recognize that a freely-moving magnet comes to rest pointing in a North-South direction.
- Describe how to magnetize a magnetic material. Describe how to demagnetize a magnet.
- Construct an electromagnet and identify its application in daily life.
- Compare different types of magnets (permanent, temporary and electromagnets).
- Recognize that there is a space around a magnet where effect of magnetic force can be observed.
- Draw magnetic field of a bar magnet using iron filings.
- Recognize Earth's magnetic field which attracts a freely pivoted magnet to line up with it.

Overview of the Unit

- All objects are composed of tiny particles known as atoms. Atoms are made up of a variety of particles, including tiny negatively charged electrons that revolve around the atom nucleus.
- Nearly all of the electrons in the atoms of magnetic objects are spinning around the nucleus in the same direction. This is what makes an object magnetic, or tends to attract magnets.
- The space around an electrical current or magnet in which the magnetic force (cause of attraction) is felt is referred to as a magnetic field.
- Many scientists believe that the Earth's magnetic field is produced by electric currents generated by molten iron at the Earth's core.
- Magnets are classified into three types: temporary, permanent, and electromagnets.
- A compass is a device used to determine direction. It is one of the most important navigational instruments. The most well-known type of compass is a magnetic compass.
- In navigation or exploring, a magnetic compass is an instrument for determining direction on the Earth's surface using a magnetic pointer that aligns with the Earth's magnetic field. It is used in various forms in aircraft, ships, and land vehicles.
- To apply the right hand rule, point your right thumb in the direction of the current's flow and curl your fingers. The curled direction of the induced magnetic field will be mirrored by the curled direction of your fingers. The curl right hand rule is especially useful when dealing with problems involving a current-carrying wires.

Lesson Plan 1	Student Book pages	Time	Workbook pages
A magnet	130	45 mins	-

Student Learning Objectives

Recognize that there is a space around a magnet where effect of magnetic force can be observed.

Engage: (5 min)

- Give students real-world examples of magnets, such as
- Have you ever noticed that when you open the fridge door, it tends to close automatically? Have you decorated your refrigerator? How are the things attached to it?
- You can explain the properties of permanent magnets by giving the demonstration with the help of magnet bar and some small items that can and cannot be attracted by a magnet. e.g. nails, paper clips, pencil, eraser.

Resources

Car toy
Tape
Small magnet bar
Big magnet

Explain: (10 min)

- Introduce the concept of magnetism and the magnetic field of the Earth.
- Describe how magnets have two poles, North and South.
- Describe how the Earth, with its North and South Poles, acts as a giant magnet, creating an invisible magnetic field around it.

Keywords

Magnet
Attract
Repel

- Explain how the Earth's magnetic field influences magnet behaviour, causing them to align with it and come to rest in a North-South direction.

They all attract certain metals.

They all have north and south poles.

Two of the same poles repel each other while opposite poles attract each other.

Explore: (15 min)

Material:

- Car toy
- Tape
- Small magnet bar
- Big magnet

Procedure:

Useful Link

https://youtu.be/SCmZVk3GsQg

Students will be astounded to learn that they can move cars without touching them!

- Set up a track or a path for the car toy to travel along. You can use a flat surface, such as a table, or you can make a track out of materials like cardboard or paper tubes.
- Using tape, secure the small magnet bar to the car toy. Check that the magnet is securely attached to the car.
- Place the large magnet at the far end of the track or path.
- Inform the individual that they will be conducting an experiment to study the effects of magnetism on the car toy.
- Place the car toy at the track's beginning, away from the large magnet.
- Ask the students to release the car toy and watch what happens as it moves along the track.
- As the car toy gets closer to the big magnet, it will be drawn to it and move closer.
- Discuss the forces at work with the students. Explain how the car's magnet interacts with the big magnet's magnetic field, creating an attractive force that pulls the car towards it.
- To make the race more interesting for the students, place some obstacles on the race track.
- Encourage the students to experiment with different positions and distances of the large magnet along the track to see how it affects the car's motion.

Elaborate: (10 min)

- Each student should be given a small bar magnet or a magnetic compass.

- Allow students to play with the magnets and watch how they align with the Earth's magnetic field.
- Allow them to move the magnets around and observe how they return to their original North-South orientation when released.

Evaluate: (5 min)

Do Discuss and Answer page 131 of student book.

Home Assignment:

- Find at least ten magnetic objects in your home. Look for objects made of iron, nickel, or cobalt, as these metals are magnetic.
- To test each object, use a small bar magnet or a magnetic compass. Hold the magnet close to the object and see if it is attracted to it.
- Write down the name of each magnetic object you find, as well as a brief description of what it is (e.g., spoon, paperclip, etc.).
- Make a note of whether the object is attracted to the North Pole or the South Pole of the magnet.
- Do Q2 on page 137 of student book.

Lesson Plan 2	**Student Book pages**	**Time**	**Workbook pages**
Types of Magnets	131	45 mins	-

Student Learning Objectives

Compare different types of magnets (permanent, temporary and electromagnets).

Resources

Permanent magnets (bar magnets)
Temporary magnets (nails, paperclips)
Electromagnet materials (coils of wire, batteries, nails)
Magnetic materials (iron, steel objects)
Stationery supplies for students to record observations (notebooks, pencils, etc.)
Real-world examples of magnets for demonstration purposes

Engage: (5 min)

- Begin by asking students if they understand what a magnet is and what it can do.
- Show examples of different types of magnets, such as a permanent magnet (for example, a bar magnet), a temporary magnet (for example, a magnetized nail), and an electromagnet (for example, a simple coil of wire wrapped around a nail).
- Encourage students to share their prior knowledge and experiences with magnets.

Explain: (10 min)

- Explain the differences between permanent magnets, temporary magnets, and electromagnets.
- Explain how a permanent magnet can attract other magnetic materials without the use of an external force.
- Temporary magnets are objects that exhibit magnetic properties only when in contact with a permanent magnet or when an electric current is passed through them.
- Discuss electromagnets, which are magnets created by passing an electric current through a wire coil, creating a magnetic field.
- Highlight the uses of each type of magnet in daily life and in various industries.

Explore: (15 min)

- Set up stations with different types of magnets and magnetic materials (paperclips, iron nails, etc.).
- Divide the class into small groups and assign each group to a different station.
- Instruct them to test the magnets with various materials and observe their behaviour.
- Give them guidelines for recording their findings and discussing their observations in the group.

Keywords

Permanent magnet
Temporary magnet
Electromagnet

Elaborate: (10 min)

- Allow each group to present their findings to the class, explaining the differences they discovered between the three different types of magnets.
- Facilitate a class discussion about the benefits and drawbacks of different types of magnets in various scenarios.
- To reinforce the concepts, show real-world examples of permanent magnets (e.g., fridge magnets), temporary magnets (e.g., magnetic induction in nails), and electromagnets (e.g., cranes in scrapyards).

Evaluate: (5 min)

- Instruct students to create a simple experiment that compares the strength and capabilities of one type of magnet (e.g., electromagnet) to others.
- Examine their experiment ideas for scientific validity and creativity.

Useful Link

https://youtu.be/SCmZVk3GsQg

Home Assignment:

- Conduct research and prepare a brief presentation on the most important real-world applications for each type of magnet. Find at least one practical use for permanent magnets, temporary magnets, and electromagnets.
- Include visuals and examples in your presentations to make them more engaging and informative.
- Do Q4 (i) on page 137 of student book.

Lesson Plan 3	**Student Book pages**	**Time**	**Workbook pages**
Making a Magnet	132	45 mins	59

Student Learning Outcomes

Describe how to magnetize a magnetic material. Describe how to demagnetize a magnet.

Engage: (5 min)

- Begin by asking students if they understand what it means for a material to be magnetic.
- Show them a magnetic (e.g., a paperclip) and a non-magnetic (e.g., a plastic ruler) object.
- Discuss their findings and ask questions such as, “What do you think makes the paperclip magnetic?”

Explain: (10 min)

- Introduce the concept of magnetization, defining it as the process by which a material becomes magnetic.

- Describe how the atomic structure of materials such as iron, nickel, and cobalt allows them to be easily magnetized.
- Explain how magnetizing a material causes its atomic domains to align in the same direction, resulting in the formation of a magnetic field.
- Introduce the two most common magnetization techniques: stroking with a magnet and using an electric current.

Resources

Magnetic materials (e.g., paperclips, nails)
Non-magnetic materials (e.g., plastic rulers)
Strong bar magnets
Heat source (e.g., Bunsen burner)
Hammers or other heavy objects for demagnetization
Stationery supplies for recording observations

Explore: (15 min)

- Students should be divided into pairs or small groups.
- Give each group a non-magnetic material (such as a nail) and a strong bar magnet.
- Instruct them to use the stroking method to magnetize the material.
- Encourage them to keep an eye out for any changes in the material's ability to attract small magnetic objects such as paperclips.

Elaborate: (10 min)

- Allow the groups to share their experiences and demonstrate their magnetized materials with the class.
- Explain that while magnetizing materials is relatively simple, they can also be demagnetized.
- Introduce the concept of de-magnetization, explaining that it is the process of removing a material's magnetic properties.

Keywords

Magnetization
Demagnetization

Evaluate: (5 min)

- Make a flowchart that shows how to magnetize and demagnetize a material using various methods.
- Include the materials required, the steps involved, and the expected results for each method.
- Inquire students about the practical applications of magnetization and de-magnetization in daily life and industry.

Useful Link

https://youtu.be/ok9GkzRiymM
https://youtu.be/PlZ30MKrFrw

Home Assignment:

Do Q1-3 on page 59 of workbook.

Lesson Plan 4	Student Book pages	Time	Workbook pages
Magnetic Field	132	45 mins	61

Student Learning Outcomes

Recognize that there is a space around a magnet where effect of magnetic force can be observed.

Resources

Bar magnets
Iron filings
Sheets of paper
World map

Engage: (5 min)

- Begin the lesson by showing the students a bar magnet and asking them to notice any effects when other objects (paperclips, iron filings) are brought close to it.
- Discuss their findings and pose questions such as, "What happens when you move the paperclips closer or farther away from the magnet?"
- Introduce the concept of a magnetic field and the invisible force that it contains.

Explain: (10 min)

- Explain that a magnetic field is the region of space around a magnet where the magnetic force of the magnet can be observed.
- Discuss how a magnet's magnetic field extends beyond the magnet's physical boundaries.
- Explain how the magnetic field has both direction and strength, with the magnetic force being greatest near the magnet's poles.
- Connect the concept of magnetic fields to the Earth's magnetic field, which is responsible for compass needle behaviour.

Keywords

Magnetic field
Space
Invisible

Explore: (15 min)

- Give each student or group a bar magnet and a piece of paper.
- Sprinkle iron filings on the paper and tap it gently to align the filings with the magnetic field.
- Instruct the students to draw the magnetic field of the bar magnet and observe the pattern formed by the iron filings.

Elaborate: (10 min)

- Ask your students to compare and contrast their depictions of the magnetic field, then talk about any similarities or differences they find.
- Provide a world map and instruct students to mark the North and South Poles, where the Earth's magnetic field is strongest.
- Show them how the magnetic compass aligns with the magnetic field of the Earth.

Evaluate: (5 min)

- Ask each student to indicate where the North and South Poles are on the world map, and then explain how a compass functions using the Earth's magnetic field.
- Do Concept Check on page 132 of student book.
- Do Q3(ii and vi) on page 137 of student book.

Useful Link

https://youtu.be/vgWiBYuPpjw

Home Assignment:

- Do Q8 on page 61 of workbook.

Lesson Plan 5	**Student Book pages**	**Time**	**Workbook pages**
Electric Current has a Magnetic Field	133	45 mins	-

Student Learning Outcome

Recognize that electric current has a magnetic field around it using a magnetic compass.

Engage: (5 min)

- Begin the lesson by demonstrating a simple circuit with a battery, a wire, and a magnetic compass to the students.
- Inquire what they believe will happen when the circuit is closed and current flows through the wire.
- Ask them to predict how the magnetic compass will behave when placed near the wire carrying the electric current.

Explain: (10 min)

- Introduce the concept of an electric current and explain how it creates a magnetic field around a wire when it flows through it.
- Explain how the magnetic field is produced by the movement of electric charges (electrons) within the wire.
- Explain how the magnetic field's direction can be determined using the "right-hand rule."

Resources

Battery
Wires
Magnetic compasses
Switches
Stationery supplies (notebooks, pencils, etc.)

Explore: (15 min)

- Allow the students to play with the circuit and magnetic compass.
- Instruct them to complete the circuit (turn on the switch) and watch what happens to the magnetic compass when it comes into contact with the wire carrying the electric current.
- Allow them to experiment with different compass positions and orientations relative to the wire and record their findings.

Elaborate: (10 min)

- Discuss the students' observations made during the exploration phase.
- Explain to them that the magnetic compass needle aligns with the magnetic field created by the electric current.
- Explain how the direction of the magnetic field is determined by the direction of the electric current flowing through the wire.

Keywords

Electric current
Perpendicular
Direction

Evaluate: (5 min)

- Ask students to write a brief explanation of the right-hand rule and how it can be used to determine the direction of the magnetic field.
- Do Q4(iv) on page 137 of student book.

Home Assignment:

Investigate and create a poster demonstrating the applications of an electric current's magnetic field in everyday life or technology. You should look into electromagnets, electric motors, and generators.

Useful Link

https://youtu.be/oEEYMhPY5tY

Lesson Plan 6	Student Book pages	Time	Workbook pages
Electromagnet	134–135	45 mins	-

Student Learning Outcome

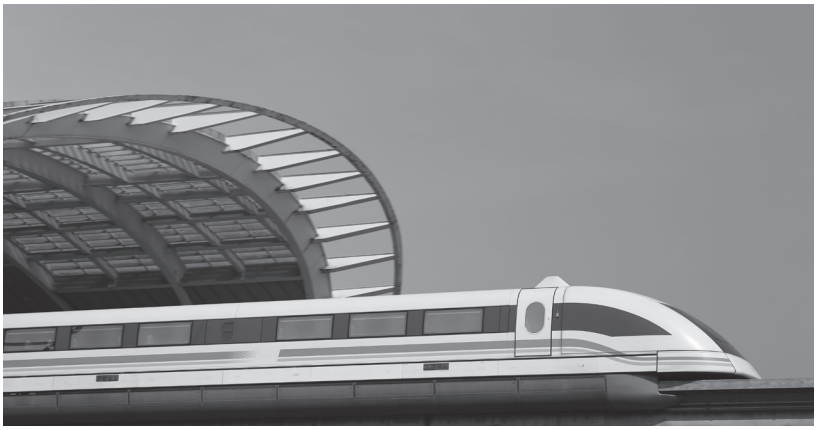
Construct an electromagnet and identify its application in daily life.

Resources

Battery
Copper Wire
Nail
Paper clips

Engage: (5 min)

- You can show students an image of a floating train and ask them if it is a super plane, a speeding car, or a floating train. What exactly is it?
- Then tell them it's a maglev train, and it can reach speeds of over 250 miles per hour while floating above the track, never touching the rails while in motion! How is this incredible feat possible?
- By using extremely powerful electromagnets.



Explain: (10 Min)

Keywords

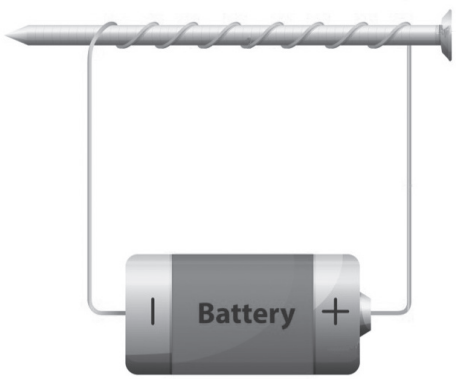
Electricity
Coil
Wire

- An electromagnet resembles a permanent magnet by using the induced magnetic field of an electric current, but it can be turned off. An electromagnet requires a constant supply of electrical energy to maintain a magnetic field, as opposed to a permanent magnet, which does not. In an electromagnet, the chemical energy in the battery is converted to electrical energy in the wire.
- Several factors influence the strength of this induced magnetic field, or electromagnet.
    - Firstly, any induced magnetic field is proportional to the strength of the inducing current.
    - Next, because the overlying fields support each other, the number of loops forming the electromagnet affects its strength as a magnet.
    - Finally, if the loops are formed around a magnetic material, the magnetic field induced by the current induces a magnetic field in the material, increasing the overall strength of the electromagnet.
    - The electromagnet is strengthened if the core is made of iron, nickel, or cobalt.

Explore: (15 min)

Material:

- Battery
- Copper Wire
- Nail
- Paper clips



Procedure:

First, a strand of copper wire is wrapped around a piece of iron, such as a rod of iron or even a nail. The electricity is then passed through the copper wire using a battery or other device. You've got an electromagnet! The electricity flowing through the wire magnetizes the iron bar, causing it to attract other metals.

Elaborate: (10 min)

To investigate how different variables can affect the strength of an electromagnet, students can carry out a controlled experiment in which they manipulate various factors and observe their impact on the electromagnet's strength.

Materials:

- Insulated copper wire
- Iron nail or rod
- Power source (e.g., battery)
- Paper clips

Variable components:

- Number of wire loops
- Amount of current flowing through the wire
- Type of core material (e.g., iron, steel)
- Thickness of wire

Procedure:

- Begin with a basic electromagnet setup by wrapping the insulated copper wire around the iron nail or rod in multiple loops, leaving enough wire at both ends to connect to the power source.
- Create a controlled baseline by holding one variable constant. You can, for example, begin with a specific number of wire loops, a constant current, a specific core material, and a wire thickness.
- Close the circuit by connecting the wire ends to a power source (e.g., a battery).
- Place the electromagnet near a pile of paper clips and see how many it can pick up. Take note of how many paper clips are drawn to the electromagnet.
- Change one variable/factor at a time and repeat the experiment to see how it affects the electromagnet's strength. Consider the following variables:

1. Number of wire loops:
    - Hold all other variables constant while increasing the number of wire loops by wrapping more wire around the core.
    - Repeat the experiment to see if increasing the number of loops produces a stronger electromagnetic field, as indicated by the number of paper clips attracted.
2. Current amount:
    - Maintain the other variables constant while adjusting the power source (e.g., increasing or decreasing the voltage) to vary the current flowing through the wire.
    - Repeat the experiment to see if changing the current affects the strength of the electromagnet and the number of paper clips attracted.
3. Core material type:
    - Change the core material of the electromagnet while keeping the other factors constant. Change from an iron core to a steel core, for example.
    - Repeat the experiment to see if the type of core material affects the electromagnet's strength and the number of paper clips attracted.
4. Wire diameter:
    - Maintain the other variables constant and construct the electromagnet with wires of varying thicknesses.

- Experiment again to see if the wire thickness affects the electromagnet's strength and the number of paper clips attracted.
- Repeat the procedure for each variable, noting your findings and the number of paper clips attracted in each case.
- Analyze your data and draw conclusions about the effect of each variable on the electromagnet's strength. Examine the variables and the number of paper clips attracted for patterns and relationships.

Evaluate: (5 min)

Do Q4 (iv-iii) on page 137 of student book.

Home Assignment:

Distribute copies of worksheet 10.2.

Useful Link

https://youtu.be/na_FpTXLFa8
https://youtu.be/BdBJhmKri5w

Worksheet 1

Circle the correct option:

Repel / Attract

Repel / Attract

Repel / Attract

Repel / Attract

2. Write down two properties of permanent magnet.

_____

_____

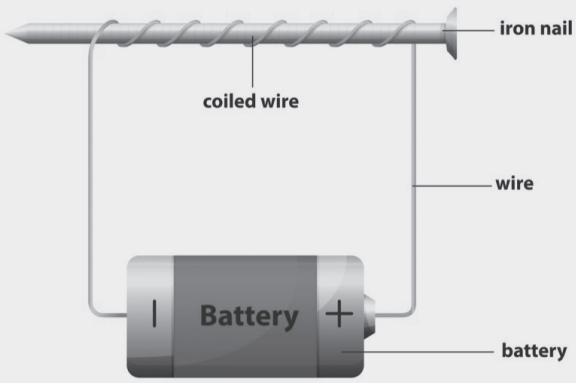
3. Write down two examples of electrical conductors.

_____

_____

Worksheet 2

1. Which of the following occurs when electricity flows through a wire?
   i. Magnetic field
   ii. Gravitational field



2. What is the source of energy in the above diagram?

_____

3. What are three things needed to make an electromagnet?

_____

_____

_____

4. Write one way to make the electromagnet stronger.

_____

5. What distinguishes an electromagnet from other magnets?

_____

Answers for Worksheet 1

Circle the correct option:

Repel / Attract

Repel / Attract

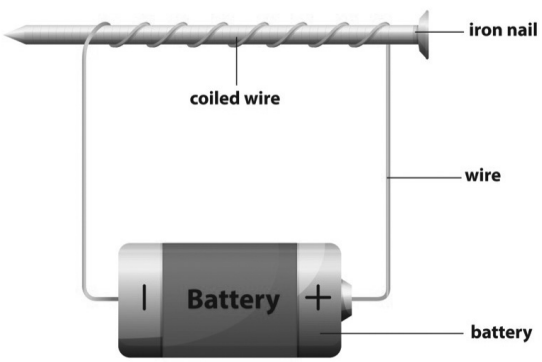
Repel / Attract

Repel / Attract

2. Write down two properties of permanent magnet.
   i. They attract certain metals.
   ii. They have north and south poles.
3. Write down two examples of electrical conductors.
   i. copper
   ii. aluminium

Answers for Worksheet 10.2

1. Which of the following occurs when electricity flows through a wire?
   i. Magnetic field



2. What is the source of energy in the above diagram?
   Battery
3. What are three things needed to make an electromagnet?
   i. Nail
   ii. Copper wire
   iii. Battery

4. Write one way to make the electromagnet stronger.
   Increase the intensity of electric current.
5. What distinguishes an electromagnet from other magnets?
   It is powered by electricity.

Exercise Answers

Answers to the questions:

1. i. b) 2 poles
   ii. The correct arrangement for attraction is:
   - N (North) pole of one magnet with S (South) pole of another magnet
   - S (South) pole of one magnet with N (North) pole of another magnet

   iii. a) The earth has a magnetic field
   iv. c) Take the electromagnet at height
   v. c) By striking with a permanent magnet
2. i. Draw arrows to show forces of attraction or repulsion between magnets.
   ii. b) pair will attract each other because opposite poles attract each other.
   iii. (a), (c), (d) pairs repel because like poles repel each other.
3. Short answer questions:
   i. A magnet is an object that produces a magnetic field and attracts certain materials like iron, nickel, and cobalt.
   ii. A magnetic field is the region around a magnet where its magnetic force can be observed or felt.
   iii. An electromagnet is a temporary magnet created by passing an electric current through a coil of wire, which generates a magnetic field.
   iv. When similar poles of magnets are brought close to each other, they repel each other, creating a force that pushes them apart.
   v. A wooden rod cannot be used as a core to make an electromagnet because wood is not a magnetic material and does not enhance the magnetic field.
4. Long answer questions:
   i. Differences between permanent and electromagnets:
   - Permanent magnets have their own magnetic field and retain their magnetism without the need for external sources, while electromagnets require an electric current to create their magnetic field.
   - Permanent magnets are usually made from magnetic materials like iron, cobalt, or nickel, whereas electromagnets are made by coiling a wire around a magnetic core, often iron.
   - Permanent magnets have a stable and constant magnetic field, while electromagnets can be turned on or off by controlling the electric current flowing through the coil.

   ii. The compass needle turns because the Earth has a magnetic field. The compass needle is a small magnet and aligns itself with the Earth's magnetic field, pointing to the Earth's magnetic North Pole.
   iii. The direction of the magnetic field is from the North (N) pole of a magnet to its South (S) pole. It follows a closed-loop pattern, extending beyond the physical boundaries of the magnet.

iv. Factors affecting the strength of an electromagnet:
- The number of turns in the coil: Increasing the number of turns in the coil enhances the magnetic field's strength.
- The amount of current flowing through the wire: Increasing the electric current flowing through the wire increases the magnetic field's strength.
- The type of core material used: Using a magnetic core material like iron enhances the magnetic field's strength.
- The distance from the electromagnet: The magnetic field weakens with distance from the electromagnet.

v. The shape of the magnetic field lines around the wire carrying current is circular. The lines of force form concentric circles around the wire.

Think about it:

a) Electromagnet C is the strongest.

b) Electromagnet C is the strongest because it has more turns in the coil.

c) Another way to increase the strength is to use a stronger magnetic core material.

Activities:

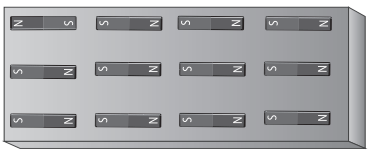
1. The first learning activity aims to revise prior knowledge on magnets and assess learners' understanding of key terms related to magnets. Learners should correctly use the terms 'magnet', 'magnetic', 'attract', and 'repel' when observing examples of magnet effects. The activity also provides an opportunity to check which pole of a magnet points to the north of the Earth.
2. In this activity, learners are asked to magnetize a nail by stroking it with a permanent magnet. After magnetization, they use the nail to pick up paper clips (or similar magnetic materials) to demonstrate its magnetic properties. Learners can visualize the magnetic domains becoming arranged in the nail using an animation. They can also investigate what happens if they stroke the magnet in different directions.
3. Learners are shown an example of magnets exerting a force at a distance. In pairs, they discuss their understanding of what is happening and share their ideas and observations with the class.
4. Learners use a simulation to demonstrate how a magnetic field can be mapped. They observe the compass experiencing different forces in the field based on its location. They learn that the magnetic field has different strengths in various places, with the field being stronger near the poles and weaker further away from them.
5. Learners are shown how to use a plotting compass to detect the magnetic field around a bar magnet. They work in pairs to draw the field around the bar magnet and compare their results.
6. Learners use the simulation again, but this time with the magnetic field visible. They compare the shape of the simulated field with the one they drew earlier. They identify where the magnetic field is strongest and predict which part of the bar magnet iron filings would be most attracted to. They observe the iron filings' concentration around the poles when the bar magnet is placed beneath a piece of card.
7. This activity offers learners an opportunity to demonstrate their scientific inquiry skills by planning, conducting, interpreting, and evaluating their investigation.
8. Learners summarize their learning by creating a table that compares and contrasts permanent magnets and electromagnets. They also research the various uses of magnets and electromagnets in different contexts, such as medical applications, route finding, security, and recycling.

Projects:

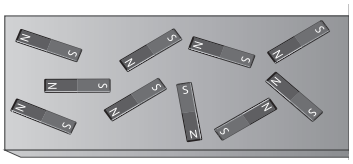
1. Learners make their own electromagnet using a low voltage applied to an insulated copper wire wrapped around an iron nail. They test this electromagnet with a compass to detect magnetism. They investigate whether the shape of the magnetic field is the same as with a permanent magnet. They also explore whether magnetism is permanent, whether it disappears when the current stops, and whether it disappears when the nail is removed but the current is kept on.
2. For the scientific inquiry activity, learners use their electromagnet to pick up small items like paper clips, using the number of paper clips picked up as their dependent variable. They design an investigation to determine how the number of coils of copper wire affects the strength of the electromagnet and how the current in the wire affects its strength.

Workbook Answers

1.



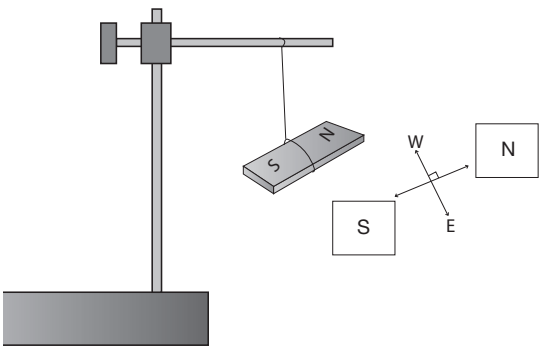
Magnetized



Demagnetized

2. i. Heating can demagnetise a magnet.
   ii. dropping a magnet several time
   iii. hitting a magnet with a hammer, on its poles
3. Construct an electromagnet by following method

   Make a coil of wire by winding some wire around a nail. Connect the two ends of the wire with a battery. Bring a compass near the coil and see the effect on the compass. Put some paper clips or other magnetic materials nearby and observe the effect.
4.



5. i. Students will draw themselves.
   ii. There are several shapes of magnets such as horse shoe, ring, bar etc.
   iii. by a magnet
6. i. There are following three types of magnets.
   Permanent magnet
   Temporary magnets
   Electromagnets

ii. Compass is a device used for navigation.

iii. Electromagnets are magnets which becomes magnetic with electricity.

iv. They are used in electric motors.

7. 1. Permanent magnets do not lose their magnetic property. These magnets do not stop being a magnet after it has been used.

2. Temporary magnets are magnetized in the presence of magnetic fields only. When the magnetic field is removed, these materials lose their magnetic property. Iron nails and paper clips become magnetic in magnetic field.

3. Electromagnets are materials which become magnetic when exposed to an electric field. These magnets consist of a coil of wire wrapped around the metal made of iron.

8. Students will draw by themselves

9. Construct an electromagnet by following method

Make a coil of wire by winding some wire around a nail. Connect the two ends of the wire with a battery. Bring a compass near the coil and see the effect on the compass. Put some paper clips or other magnetic materials nearby and observe the effect.

10. An iron rod can be magnetized by a permanent magnet.

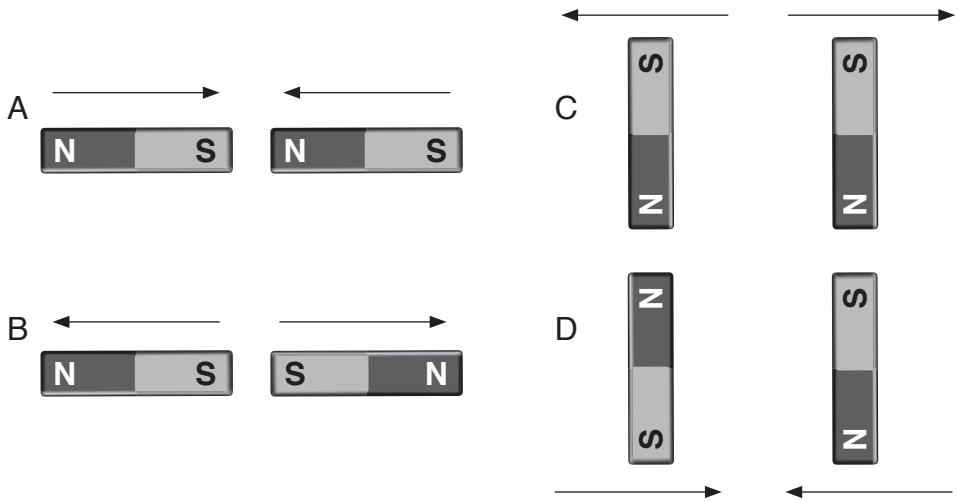
- Take a piece of iron
- Stroke it several times from one end to another using one pole of a permanent magnet
- Make sure you always stoke in the same direction.

11. i. Heating can demagnetise a magnet.

ii. dropping a magnet several time

iii. hitting a magnet with a hammer, on its poles

12.



13. i. Aluminium and steel can

ii. Rusty can

iii. It is made up of iron

14. Refer Student book for answer

CHAPTER 11

The Solar System

Student Book Pages 139–151

Learning outcomes

- Differentiate between the characteristics of different planets.
- Describe the characteristics of asteroids, meteorites and comets.
- Describe the uses of various satellites in space i.e., geostationary, weather, communication and Global Positioning System (GPS).
- Investigate how artificial satellites have improved our knowledge about space and are used for space research
- Differentiate between planets and dwarf planets.
- Inquire into the sighting of Halley's Comet; describe what they would feel if they saw it.

Overview of the Unit

- Our solar system formed 4.5 billion years ago from a dense cloud of interstellar dust and gas.
- The cloud is thought to have collapsed when a nearby star (known as a Supernova) exploded, causing shockwaves.
- This dust cloud was reduced to a solar nebula after collapsing (a swirling and spinning disc of material).
- Because of gravity at the core, more and more material was drawn inside, increasing the pressure at the core.
- The pressure eventually rose to the point where hydrogen atoms began to combine and form helium gas, releasing a massive amount of energy.
- Our Sun was created as a result of the release of energy.
- Matter further out on the disc were also clumping together, and the clumps continued to smash against each other to form larger objects.
- Some of these mass accumulations grew big enough to have their own gravitational pull, which constrained them to form spheres and eventually transform them into planets, moons, or dwarf planets.
- Planets could not be formed in some cases, such as the asteroid belt, which is made up of fragments of the early solar system that were unable to come together to form a planet.
- Comets, meteoroids, asteroids, and small irregular moons were formed from the smaller leftover pieces.

Lesson Plan 1	Student Book pages	Time	Workbook pages
Planets of our Solar System	139–141	45 mins	66

Student Learning Objectives

Differentiate between the characteristics of different planets.

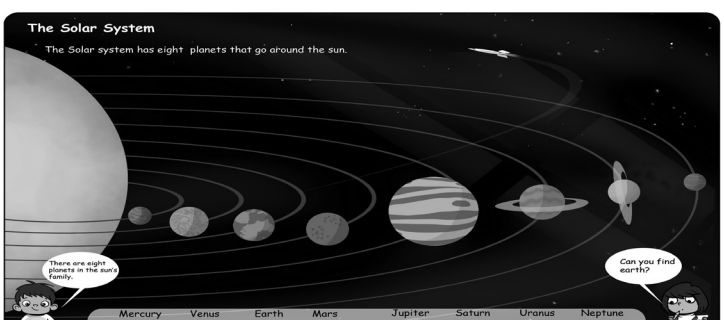
Engage: (5 min)

Start your lesson by writing "Solar System" and drawing a large sun on the board. Ask the students if they know what this is, and then invite volunteers to come up to the board and draw anything related to the solar system that they can think of. Discuss the components of the solar system, such as stars, planets, and asteroids, and find out their previous knowledge.

Resources

- Balls of various sizes
- Coloured paper or cardboard cutouts,
- Planet pictures.
- Planet names tags
- Whiteboard and marker

Solar System



- What are the names of the eight planets? Can they recall them all, and in the correct order?
- What is the length of a year? (duration of the Earth's orbit around the Sun)

Keywords

Inner planets
Outer planets
Asteroid belt

Explain: (10 Min)

- After understanding the students' prior knowledge, explain the solar system in detail to them using the drawing you made on the board.
- You can tell these interesting facts about the planets of our solar system to gain your students interest.
- Some interesting characteristics of our solar system planets are:
- Mercury is both extremely hot and extremely cold: daytime temperatures on the side facing the sun reach 800 degrees Fahrenheit, while the side facing away from the sun drops to minus 290 degrees Fahrenheit.
- A day on Mercury lasts 59 days, while a year lasts only 88 days. Mercury's elliptical orbit and slow rotation cause the morning sun to rise briefly, set, and then rise again in some parts of the planet. At sunset, the same thing happens in reverse.
- The blood-red colour of Mars is because of iron oxide in the soil.
- The only planet that rotates from East to West is Venus.
- Uranus rotates on its sides, so its poles are where the other planets' equators are.
- Neptune is the solar system's windiest planet, with winds of frozen methane travelling at 2000km/hr. However, the fastest winds on Earth reach only 400km/hr.
- Neptune is the only planet in the solar system that cannot be seen with the naked eye.
- Jupiter is the solar system's largest planet. Jupiter would still be larger if the mass of all the other planets was added together and then doubled. In other words, 11 Earths could fit along Jupiter's equator.

Explore: (15 min)

- Divide the class into small groups and give each group a set of materials, including various objects representing the planets. These objects can be balls of various sizes, coloured paper or cardboard cutouts, or even planet pictures.
- Instruct each group to examine the objects and arrange them in the order that they believe represents the positions of the planets in the solar system.
- Encourage groups to discuss their reasoning for arranging the objects in a particular order, taking into account factors such as size, distance from the Sun, and any other relevant characteristics they know about the planets.
- Allow the groups to experiment and adjust their arrangements as needed.

Elaborate: (10 min)

At this point in the lesson, the teacher can clear up any misconceptions about the characteristics of planets in a solar system.

Useful Link

https://youtu.be/libKVRa01L8

Evaluate: (5 min)

- Give students various coloured and sized balls with planet name tags on them, including the Sun, and create a solar system by calling on any student to come up and arrange a ball representing the planet in the solar system.

- Do Q6 on page 66 of Workbook.

Home Assignment:

Worksheet 11 will be given to complete at home.

Lesson Plan 2	**Student Book pages**	**Time**	**Workbook pages**
Satellites, Asteroids, Meteorites, and Comets	141-144	45 mins	63 and 67

Student Learning Objectives

Describe the characteristics of asteroids, meteorites and comets.

Resources

Images of celestial bodies

Research resource material e.g. books or websites.

Engage: (10 min)

- Inquire if students have heard of asteroids, meteorites, comets.
- Show students images or videos of these celestial bodies and ask them to describe what they see and what they know about them.
- In order to elicit students' prior knowledge and perceptions about these objects, lead a class discussion.

Explain: (10 min)

- Explain asteroids, meteorites, and comets, emphasizing their similarities and differences.
- Asteroids are rocky objects that orbit the Sun and are most commonly found in the asteroid belt between Mars and Jupiter.
- Meteorites are small fragments of asteroids or comets that survive the Earth's atmosphere and land on the surface.
- Comets are icy objects that have a tail when they get close to the Sun due to the melting of their ice.
- Distinguish these objects based on their composition, location, and observable characteristics.

Explore: (10 min)

- Divide the students into small groups and assign one of the celestial objects (asteroid, meteorite, comet) to each group.
- Charge each group with researching their assigned object, including its characteristics, composition, location, and notable examples.
- For students to gather information, provide resources such as books or websites.
- Encourage students to talk about and share their findings in small groups.

Keywords

Satellites
Asteroid
Meteorites
Comets

Elaborate: (10 min)

- Allow each group to present their findings to the class, focusing on the characteristics and unique features of the celestial object assigned to them.
- Facilitate a class discussion about the differences and similarities between asteroids, meteorites and comets.
- Discuss the importance of these celestial objects in our solar system, as well as their potential impact on Earth.
- Encourage students to ask questions and dig deeper into the subject.

Evaluate: (5 min)

Do Q2(i-v) on page 150 of student book.

Useful Link

https://youtu.be/UHK-fbdbwF8

Home Assignment:

Do Q1, 8 and 9 on page 63 and 67 of workbook.

Lesson Plan 3	Student Book pages	Time	Workbook pages
Halley's Comet and Planets and Dwarf Planets	145	45 mins	63

Student Learning Outcomes

- Inquire into the sighting of Halley's Comet; describe what they would feel if they saw it.
- Differentiate between planets and dwarf planets.

Resources

Images of Halley's Comet
A large clear container
Water
Dry ice
A light source.

Engage: (10 min)

- Show images of Halley's Comet and other comets to pique students' interest and curiosity.
- Ask students to describe how they think it would feel to see a comet like Halley's Comet in person.

Explain: (10 min)

- Give background information on Halley's Comet, such as its periodicity and historical significance.
- Explain comet characteristics such as their icy composition, tails, and appearance in the Earth's sky.
- Discuss the rarity of Halley's Comet and the excitement it inspires in astronomers and stargazers.
- Explain the difference between planets and dwarf planets.

Keywords

Halley's comet
Comet's tail

Explore: (10 min)

- Form small groups with the students.
- Give each group materials such as a large clear container, water, dry ice, and a light source.
- Instruct the groups to build a model that depicts the appearance of a comet, focusing on Halley's Comet.
- Encourage students to use their imaginations to design and build the model, taking into account the comet's nucleus, coma, and tail.
- After the models have been constructed, have each group present their comet models to the class.
- Facilitate a class discussion about the similarities and differences between the various comet models and how they relate to Halley's Comet's characteristics.

Elaborate: (10 min)

Ask students to search about why the comet takes such a long time to reappear.

Useful Link

https://youtu.be/C8zV1xiGqf4
https://youtu.be/tZzulY2V0rM

Evaluate: (5 min)

Do Q2(vi) on page 150 of student book.

Homework:

- Conduct research on Halley's Comet, including its discovery, periodicity, and notable appearances throughout history, and prepare a presentation on it. Include details about its composition, size, and orbital properties. Finish with its next predicted appearance and astronomical significance.
- Do Q2 on page 63 of workbook.

Lesson Plan 4	**Student Book pages**	**Time**	**Workbook pages**
Artificial Satellites	145-148	45 + 45 mins	63-64

Student Learning Outcomes

- Describe the uses of various satellites in space i.e., geostationary, weather, communication and Global Positioning System (GPS).
- Investigate how artificial satellites have improved our knowledge about space and are used for space research.

Resources

Video of artificial satellite
Internet connected computer
Paper,
markers,
art supplies

Engage: (10 min)

- Inquire if students have ever wondered how scientists gather information about objects in space that are too distant or difficult to reach.
- Display videos of artificial satellites and discuss their function and purpose.
- Encourage students to share their perspectives on how artificial satellites have improved our understanding of space.

Explain: (10 min)

- Give an overview of man-made satellites, describing what they are and how they orbit the Earth.
- Distinguish between the various types of artificial satellites, such as communication satellites, weather satellites, and scientific research satellites.
- Explain how artificial satellites are outfitted with various instruments and sensors in order to collect and transmit data back to Earth.

Explore: (10 min)

- Students should be divided into pairs or groups.
- Provide each group with an internet-connected computer.
- Instruct students to visit online satellite tracking websites.
- Allow students to investigate the real-time tracking of various artificial satellites, such as weather satellites, communication satellites, and scientific research satellites.
- Encourage students to observe the satellites' orbits, locations, and movements.
- Students should keep track of their observations and the missions of the satellites they are tracking.
- Facilitate a class discussion in which students discuss their findings and the significance of the observed satellite movements and their contributions to space research.

Elaborate: (10 min)

- Organize a group activity.
- Assign each group the task of creating a future satellite mission.

- Give the groups the tools they need to produce visual representations of their satellite designs, such as paper, markers, and art supplies.
- Tell each group to focus on a particular aspect of space research, such as studying far-off planets, keeping track of climate change, or venturing into deep space.
- Ask groups to discuss and come up with ideas for their satellite mission's goals, equipment, and data collection techniques.
- Encourage teams to use their imaginations and think of fresh ways to collect data for research.
- To present their satellite mission designs to the class, ask each group to briefly describe the mission's goals, instruments, and potential contributions to space research.

Keywords

Orbit
Weather satellites
Communication satellites
Remote sensing satellites

Evaluate: (5 min)

Do Concept Check page 148

Useful Link

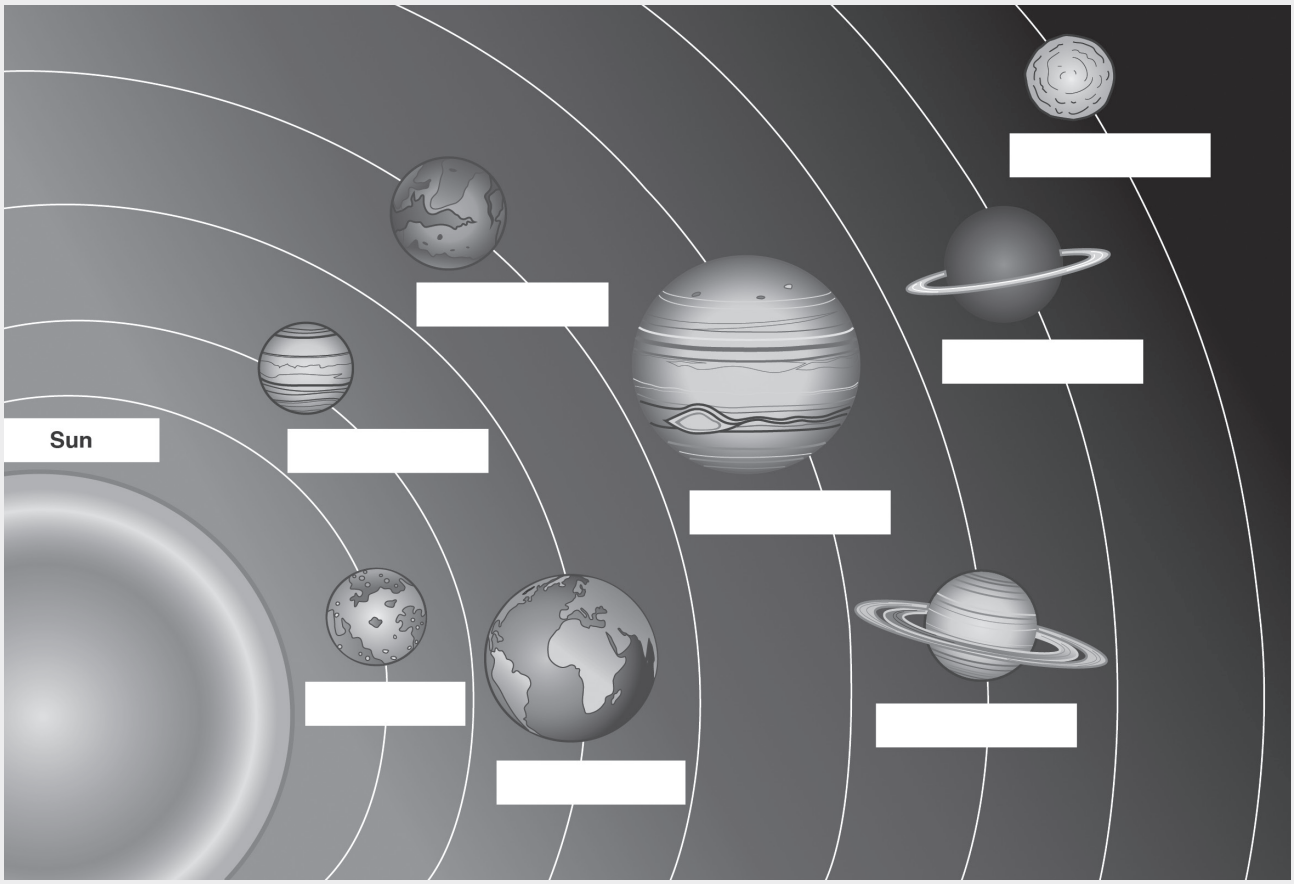
https://youtu.be/n70zjMvm8L0
https://youtu.be/aVQXkI1tzok

Home Assignment:

- Provide copies of Worksheet 11.2.
- Do Q3 on page 153 of student book.
- Do Q3 – 4 on page 63-64 of workbook.

Worksheet 1

Write the name of the planet according to its position in the solar system:



Write your answer in the box:

1. How long does a year last in Mercury?

2. What is the name of the largest planet?

3. Which planet has the highest temperature?

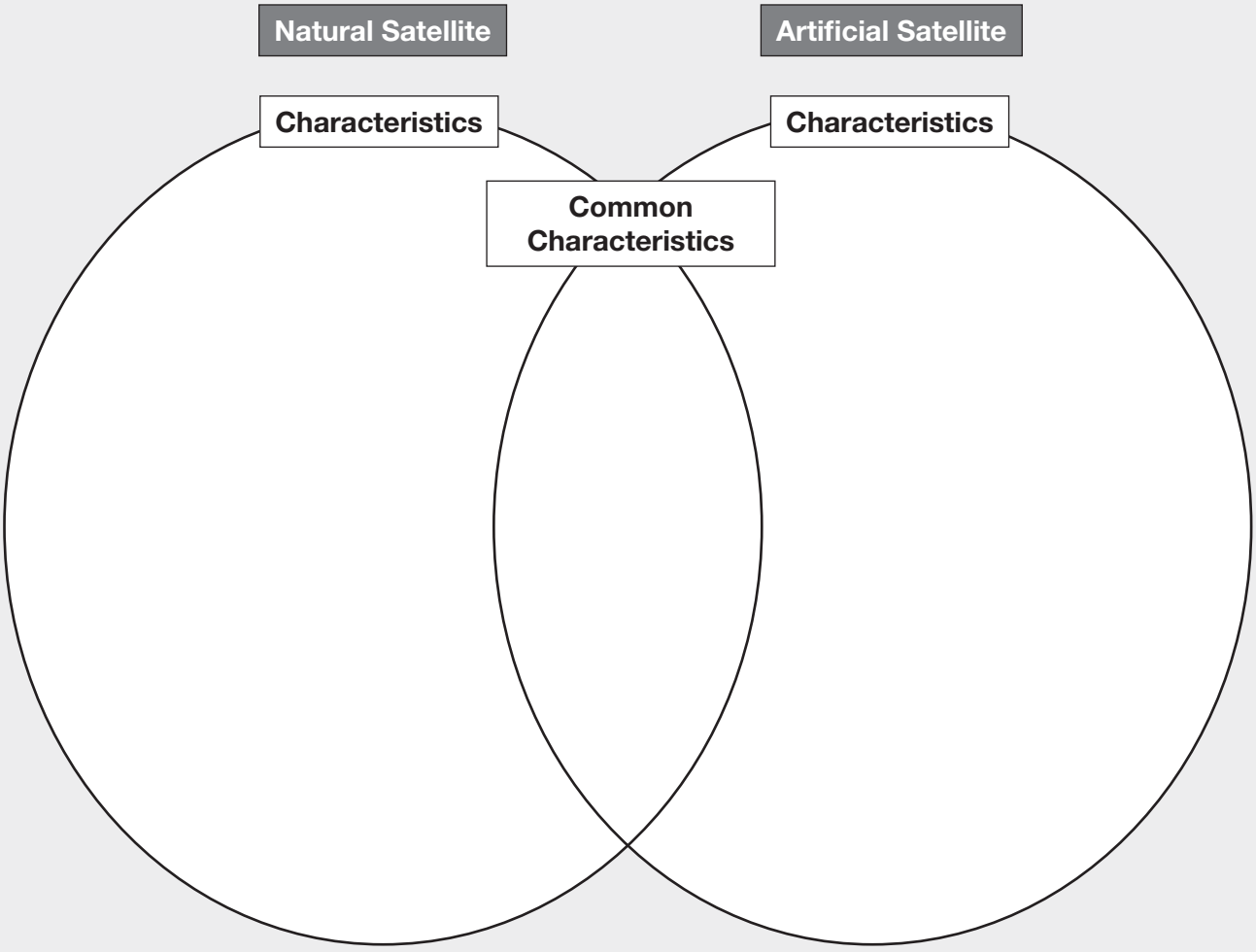
4. Which planet is extremely cold?

5. Which planet is known as the red planet

Worksheet 2

Write down the characteristics that are shared by natural and artificial satellites, as well as the differences between them.

Characteristics of Natural and Artificial Satellites



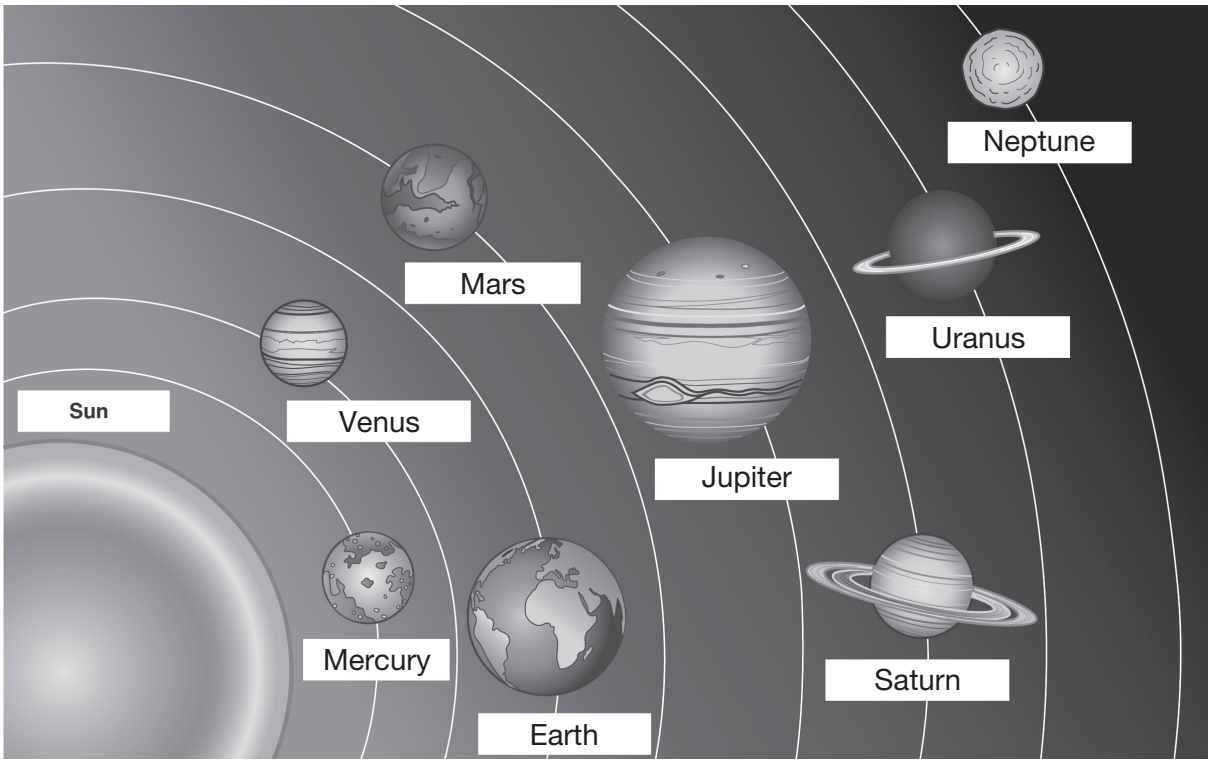
i. Which planets lack natural satellites?

_____

ii. Write the names of any two types of artificial satellites.

_____

Answers for worksheet 1



1. How long does a year last in Mercury?
   Mercury orbits around the Sun takes 88 days. Mercury's year is so short because it is so close to the Sun.
2. What is the name of the largest planet?
   Jupiter is the largest planet of the solar system.
3. Which planet has the highest temperature?
   Venus has the highest surface temperature.
4. Which planet is known as the ice giant?
   Uranus and Neptune are called ice giants.
5. Which planet is known as the red planet?
   Mars is known as the red planet due to its reddish appearance.

Answers for worksheet 2

Difference between Natural and artificial satellites:

Natural satellites	Artificial satellites
Nature creates them.	They are created by humans
They are not controlled by humans	They are controlled by humans.

These satellites are permanent.	These are temporary.
They do not serve as a means of communication.	They do not serve as a means of communication.

Common characteristics between Natural and artificial satellites:

All satellites revolve around another object in a path.

i. Which planets lack natural satellites?

Venus and Mercury are the only two planets without a single natural moon (natural satellite) orbiting them.

ii. Write the names of any two types of artificial satellites.

1. Geostationery
2. Weather

Exercise Answers

1. Choose the correct answer:
   - i. b) reflects sunlight
   - ii. b) Sun
   - iii. a) the moon
   - iv. c) elliptical
   - v. c) meteor
2. Short answer questions:
   - i. Mercury
   - ii. Moon
   - iii. Venus and Mercury
   - iv. Jupiter
   - v. The Moon has no atmosphere to scatter sunlight, resulting in a black sky.
   - vi. Halley's Comet has an orbital period of approximately 76 years.
   - vii. a) An asteroid is a rocky body that orbits the Sun, while a meteor is a bright streak of light produced when a meteoroid burns up in Earth's atmosphere.
     b) A polar orbit goes over Earth's poles, while a geostationary orbit keeps the satellite fixed over a specific point on Earth's equator.
     c) A natural satellite is a celestial body that orbits a planet, while an artificial satellite is a human-made object placed into orbit around a celestial body.
   - viii. Atmospheric friction causes most satellites to gradually lose energy, leading to their eventual re-entry into Earth's atmosphere.
3. Long answer questions:
   - i. Different types of artificial satellites include communication satellites, weather satellites, scientific research satellites, navigation satellites (GPS satellites), spy satellites (military satellites), and Earth observation satellites.
   - ii. Three examples of special-purpose artificial satellites:
     - Hubble Space Telescope (scientific research, observing distant objects in space).

- Global Positioning System (GPS) satellites (navigation and precise location services).
- GOES (Geostationary Operational Environmental Satellites) for weather monitoring and forecasting.

iii. Satellite orbits are the paths followed by satellites as they revolve around a celestial body (e.g., Earth). Different types of orbits include geostationary, polar, sun-synchronous, and elliptical orbits.

iv. Artificial satellites are preferred to be launched eastward (in the same direction as Earth's rotation) to take advantage of the Earth's rotational speed and gain orbital velocity.

v. Communication and navigation satellites need to remain in geostationary orbits above the Earth's surface to stay fixed relative to a specific point on Earth, allowing for constant coverage.

4. Think about it:

i. Artificial satellites cannot stay in their orbit forever due to factors such as atmospheric drag and gravitational perturbations from other celestial bodies, causing their orbits to decay over time.

ii. The Hubble Space Telescope can see things that are not visible from Earth because it is located above Earth's atmosphere, which distorts and blocks certain wavelengths of light. It provides clear and detailed images of distant objects in space.

iii. In my opinion, communication satellites have influenced the progress of today's modern world the most by enabling global telecommunications, internet connectivity, and information sharing across continents.

Activities:

1. Experiment with the Moon's position:

   After half an hour, the Moon's position will have changed. It will appear to have moved along its apparent path in the sky due to the Earth's rotation. The Moon's position in the sky seems to keep changing because of Earth's rotation, causing the celestial objects to appear to move across the sky.

2. Characteristics of planets:
   - Divide learners into groups and assign each group one planet.
   - Each group prepares a one-page advertisement on chart paper to persuade someone to visit their assigned planet.
   - Presentations should describe the characteristics of the planet and how it is different from other planets.
3. Differentiate between asteroids, meteorites, and comets:
   - Place three boxes labeled asteroids, meteorites, and comets.
   - Write down the characteristics of each on paper strips and ask learners to correctly place them in the corresponding boxes.
4. Learn how satellites work:
   - Divide learners into groups and provide them with construction materials to build a model satellite.
   - Create larger teams with satellites, space rocks, and signal rocks.
   - Learners pass their signal ball from the starting satellite to the final satellite, understanding how signals are transmitted.

5. Roleplay:
    - Students prepare short plays on their favorite topics from the unit and present them to the class.
    - They express how they would feel if they saw the planet, comet, or space rock in real life.

Projects:

1. Solar System Model:
    - Learners create a model of the solar system using different colored balloons or playdough to represent each planet, presenting their models to the class.
2. Space Exploration Timeline:
    - Cut same-sized strips of colored paper and write down important space exploration achievements from the past 60 years on each strip.
    - Join the strips together in chronological order to form a timeline.
    - Display the timeline in the classroom or on corridor walls.

Workbook answers

1.

Words	Meanings
Solar System	a small piece of matter from space which enters the Earth's atmosphere and burns up
Asteroid	a body in space made of dust particles frozen in ice
Comet	the Sun and the eight planets that orbit the Sun
Planet	one of many lumps of rock orbiting the Sun between the orbits of Mars and Jupiter
Moon	a lump of rock or metal that has not burned up completely as it falls through the Earth's atmosphere
Meteor	an extremely large object which orbits the Sun or some other star
Meteorite	the Earth's only natural satellite

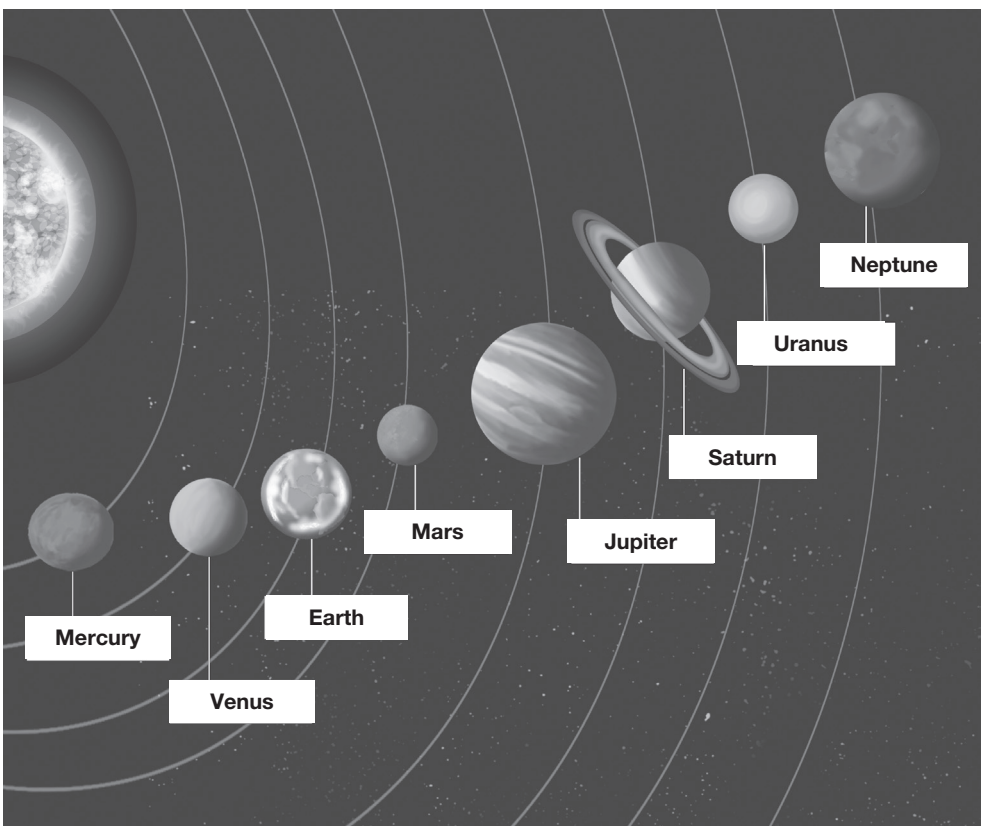
2.

Planet	Dwarf Planet
A planet is a huge body which reflects the light of a star around which it revolves.	Dwarf planets are celestial objects that are similar to planets but are not big enough.
A planet clears its orbit from every other object	A dwarf planet cannot clear its orbit.

3.

Polar Orbit	**Geostationary Orbit**
The satellite is in orbit over the Earth's poles.	The satellite travels Eastwards in an orbit directly above the equator.
The satellite appears to travel a spiral track over the Earth's surface.	Each satellite appears to remain stationary above a point on the equator.

4. i. A satellite is a small object that orbits around a larger one e.g. moon.
   ii. There are two types of satellites i.e. natural and artificial satellites.
   iii. Natural satellites are formed naturally while artificial satellites are man-made. Natural satellites can influence nature of the planet while artificial satellites cannot do that.
   iv. Because of the gravity of the Earth.
   v. They are used to track weather and to explore space.
5. I. Moon
   II. Mercury and venus
   III. 124
   IV. Saturn
   V. Mercury and venus, Earth, Mars, Neptune, Uranus, Jupiter, Saturn
6.



7. i. Stars shine on their own like the Sun.
   ii. Satellites shine by the reflected light of the Sun. So you can only see them when the position is

right around sunset and sunrise

iii. It is possible to see satellites in morning or evening because they are high enough to be not in Earth's shadow.

iv. They are used to track weather and to explore space.

8. i. With the help of a telescope.

9. i. When meteoroids land on the earth in a solid form, they are called Meteorites.

ii. Meteors are also called shooting stars. If a meteoroid enters the Earth's atmosphere, it vaporises and turns into a meteor.

iii. Moon

iv. Neptune and Uranus

v. Uranus

vi. Rocks and ice

10. 1. Venus

2. Uranus

CHAPTER 12

Technology in Everyday Life

Student Book Pages 152–161

Learning outcomes

- Grow seasonal plants and vegetables in earthen pots and demonstrate the effect of use of fertilizers on the growth of plants
- Prepare yogurt and cheese from milk to demonstrate the beneficial microorganisms.
- Design a solar oven to convert solar energy into heat energy.
- Assemble a circuit to demonstrate the working of an electric bell.

Overview of the Unit

- Technology surrounds us and is embedded in the functionality of so many aspects of daily life. Our devices, pens and pencils, dishwashers, indoor plumbing, toasters, light bulbs, and so much more are examples of everyday technology.
- Technology is the application of scientific principles to benefit human life or the industries that humans create. Our modern way of life would not be possible without technological advancement. Everyday technology refers to technology that is widely used in modern human life. Throughout history, technology has been used to improve people's lives. It would be difficult to find a human life that does not rely on technology.
- The scientific principles that are used to create technology are usually inspired by a problem that needs to be solved. Scientific problems are typically questions that must be answered. They can range from simple inquiries such as "how do I get food?" or "how do we effectively water our field away from a water source?" to more complex inquiries such as "how do we safely perform heart surgery?"

Lesson Plan 1	Student Book pages	Time	Workbook pages
Importance of Fertilizers in Growth of Seasonal Plants	152–155	45 mins	-

Student Learning Objectives

Grow seasonal plants and vegetables in earthen pots and demonstrate the effect of use of fertilizers on the growth of plants.

Resources

Several identical plant pots
Potting soil
Seeds or young plants of the same species (e.g., tomato, bean, or radish)
Different types of fertilizers (e.g., organic fertilizer, chemical fertilizer, or no fertilizer)
Water
Measuring tools (ruler, measuring cup)
Labels or markers
Notebook

Engage: (5 min)

- Engage students by asking them questions such as, "If you want to grow a plant, what should you do?"
- Students will respond in a variety of ways, such as water, sunlight, or soil.
- Then ask them if there is anything you can do to make your plant healthier and grow faster.
- If they already know what fertilizers are, students may respond with that word.

Explain: (10 Min)

- Fertilizer is a natural or synthetic material that is added to the soil or plants to promote growth and productivity. They provide nutrients to the plants. For instance, urea, anhydrous ammonia, and so on.
- Organic and inorganic fertilizers are the two main types of fertilizers.
- The following are the benefits of fertilizers:
  - Transportable, storable, and easy to use.

- We can choose a specific fertilizer to supply a specific nutrient because of its nutrient specific nature.
- Water soluble and easily dissolved in soil as a result, they are easily absorbed by plants.
- They have an immediate impact on crops.
- Increase crop yield and supply enough food to feed the growing population.
- Reliable and predictable.

Explore: (15 min)

Materials:

- Several identical plant pots
- Potting soil
- Seeds or young plants of the same species (e.g., tomato, bean, or radish)
- Different types of fertilizers (e.g., organic fertilizer, chemical fertilizer, or no fertilizer)
- Water
- Measuring tools (ruler, measuring cup)
- Labels or markers
- Notebook

Procedure:

- Prepare the plant pots as follows: Fill each plant pot halfway with potting soil.
- Planting the seeds or young plants: Follow the seed packet instructions or the specific requirements for the young plants. Plant the seeds or young plants in the same depth and spacing in each pot.
- Labelling: Assign a label or marker to each pot to identify the various fertilizers used (for example, A, B, C for organic, chemical, and control/no fertilizer).
- Applying the fertilizers: For each type of fertilizer, follow the recommended dosage and instructions. Apply the appropriate fertilizers to the designated pots, ensuring that each plant receives equal treatment.
- Watering: Use the same amount of water in each pot to ensure uniform watering for each plant.
- Observation and data collection: Regularly observe and record the growth of the plants. Take note of the plants' height, number of leaves, leaf colour, and any other visible differences or abnormalities.
- Maintain consistent growing conditions for all plants throughout the experiment, including temperature, sunlight exposure, and watering schedule.
- Data analysis: After a set period of time (for example, a few weeks), collect and compare the data collected. Analyze the growth patterns, measurements, and observations for each plant, taking into account the differences between plants that received different types of fertilizers and those that did not.
- Conclusion: Draw conclusions about the effect of different fertilizers on plant growth based on your observations and data analysis. Consider height, leaf count, overall plant health, and any noticeable differences.

Elaborate: (10 min)

Instruct students to create a chart and meticulously record the growth of the plants on a weekly basis. They can also take photos and stick them on their chart. After the experiment is completed, plan a discussion session in which all students will be given time to present their charts and speak about their findings in front of the class.

Evaluate: (5 min)

- Ask students about the benefits and drawbacks of plant fertilizers.
- Do Q1 on page 69 of workbook.

Home Assignment:

Worksheet 12.1 will be given to complete at home.

Lesson Plan 2 Benefits of Microorganisms	**Student Book pages** 156–158	**Time** 45 mins	**Workbook pages** -

Student Learning Objectives

Prepare yogurt and cheese from milk to demonstrate the beneficial microorganisms.

Engage: (5 min)

- Consider an example of simple flour fermented for baking. Ask students what the difference is between simple homemade bread (roti) and white baked bread, despite the fact that both are made from the same type of flour. How do we obtain rising flour for baking?
- Allow the student to think before responding.

Explain: (10 Min)

- Microorganisms are extremely small. They cannot be seen with the naked eye.
- Microorganisms can be found in a variety of environmental sources, including soil, air, water, animal bodies, and plants.
- Some microorganisms play a role in food processing and preservation in both domestic and industrial food production.
- Microorganisms are commonly used in the production of dairy products (yoghurt and cheese), fermented vegetables (olives, pickles), fermented meats, and sourdough bread.
- After listening to the students' responses in the warm-up activity, explain how we make bread dough using yeast.
- The magical process of fermentation, or the metabolic action of yeast, transforms a dense mass of dough into a well-risen and flavorful loaf of bread. All yeast requires food, moisture, and a controlled warm environment in order to ferment. Its byproducts from food consumption include carbon dioxide, alcohol, and other organic compounds. The gas acts as a rising agent in bread,

while the other "waste" products contribute to the subtle flavours and texture of a good loaf. It is mixed into the bread ingredients using various bread mixing methods.

- Explain using other food preservative examples.

Explore: (15 min)

- Perform the experiments given in the textbook.
- You can divide the class into two groups, one for yoghurt and the other for cheese preparation.

Elaborate: (10 min)

Discuss the phenomenon that how the microorganisms reacts to make the new products.

- Yogurt is a milk product produced by the lactic acid fermentation of milk-specific microorganisms. During fermentation, milk sugar (lactose) is first converted into glucose and galactose, which are then converted into lactic acid.
- The microbial number in the starting material ranges from one to two billion on the first day of the cheese making process.
- Cheese is one of the few foods that contains a high concentration of living, metabolizing microbes.
- The specificity of cheese is determined by the microorganisms used.

Evaluate: (5 min)

- Show the students the flash cards with images of various food items and ask them to identify which are made with microorganisms.
- Do Q3 on page 69 of student book.

Home Assignment:

Worksheet 12.2 will be given to complete at home.

Lesson Plan 3	Student Book pages	Time	Workbook pages
Designing a Solar Oven for Heat Conversion	158–159	45 mins	-

Student Learning Outcomes

Design a solar oven to convert solar energy into heat energy.

Resources

cardboard
aluminium foil
glass or plastic sheet
tape
black construction paper
a thermometer

Engage: (10 min)

- Begin the lesson by discussing solar energy and its significance as a renewable energy source.
- Inquire if students have ever heard of or used solar ovens. Encourage them to share their solar cooking knowledge and experiences.

Explain: (10 min)

- Explain to students that a solar oven is a device that uses sunlight to generate heat for cooking food.
- Discuss the principles of solar energy conversion and how solar ovens use sunlight to their advantage.
- Explain how a solar oven's various components and features, such as reflectors, insulation, and a heat-absorbing surface, work.

Explore: (10 min)

Material:

- cardboard,
- aluminium foil,
- glass or plastic sheet,
- tape,
- black construction paper,
- and a thermometer

Procedure:

- Students should be divided into small groups.
- Provide the material to each group.
- Instruct students to design and build their own solar ovens out of the materials provided, making sure to include reflectors and an insulated cooking chamber. (Follow instructions given in the textbook.)

Elaborate: (10 min)

- Gather the groups to test their solar ovens.
- Request that each group place a small cooking vessel filled with food or water inside their solar oven.
- Place the solar ovens in direct sunlight and use thermometers to monitor temperature changes.
- Facilitate a discussion about the effectiveness of various designs and the factors that influence solar oven efficiency, such as reflector size, angle, and insulation.

Evaluate: (5 min)

Students' understanding of the topic will be assessed through a group presentation in which they will describe the design process and the principles underlying their solar ovens.

Home Assignment:

Explain the process of converting heat energy to solar energy, emphasizing the importance of solar panels in capturing and converting sunlight into electricity.

Lesson Plan 4	**Student Book pages**	**Time**	**Workbook pages**
How to Design an Electric Bell	160–161	45 mins	63-64

Student Learning Outcomes

Assemble a circuit to demonstrate the working of an electric bell.

Engage: (10 min)

- Display a picture or diagram of an electric bell to students and discuss its basic structure and function.
- Inquire if they've ever wondered how an electric bell works or what parts are involved.

Explain: (10 min)

- Explain to students how an electric bell works, which includes an electromagnet, a striker, and a circuit.

- Discuss each component's role and how they interact to produce sound in an electric bell.
- Explain what an electromagnet is and how it is created by passing an electric current through a wire coil.

Explore: (10 min)

- Students should be divided into small groups.
- Give each group a battery, a switch, a bell, wires, and a small electromagnet (created by wrapping wire around an iron nail).
- Instruct students to connect the bell to a circuit that includes the battery, switch, and electromagnet.
- Ask students to follow the instructions given in their text books.

Elaborate: (10 min)

- Ask each group to demonstrate and test their assembled electric bells.
- Each group should take turns closing the circuit by flipping the switch and watching the bell ring.
- Facilitate a discussion about how the electric bell works, emphasizing the role of the electromagnet in attracting the striker and producing sound.
- Encourage students to make changes and improvements to their circuits to improve the sound or to experiment with different designs.

Evaluate: (5 min)

Do Q2 on page 69 of workbook.

Home Assignment:

Draw an electric bell circuit and describe its components in your notebooks.

Worksheet 1

Complete the following paragraph:

Fertilizers are _____ substances that are applied to crops in order to _____ their production.

Farmers utilize these on a daily basis to _____ crop productivity. The fertilizers include _____, _____, and _____, which are necessary minerals for plants.

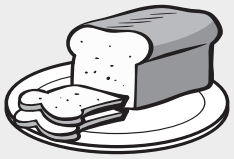
They improve the soil's water retention capacity while also increasing its _____.

Write down the advantages and disadvantages of using fertilizers for the plant growth:

Advantages	Disadvantages

Worksheet 2

Select the appropriate microorganism form for its given use.

Use	Bacteria	Fungi
		
		
		
		
		
		
		

Answers for worksheet 1

Complete the following paragraph:

Fertilizers are chemical substances that are applied to crops in order to boost their production.

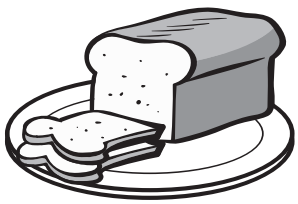
Farmers utilize these on a daily basis to maximize crop productivity. The fertilizers include nitrogen, potassium, and phosphorus, which are necessary minerals for plants. They improve the soil's water retention capacity while also increasing its fertility.

Write down the advantages and disadvantages of using fertilizers for the plant growth:

Advantages	Disadvantages
They restore soil fertility and provide plant nutrients quickly.	Expensive to use.
They are lightweight and portable.	Over usage can damage plants
Fertilizers are easily absorbed by plants.	Chemical fertilizers are toxic and harmful to humans and plants.
Fertilizers improve and increase crop productivity.	Long-term use of fertilizers can reduce the quality of soil

Answers for worksheet 2

Select the appropriate microorganism form for its given use.

Use	Bacteria	Fungi
		Fungi
	Bacteria	

Use	Bacteria	Fungi
	Bacteria	Fungi
		Fungi
	Bacteria	
	Bacteria	
		Fungi

NOTES

NOTES