PlusOne

Science and Technology

Heritage-Based Curriculum
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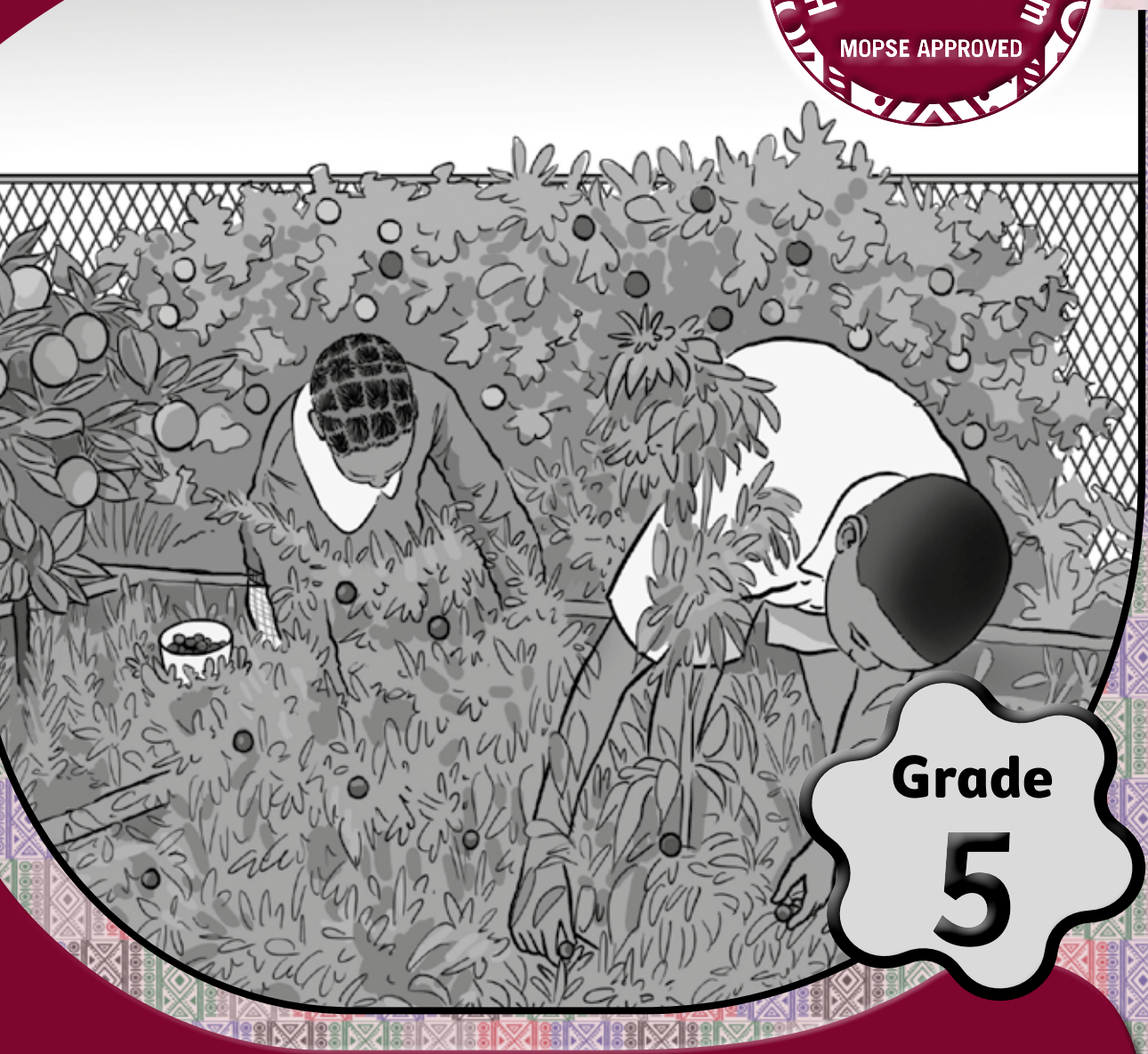

Grade
5

Tinashe Takawira
Cleopatra Nkala

Teacher's Guide

PlusOne

Science and Technology

Teacher's Guide

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PlusOne **Science and Technology | Grade 5 - Teacher's Guide**

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Editor-in-Chief: Munyaradzi Gunduza
Development Editor: Reggies Chapwanya
Design and text layout: Ropafadzo M. Chikonamombe

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Introduction

This **PlusOne Science and Technology Grade 5 Teacher's Guide** provides basic and practical ways to teach key components required by the Science and Technology competency-based curriculum for primary schools. It closely follows the curriculum requirements and outcomes, tying to the topics and units.

This book offers valuable guidelines on how to use the PlusOne Science and Technology Grade 5 learner's book which has the following topics:

1. Health and hygiene practices
2. Food and nutrition
3. Crops, plants and animals
4. Environmental awareness and conservation
5. Tools, equipment and implements
6. Energy and fuels
7. Disaster risk management and resilience
8. Educational technology and innovations

In this facilitator's guide for Grade 5, you can expect to find teaching skills that focus on high levels of engagement for learners through active learning styles. Many of these pedagogical approaches require the teacher to act as a facilitator who skillfully guides the learning process by employing targeted questions at appropriate times to encourage learners to think deeply on the more difficult or complex concepts and content.

Methodology and time allocation

Some of the inclusive learner-centred and multisensory methods and approaches that can be used to learn Science and Technology at junior level are suggested below. The principles of individualisation, concreteness, unification and stimulation should enhance implementation of these methods.

- Educational tour
- Discovery
- Experimentation
- Demonstration
- Resource person
- Science and technical exhibition
- Simulation
- Case study
- Project work
- Research
- Game
- Quiz
- Gallery walks
- Debate
- Nature-based learning
- Project
- Field trip/excursion

Ten 30-minute periods per week of two double lessons and 1 single lesson, should be allocated for adequate coverage of concepts. If possible, there should be internal arrangements for more time for activities outside the classroom such as excursions and other educational visits. This will make learners have enough time for practical lessons.

Subject-specific aims

The Heritage-Based Junior Science and Technology syllabus aims to:

- develop an understanding of basic scientific and indigenous knowledge concepts.
- instil the use of traditional technologies to solve day-to-day problems.
- develop problem-solving skills through hands-on experiences.
- analyse scientific information.
- cultivate curiosity and exploration.
- appreciate innovative solutions.
- develop environmental awareness and protection responsibility.

Pedagogical approaches

These include the approaches, methods, strategies, appropriate relevant teaching, and learning resources for ensuring that every learner benefits from the teaching and learning process. The teacher should:

- create learning-centred classrooms using creative approaches.
- position inclusion and equity at the centre of quality teaching and learning.
- use differentiation and scaffolding as teaching and learning strategies.
- use Information and Communication Technology (ICT) as a pedagogical tool.
- identify subject specific instructional expectations to make the subject relevant.
- integrate all assessment strategies.
- use questioning techniques that promote deep learning.

This teacher's guide provides teaching methodology for each lesson and concept to ensure that the correct pedagogical approach is used. However, this may need to change based on the skills levels of your class in any year, so use your own experience and discretion to adapt these methodologies accordingly.

Teaching tips

a Scheme of work

Never go into a class unprepared even if you have taught a lesson many times before. Have your ideas, plans and materials ready. You should make sure you are confident with your material. Classes are easier to manage, and behaviour is better when a lesson is tightly organised.

You might want to develop a regular pattern such as:

- A brief period of revision. What did we do last time?
- The introduction of new material given in the form of a class lesson.
- Activities, undertaken in pairs, groups or singly.
- Whole class discussion of what everyone has done.

When learners are used to being occupied for the whole time, they tend to be more co-operative and to value the lesson more.

Here are some points to remember when developing a scheme of work:

- Know your syllabus.
- Make a preliminary plan based on the time you think you will need to cover each unit.
- Be prepared to change that plan as you learn how much time each theme really takes. Consider school events which take up time such as sport, important national events, examinations and any other special occasions.
- Leave some spare time in your planning. Very few timetables work out perfectly.

Remember all the time that facts are only part of education. Keep in your mind the skills you wish to develop, particularly those of easy communication, co-operation and the development of mutual tolerance and respect. Make sure you have all the materials ready at hand for each lesson. If classes are sharing resources, make sure the ones you want are available when you want them. Before you start on any topic, check on your aims and work out how you can find out if you have achieved them. This is called evaluation.

When preparing materials and activities, consider the different abilities of your learners. Try to organise additional activities for the quicker learners to give you time to help those who are finding the lesson difficult.

b Learning-centred pedagogy

A learning-centred classroom creates the opportunity for learners to engage in meaningful hands-on activities that relate what they are learning to the real world. It is a place for learners to discuss ideas, become actively engaged in looking for answers, working in groups to solve problems. They also research analyse and evaluate information. The aim of the learning-centred classroom is to enable learners to take ownership of their learning.

i Inclusion

Inclusion is ensuring access and learning for all learners especially those disadvantaged. Each lesson in this PlusOne Science and Technology Grade 5 Teacher's Guide contains advice on how to teach that concept to large classes, and to learners with special needs.

ii Differentiation and scaffolding

Differentiation is a process by which differences (learning styles, interest and readiness to learn) between learners are accommodated so that all learners in a group have the best possible chance of learning. Differentiation could be by content, tasks, questions, outcome, groupings and support.

c Marking work

When you have a large class the marking of learners' work can become a burden. If it is postponed the burden can become unbearable. Learners need to have their work marked and returned promptly with constructive criticism and as much encouragement as you can give them.

- Some marking of work can be done by learners themselves, swapping papers so that there is a check.
- You can mark work in class while you are going round supervising and encouraging the learners as they work. This has the advantage of offering instant praise and correction.
- Do not let your marking pile up from one day or one week to another.
- It is important to create an atmosphere of trust in which learners feel confident enough to ask you questions without feeling embarrassed.
- Learners should never be allowed to make fun of a learner who asks a question to which other learners already know the answer. Make it clear that such a response is not acceptable.

Use of Information and Communication Technology (ICT)

Teachers are encouraged to use ICT as a teaching and learning tool to enhance deep and independent learning. If your school has internet access, these functions can be done online. Alternatively, download the clips or games to use offline in the classroom. The internet can provide as much additional material as you will ever need. Once your learners have the chance to use a computer, they too will have access to a world of information. This can be done through effective use of the following ICT tools:

- Laptop or desktop computers
- Smartphones
- Tablets
- CD players
- Projectors
- Calculators
- Radios
- Cameras
- Television sets
- Computer and related software, such as Microsoft Office packages (Word, PowerPoint, and Excel).

ICTs are a useful communication technology that can, by and large, be used to enhance the quality of teaching and learning in schools.

Diagnostic assessment

a Assessment as learning

Assessment as learning relates to engaging learners to reflect on the expectations of their learning. Information that learners provide the teacher forms the basis for refining teaching-learning strategies.

Learners are assisted to play their roles and to take responsibility of their own learning to improve performance. Learners are assisted to set their own goals and monitor their progress.

b Assessment for learning

It is an approach used to monitor learner's progress and achievement. This occurs throughout the learning process. The teacher employs assessment for learning to seek and interpret evidence which serves as timely feedback to refine their teaching strategies and improve learners' performance.

Learners become actively involved in the learning process and gain confidence in what they are expected to learn.

c Assessment of learning

This is summative assessment. It describes the level learners have attained in the learning, what they know and can do over a period of time. The emphasis is to evaluate the learner's cumulative progress and achievement.

Reinforcement and revision

Sometimes you will need to revise parts of the topic with the whole class. You will certainly need to start the next lesson by asking learners what they remember of the last one. Children need reinforcement. A few revision notes on the board to cover earlier work will be a very valuable start to every lesson.

The Learner's Book

Within each topic and unit of the learner's book, there are different types of text, illustrations and activities. These are designed to be used in a variety of ways to make lessons interesting, to increase learners' knowledge and motivation and to encourage them to be inquisitive, skilled, confident and mutually supportive.

Using resources effectively

In order to help learners gain the most draw on as many resources as possible. This section contains some suggestions on how best to use the resources in the learner's book and how to make use of other resources that may be available. The factual material in the Learner's Book is useful but it should be used alongside other information that the learners find out for themselves. It is important that learners learn techniques for finding out additional information.

Low-resource schools

Some schools do not have electronic devices. Teachers in such situations should prepare in an entirely different way from the better-equipped schools especially in urban areas. However, there are numerous parts that do not require learners to be working on a computer. Teachers might be able to use the following ideas:

- Prepare flashcards with key words by placing a picture on one card and its definition on another card. Hand one card to each learner randomly and ask learners to find their match.
- Ask learners to explain or describe in their own words their understanding of their key word.
- Create or provide classroom posters for your display boards. Use these for reference during explanations.
- Create 'find the matching words' activities by using the key words lists.
- Create 'fill in the missing words' worksheets.
- Draw information-rich sketches on a writing board, developing a discussion or explanation as the drawing is being developed and using the learner's book as a point of reference.
- Ask learners to do the activities in the learner's book or the teacher's guide that do not require the use of a computer.
- Arrange learners in groups to work through questions in the learner's book or teacher's guide.

Using the local environment

The study of Science and Technology is about the whole of your learners' social and cultural surroundings. The resources lie around the learner's life. For example, some learners have easy access to cellphones, tablets, computers at both home and school. Let them utilise these resources as they learn in class. Take the learners out into their environment so that they can appreciate how digital the world has gone. That way, learners will enjoy the subject more.

Bring software technicians and network technicians into the school to talk about their roles in the community; make the most of local examples. These resource people and other valuable material to be used as teaching aids are called realia.

Topic 1 Health and hygiene

Unit 1: The human body digestive system

Unit objectives

By the end of this unit, learners should be able to:

a identify the parts of the digestive system.
b state the functions of parts of the digestive system.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, Page 1-5.
- Science and Technology Grade 3-7 syllabus.
- Human body model, tubes, baloons and platic bags.

Teaching notes

- Digestion is a process where food is broken down into smaller, soluble pieces that can be absorbed into the blood.
- There are two types of digestion: mechanical digestion and chemical digestion.
- Different parts of the digestive system have different functions.
- The oesophagus is also referred to as the gullet.
- Pancreatic juice and gastric juices are examples of chemicals which help in chemical digestion.
- Ingestion is the taking in of food through the mouth.
- Egestion is the passing out of undigested waste material through the anus.

Activities guidelines

Activity 1.1

a **Discussion: What happens to the food we eat?** Facilitate a class discussion asking learners what they think happens to the food they eat, guiding them to consider the entire journey of food through the body.

b **Model building: Simulating digestion** – Divide learners into small groups. Provide materials such as tubes, balloons and plastic bags. Instruct each group to create a model of the human digestive system, demonstrating how food moves and is broken down. After construction, guide them to label each part of their model and explain its function.

c **Identification and labelling: Parts of the digestive system** – Use the diagram provided in the Learner's Book. Have learners identify and name the parts of the human digestive system. Then, instruct them to draw and label their own diagram of the human digestive system, stating the function of each part as they label.

d **Resource integration:** Encourage the use of various resources. This could include examining print media (for example, science textbooks, health pamphlets), interacting with physical models of the digestive system or inviting a local health officer as a resource person to discuss how food is processed in the digestive system.

Suggested answers

Exercise 1.1

1. Digestion
2. Saliva, gastric juices, pancreatic juice. (Any two)
3. Alimentary canal
4. Gall bladder
5. Large intestine
6. Mouth
7. Small intestine
8. To churn food and mix it with digestive juices.

Unit revision exercises

Multiple choice answers

1. C
2. A
3. B
4. C
5. B
6. D
7. C
8. C
9. C
10. C

Structured questions answers

1. **(a)** A - Liver
   B - Stomach
   C - Gall bladder
   D - Pancreas
   E - Small intestines
   F - Large intestine
   G - Anus

(b) A - (Liver) Stores some nutrients and releases them into the blood. Produces bile and filters toxins and chemicals.

C - (Gallbladder) Stores a chemical called bile which flows along the bile duct into the intestine to help in chemical digestion.

D - (Pancreas) Produces pancreatic juice which helps to digest food.

2. Mechanical digestion and chemical digestion.
3. Pancreatic juice
4. Stomach
5. Anus

Unit 2: Unhealthy eating habits/eating disorders

Unit objectives

By the end of this unit, learners should be able to:

a. define unhealthy eating habits.
b. identify eating disorders.
c. explain consequences of unhealthy eating habits.
d. engage in activities that promote healthy lifestyle.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 6-12.
- Science and Technology Grade 3-7 syllabus.
- Food, digital tools, print media.

Teaching notes

- Unhealthy eating habits can include skipping meals, excessive sugary drinks and relying heavily on processed snacks.
- Eating disorders are mental disorders defined by abnormal eating habits that negatively affect a person's physical or mental health.
- Common eating disorders include obesity, anorexia and bulimia.
- Obesity is a medical condition where excess body fat accumulates and negatively affects health.
- Anorexia is eating too little or starving oneself, leading to excess loss of body weight.
- Bulimia involves overeating and then forcing vomiting.
- A healthy lifestyle involves eating a balanced diet, exercising regularly and avoiding processed foods.

Activities guidelines

Activity 2.1

Group discussion: Unhealthy eating habits – divide learners into small groups. Instruct them to discuss and identify various eating habits they consider unhealthy. Guide them to think about how specific foods or eating behaviours can affect their health. After the discussion, each group should share their findings with the class.

Activity 2.2

Group discussion: Consequences of unhealthy eating – In their groups, direct learners to explain the consequences of unhealthy eating habits, drawing connections to potential health problems.

Activity 2.3

Pair discussion: Promoting a healthy lifestyle – In pairs, learners should discuss the importance of regular exercise and healthy eating for maintaining a good lifestyle.

Suggested answers

Exercise 2.1

Unhealthy eating habit	Description
Frequent sugary drinks.	Consuming high-sugar drinks regularly.
Snacking on unhealthy options.	Choosing chips, sweets or cookies over healthier snacks.
Skipping meals.	Not eating breakfast or lunch.
Overeating at meals	Overeating without paying attention to fullness.
Mindless eating while watching television.	Eating while distracted.
Poor hydration.	Not drinking enough water.
Unhealthy lunch choices.	Packing processed lunches.

Exercise 2.2

1. An eating disorder is a mental disorder defined by abnormal eating habits that negatively affect a person's physical or mental health.
2. Obesity, anorexia, bulimia. (Any two)

3. Cardiovascular diseases, type 2 diabetes, sleep apnoea, certain types of cancer, depression. (Any two)
4. Gastrointestinal (stomach) problems, severe dehydration, heart problems. (Any two)
5. Anorexia

Exercise 2.3

1. True
2. False
3. True
4. True
5. False
6. True
7. True
8. False

Unit revision exercises

Multiple choice answers

1. C
2. D
3. C
4. C
5. B
6. B
7. C
8. B
9. B
10. C

Structured questions answers answers

1. **(a)** Diet - kinds of food that a person eats daily.
   (b) Balanced diet - a meal containing all the required nutrients in their correct proportions.
2. Obesity, anorexia, bulimia. (Any two)
3. Obesity
4. Exercise
5. Type 2 diabetes
6. Unhealthy
7. Vomiting
8. Obesity
9. Indigestion
10. Nutritional deficiencies

Unit 3: Environmental hygiene water pollution

Unit objectives

By the end of this unit, learners should be able to:

a. define water pollution.
b. identify the causes of water pollution.
c. state the effects of water pollution.
d. discuss the measures of reducing water pollution.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 13-19.
- Science and Technology Grade 3-7 syllabus.
- Local environment, digital media.

Teaching notes

- Water pollution is the introduction of harmful substances or products into water sources.
- Causes of water pollution include faecal matter/sewage, chemicals and fertilisers from agriculture, waste from industries, mining, atmospheric air pollution and accidental water pollution.
- Effects of water pollution include death of aquatic animals, outbreak of diseases, clogging of irrigation nozzles, destruction of plants by acid rain and death of livestock.
- Measures to reduce water pollution include proper waste disposal, avoiding overuse of fertilisers and pesticides, strict laws for industries, educating people, efficient sewage treatment and clean-up campaigns.

Activities guidelines

Activity 3.1

Outdoor observation and prevention discussion: Guide learners outside the classroom to identify any substances near and around the school that may result in the pollution of water bodies. In pairs, learners should discuss how this pollution could be prevented.

Activity 3.2

Group discussion: Effects of water pollution – Divide learners into groups of five. Instruct them to discuss the effects of water pollution on humans, animals and aquatic life.

Activity 3.3

- **Internet research and video observation: Preventing water pollution** – Instruct learners to access the internet using a computer or smartphone. They should research more on ways of preventing water pollution and watch videos that demonstrate how water pollution can be prevented.

Suggested answers

Exercise 3.1

1. Pollution is the introduction of harmful substances or products into the environment.
2. Faecal matter/sewage, chemicals and fertilisers from agriculture, waste from industries, mining, atmospheric air pollution, accidental water pollution. (Any five)
3. Accidental water pollution can come from burst sewer pipes and tanks or underground storage leakages where contaminants find their way into nearby water bodies through infiltration or run-off.
4. A pollutant is a substance or product that causes harm to the environment.

Exercise 3.2

1. Hepatitis, cholera, typhoid, dysentery, bilharzia. (Any three)
2. Death of aquatic animals, outbreak of diseases, clogging nozzles in irrigation systems, destruction of plants by acid rain, livestock dying. (Any three)
3. True
4. False
5. False
6. True

Exercise 3.3

1. Waste bin
2. Drain, toilet. (Either)
3. Dangerous
4. Water
5. Marketplaces
6. Educating
7. Communities
8. Avoiding throwing away rubbish anyhow, not throwing chemicals, oils, paints and medicines down the drain or in the toilet, buying environmentally safe cleaning liquids, avoiding overuse of fertilisers and pesticides, strict laws for industries, educating people on dangers of water pollution, efficient treatment of sewage, clean-up campaigns. (Any three)

Unit revision exercises

Multiple choice answers

1. B
2. B
3. A
4. C
5. D
6. C
7. A
8. C
9. B
10. C

Structured questions answers

1. Eutrophication
2. Farmers use chemicals like pesticides, herbicides and fungicides, as well as fertilisers. When too much is used, these chemicals are washed away into open water sources, contaminating the water and killing aquatic animals. Fertilisers can cause excessive growth of water plants, leading to oxygen depletion (eutrophication) when they die.
3. Acid
4. Sewage/faecal matter, chemicals/fertilisers, industrial waste, mining waste, acid rain, accidental spills. (Any two)
5. Disease outbreaks.
6. Chemicals
7. Cholera
8. Oxygen
9. Strict waste disposal laws.

Unit 4: Emotional health

Unit objectives

By the end of this unit, learners should be able to:

a. define emotional health.
b. discuss the signs of emotional health.
c. explain the factors influencing emotional health.
d. state emotional health coping mechanisms.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 20-27.
- Science and Technology Grade 3-7 syllabus.
- Resourc person, digital tools, print media.

Teaching notes

- Emotional health is how you think and feel and how you respond to life's challenges.
- Signs of positive emotional health include the ability to regulate emotions, cope with stressors and maintain healthy relationships.
- Emotional health is affected by biological, psychological and social factors.
- Healthy coping strategies for emotional health include setting boundaries, practising relaxation techniques, engaging in physical activity, creating to-do lists and seeking support/therapy.

Activities guidelines

Activity 4.1

Group discussion: Signs of emotional health – Divide learners into groups and instruct them to discuss what they believe are the signs of emotional health.

Activity 4.2

Group discussion: Factors influencing emotional health – In their groups, direct learners to discuss the various biological, psychological and social factors that affect emotional health.

Activity 4.3

Collaborative definition: Emotional health – Divide learners into small groups or pairs. Give them 2-3 minutes to brainstorm and come up with their own definition of emotional health. Each group will then share their ideas with the class. As a class, combine these ideas into one comprehensive class definition, ensuring it includes key concepts such as a healthy mind-body connection, how mental health affects thoughts/feelings/actions and how it impacts emotion management.

Activity 4.4

Role-play and discussion: Emotional management – Guide learners in role-playing scenarios where characters experience and manage emotions like fear, stress and anxiety. During the role-play, emphasise characters seeking comfort. After the role-play, discuss the importance of seeking comfort and support from others when dealing with strong emotions.

Suggested answers

Exercise 4.2

1. biological
2. mood
3. sleep
4. emotional
5. relationships
6. psychological

7. social

8.

Factor	Example
Biological	Physical health conditions.
Psychological	Beliefs and perceptions.
Social	Relationships

Exercise 4.3

1. True
2. True
3. True
4. False
5. False
6. Deep breathing, talking to a trusted adult, engaging in hobbies, exercising or setting boundaries. (Any two)

Unit revision exercises

Multiple choice answers

1. C
2. C
3. B
4. C
5. D
6. A
7. D
8. B
9. A
10. D

Structured questions answers

1. challenges
2. behavioural
3. emotions
4. psychological
5. resilience
6. healthy
7. Any relevant answer from the text. Examples: Immediately notify a trusted adult (parent, teacher, counsellor), encourage them to talk about their feelings, suggest seeking professional help, do not keep it a secret.
8. Any two symptoms of stress, for example, worry, discomfort, headaches, reduced physical activity, anxiety, depression. (Accept any relevant answer from the text describing negative emotional or physical responses to stress).

9. Any relevant answer, such as talking about feelings, practising relaxation techniques, maintaining routines, seeking professional help, engaging in physical activity, expressing emotions through art/journaling, setting boundaries.
10. Any relevant answer, such as hopelessness, unbearable emotional pain, despair, feeling trapped, overwhelming sadness.

Unit 5: Sexually Transmitted infections (STIs)

Unit objectives

By the end of this unit, learners should be able to:

a. define Sexually Transmitted Infections (STIs).
b. list STIs.
c. identify signs and symptoms of STIs.
d. state STIs prevention measures.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 28-33.
- Science and Technology Grade 3-7 syllabus.
- Digital tools, resource person, print media.

Teaching notes

- Sexually Transmitted Infections (STIs) are diseases caused by bacteria or viruses, acquired by sexual contact or sometimes non-sexually.
- Examples of STIs include gonorrhoea, syphilis, genital warts and herpes.
- STIs can have a range of signs and symptoms or no symptoms at all (asymptomatic).
- Prevention measures include abstaining from sexual activity, avoiding unprotected sex, not sharing needles, regular doctor visits for STI checks and learning more about STIs.

Activities guidelines

Activity 5.1

Group Discussion: Types, transmission and health effects of STIs – Divide learners into small groups. Instruct them to discuss the different types of STIs mentioned in the learner's book (for example, Gonorrhoea, Syphilis, Genital Warts, Herpes). Guide them to think about how these STIs are transmitted and how they can affect health. After their discussion, each group should share their findings with the class.

Activity 5.2

Group discussion: STI signs and symptoms – In groups, instruct learners to discuss the various signs and symptoms of STIs, emphasising that some STIs may show no symptoms.

Activity 5.3

Class discussion: STI prevention measures – Facilitate a class discussion on the prevention of STIs. Guide learners to recall and discuss measures such as abstinence, condom use, avoiding shared needles, regular doctor visits for STI checks and learning more about STIs.

Suggested answers

Exercise 5.1

1. Sexually Transmitted Infections
2. Gonorrhoea, syphilis, genital warts, herpes.
3. Gonorrhoea, syphilis.
4. Genital warts, herpes.
5. Syphilis
6. Gonorrhoea
7. Herpes

Exercise 5.2

1. Painful urination, discharge from the penis or vagina, swelling or pain in the testicles (men), abdominal pain (women), bleeding between periods (women). (Any two)
2. Painless sores or ulcers, skin rashes, mouth ulcers, swollen lymph nodes, fever, hair loss and fatigue, organ damage. (Any two)
3. Small bumps or growths in the genital or anal area, itching or discomfort around the genitals or anus, bleeding or pain during sex or urination. (Any two)
4. Painful blisters or sores on the genitals, anus or mouth, itching or burning sensations, pain during urination, flu-like symptoms. (Any two)

Exercise 5.3

1. True
2. False
3. False
4. False
5. True
6. False
7. True

8. Abstaining from sexual activity with multiple partners, avoiding unprotected sex, avoiding sharing needles, visiting the doctor regularly for STI checks, learning more about STIs. (Any three)

Unit revision exercises

Multiple choice answers

1. B
2. B
3. B
4. C
5. B
6. B
7. B
8. A
9. C
10. B

Structured questions answers answers

1. Sexually Transmitted Infections (STIs) are diseases caused by bacteria or viruses that are acquired by sexual contact.
2. Abstinence, condom use, regular testing, vaccination, mutual monogamy. (Any two)
3. bacteria.
4. Herpes
5. Abstinence
6. False
7. True
8. Gonorrhoea
9. Small bumps or growths in the genital or anal area, itching or discomfort, bleeding or pain during sex or urination. (Any one)
10. Painless sores or ulcers, skin rashe, mouth ulcers, swollen lymph nodes, fever, hair loss, fatigue, organ damage.

Topic 2 Food and nutrition

Unit 6: Nutrient deficiency and excess

Unit objectives

By the end of this unit, learners should be able to:

a. identify nutrients.
b. explain nutrient deficiency.
c. list nutrient deficiency diseases.
d. identify the importance of nutrients for growth and development.
e. discuss the causes of nutrient deficiency diseases.
f. outline the consequences of nutrient deficiency diseases.
g. state the effects of nutrient excess.
h. explain the importance of nutrient moderation.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 34-43.
- Science and Technology Grade 3-7 syllabus.
- Food items, digital tools, resource person, print media.

Teaching notes

- Nutrients are chemical compounds in food that help your body function and stay healthy.
- Major nutrients include carbohydrates, fats, proteins, vitamins, minerals and water.
- Nutrient deficiency diseases occur when the body does not get enough of a certain nutrient.
- Examples of deficiency diseases are kwashiorkor, marasmus, night blindness, rickets, scurvy, goitre and anaemia.
- Nutrient excess occurs when consuming excessive amounts of certain nutrients, leading to serious health issues.
- Effects of nutrient excess include weight gain/obesity, high blood pressure, liver damage (for example, from excess Vitamin A) and kidney damage (for example, from high protein or excess calcium).

- Nutrient moderation involves consuming the right amounts of nutrients to maintain optimal health, preventing both deficiencies and excesses.

Activities guidelines

Activity 6.1

Group discussion and food examples: Nutrients – Divide learners into small groups. Instruct them to name and discuss different nutrients (carbohydrates, fats, proteins, vitamins, minerals, water) and their importance in the body. Then, direct them to write down examples of foods that provide these nutrients for each nutrient discussed.

Activity 6.2

Research and presentation: Nutrient deficiency diseases – Instruct learners to research the causes and symptoms of various nutrient deficiency diseases. They should then present their findings to the class, utilising digital tools or print media for their presentation.

Activity 6.3

- **Group discussion: Nutrient excess and prevention** – Guide learners in groups to discuss how eating too much of certain foods can lead to health problems. Following this, they s
- **Group discussion: Nutrient moderation** – In groups, learners should discuss the term "nutrient moderation." Following this, they should explain why nutrient moderation is important for overall health and well-being.

Suggested answers

Exercise 6.1

1. **(a)** Vitamin C, Vitamin D. (Any one)
   (b) – Vitamin C: citrus fruits, peppers, strawberries, blackcurrants, broccoli, brussels sprouts, potatoes. (Any one or more)
   – Vitamin D: fish, cod liver oil, egg yolks, beef liver, cheese, butter. (Any one or more)
2. Proteins
3. Helps produce thyroid hormones, regulates metabolism and development, promotes brain development, maintains cognitive function, treats fibrocystic breasts, disinfects skin wounds. (Any one)
4. Iodine, iron.
5. Vitamin D supports the body's natural immune defences, modulates the function of immune cells and promotes bone and muscle health. (Any one)
6. Vitamin D

Exercise 6.2

1. Deficiency
2. Kwashiorkor, marasmus, night blindness, rickets, scurvy, goitre, anaemia. (Any three)
3. Vitamin C
4. Rickets
5. Swollen stomach, weak muscles, poor growth, dry flaky skin, irritability, changes in hair colour, fatigue, diarrhoea. (Any one)
6. By consuming foods rich in Vitamin A (for example, carrots, leafy greens, sweet potatoes) or taking Vitamin A supplements.
7. Goitre
8. Iron
9. Bleeding gums, weakness, bruising, joint pain, slow wound healing, anaemia, dry skin. (Any one)

Exercise 6.3

1. weight gain
2. salt
3. vitamin A
4. kidneys
5. calcium
6. diabetes
7. salt
8. vitamin A

Exercise 6.4

1. healthy
2. excess
3. moderation
4. physical
5. well-being
6. heart
7. obesity
8. nutrients

Unit revision exercises

Multiple choice answers

1. C
2. C
3. D
4. D
5. C
6. C
7. B
8. B
9. B
10. B

Structured questions answers

1. **(a)** Diet - kinds of food that a person eats daily.
   (b) Balanced diet - a meal containing all the required nutrients in their correct proportions.
2. Kwashiorkor, marasmus, goitre, beriberi, rickets, scurvy, anaemia. (Any two)
3. Proper eating habits are important because they help maintain overall health, prevent nutrient deficiencies and avoid health issues caused by nutrient excess. (Accept any relevant answer from the text)
4. Swollen stomach, weak muscles, poor growth, dry flaky skin, irritability, changes in hair colour, fatigue, diarrhoea. (Any two)
5. Helps the body fight infections, helps absorb iron, promotes healthy teeth and gums, helps with wound healing, helps form collagen, helps relieve allergy symptoms. (Any one)
6. Weight gain, high blood pressure, liver damage, kidney damage. (Any one)
7. Goitre
8. Red meat, liver, poultry, seafood, lentils, beans, spinach, tofu, fortified cereals. (Any one)
9. Kidneys
10. Vitamin D

Unit 7: Food preservation

Unit objectives

By the end of this unit, learners should be able to:

a. define food preservation.
b. state the importance of food preservation.
c. explain the methods of preserving food in the home.
d. explain how food can be spoiled and contaminated.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 44-51.
- Science and Technology Grade 3-7 syllabus.
- Food, salt, kitchen utensils, print media.

Teaching notes

- Food preservation is the process of treating and handling food to slow down spoilage and extend its shelf life.
- The importance of food preservation includes reducing food waste, ensuring food availability during shortages, maintaining nutritional value and preventing foodborne illnesses.

- Methods of food preservation at home include indigenous methods (drying, salting, fermentation, smoking) and modern methods (refrigeration, freezing, canning, pickling, pasteurisation).
- Food spoilage occurs when food becomes unsafe to eat due to bacterial growth, mould or chemical reactions.
- Food contamination happens when harmful microorganisms or substances enter food.
- Common causes of spoilage and contamination include microorganisms, chemical reactions (oxidation), pests, poor storage and unhygienic handling.

Activities guidelines

Activity 7.1

Market research and discussion: Preserved foods – Assign learners the task of identifying and listing five examples of preserved foods available in the market. For each food item, they should determine its approximate shelf life and note any storage instructions provided on its label. Learners should also consider and discuss one reason for these specific storage requirements.

Activity 7.2

Demonstration: Indigenous food preservation – Divide learners into small groups. Instruct each group to demonstrate an indigenous method of food preservation. For example, they could harvest leaf vegetables or fruit vegetables (like tomatoes) and preserve them through a drying method. Each group should then explain how the chosen method prevents food spoilage.

Activity 7.3

Experiment and discussion: Food spoilage and contamination – Guide learners to conduct an experiment by leaving different types of food exposed to air for a few days (for example, a piece of bread, a fruit slice). Instruct them to observe and record the changes that occur daily. After the experiment, lead a discussion on how contamination occurs and how it can be prevented in food.

Suggested answers

Exercise 7.1

1. Drying, salting, fermentation, smoking. (Any two)
2. To remove moisture from food to prevent the growth of microorganisms, thus preventing spoilage.
3. Meats, fish, vegetables. (Any two)
4. By storing food at low temperatures (0°C to 5°C) to slow down bacterial growth and delay spoilage.
5. Salt is used to draw moisture out of food and create an environment that prevents the growth of harmful bacteria.

6. Refrigeration slows bacterial growth, while freezing stops it completely by turning water into ice, allowing for much longer preservation.
7. Extends shelf life, improves taste, texture and nutritional value. (Any one)
8. Select fresh, tender peas and shell them. Boil water with 10g of salt per litre. Add peas and blanch for 2 minutes. Drain, cool immediately and pack into small polythene bags, removing air before sealing. Freeze at -18°C.

Exercise 7.2

1. bacterial
2. harmful
3. storage, utensils.
4. oxidation
5. rodents, insects.
6. dirty
7. Food spoils faster in warm temperatures because warmth promotes the rapid growth of microorganisms like bacteria and fungi, which cause decay.
8. Proper food handling prevents contamination by ensuring clean hands, utensils and surfaces, reducing the introduction of harmful microorganisms into food.

Unit revision exercises

Multiple choice answers

1. C
2. B
3. D
4. A
5. B
6. B
7. A
8. C
9. C
10. C

Structured questions answers

1. Food preservation is the process of treating and handling food to slow down spoilage and extend its shelf life.
2. Drying, salting, fermentation, smoking. (Any two)
3. Refrigeration, freezing, canning, pickling, pasteurisation. (Any two)
4. Microorganisms, chemical reactions (oxidation), pests, poor storage, unhygienic handling. (Any two)
5. Drying
6. Food should be handled properly to prevent spoilage and contamination by harmful substances or microorganisms, which can cause illnesses if consumed. (Accept any relevant answer.)

7. Proper food handling (for example, washing hands, using clean utensils), proper storage (for example, refrigerating perishable foods), avoiding cross-contamination, cooking food thoroughly. (Any one)
8. Refrigeration preserves food by storing it at low temperatures (0°C to 5°C), which significantly slows down bacterial growth and delays spoilage.
9. The main reason for pasteurisation is to heat food (especially liquids) to a specific temperature for a set period to kill harmful bacteria without significantly altering taste or nutritional value, ensuring it remains safe for consumption and extending shelf life.

Unit 8: Meal planning and budgeting

Unit objectives

By the end of this unit, learners should be able to:

a. identify types of meals.
b. plan a simple meal.
c. state the benefits of meal planning.
d. discuss budget goals when planning for a meal.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 52-58.
- Science and Technology Grade 3-7 syllabus.
- Meal card, digital tools, print media, resource person.

Teaching notes

- The three main types of meals are breakfast, lunch and supper.
- Meal planning is the process of deciding in advance what meals to prepare and eat over a specific period.
- Benefits of meal planning include reducing food waste, controlling portions and ensuring balanced nutrition.
- Budget goals when meal planning include cost control, saving money and avoiding impulse buying.

Activities guidelines

Activity 8.1

Group discussion: Types of meals – Divide learners into small groups. Instruct them to discuss the three main types of meals: breakfast, lunch and supper. Guide them to articulate what makes each meal unique in terms of typical foods, time of day and purpose (for example, energy for the day, sustaining midday energy, lighter evening meal).

Activity 8.2

Practical meal planning: "Rainbow" plate, "Pizza" night, "Theme" nights – Engage learners in practical activities related to meal planning and healthy eating:

a. **"Rainbow" plate:** Learners fill actual plates (if resources allow) or draw plates filled with different coloured fruits and vegetables, discussing the importance of variety.

b. **"Pizza" night (at home/school):** Learners make mini whole wheat pizzas at home (or as a school activity if feasible) with healthy toppings (for example, vegetables, lean protein, low-fat cheese). They can then share their healthy pizza choices at school.

c. **"Theme" nights:** Encourage learners to plan "theme" nights at home based on different cuisines (for example, Taco Tuesday or Sushi Saturday), focusing on how to incorporate balanced nutrients into varied meals.

Activity 8.3

Group activity: Meal budgeting – Divide learners into groups. Instruct each group to make a budget for a simple meal, considering both the cost of ingredients and the nutritional value of the meal. They should aim to plan a meal that is healthy and cost-effective.

Suggested answers

Exercise 8.1

1.

Type of meal	Time of day
Breakfast	Morning
Lunch	Midday
Supper	Evening

2. Mealie-meal porridge, cornflakes, oatmeal, bread, buns, scones, muffins, tea, milk, juice, sausages, bacon, eggs, cheese, cold meat, avocados, bananas, berries, smoothies, yoghurt. (Any three)
3. *Sadza*, rice, pasta, samp, green vegetables, beans, potatoes, pumpkins, beetroots, carrots, grilled or stewed beef, pork, chicken, fish, pudding, custard, jelly, trifle, salads. (Any three)
3. Food that is taken for lunch but in smaller quantities. (Accept any three relevant lunch examples, stating smaller portions).

Exercise 8.2

1. reduce
2. portion
3. nutrients
4. budget

Exercise 8.3

1. Cost control, saving money, avoiding impulse buying.
2. **Cost control**: Cooking from scratch with ingredients like rice, beans and fresh vegetables instead of buying pre-packaged meals. Purchasing staple foods in bulk. Comparing prices at different supermarkets. (Any one)

   Saving money: Planning a weekly menu to prevent buying takeaway meals. Cooking larger portions and storing leftovers. Using seasonal fruits and vegetables. (Any one)

   Avoiding impulse buying: Going to the market with a shopping list. Eating a meal before grocery shopping. Sticking to planned recipes.
3. Budgeting helps control food expenses by avoiding unnecessary purchases and preventing last-minute expensive food buys. It also helps save money in the long run. (Any one)

Unit revision exercises

Multiple choice answers

1. A
2. B
3. B
4. A
5. B
6. B
7. B
8. B
9. B
10. B

Structured questions answers

1. Meal planning is the process of deciding in advance what meals to prepare and eat over a specific period.
2. Reducing food waste, controlling portions and providing balanced nutrition.
3. supper
4. impulse buying
5. all the nutrients
6. meal planning
7. balanced
8. saving money
9. poor nutrition
10. portion sizes

Topic 3 Crops, plants and animals

Unit 9: Plant reproduction

Unit objectives

By the end of this unit, learners should be able to:

a. define plant reproduction.
b. describe the process of pollination.
c. explain fertilisation.
d. outline seed formation.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 59-66.
- Science and Technology Grade 3-7 syllabus.
- Local enviroment, apparatus, digital tools, plants, seeds, fruits.

Teaching notes

- Plant reproduction is when plants produce new young plants (offspring).
- There are two main types of plant reproduction: flowering plant reproduction (sexual reproduction) and non-flowering plant reproduction (asexual reproduction and spores/ vegetative propagation).
- Pollination is the transfer of pollen grains from the anther to the stigma of a plant.
- Fertilisation is the fusion of male and female gametes (egg cell and pollen grain) in plants, occurring inside the ovule.
- After fertilisation, the fertilised ovule develops into a seed and the ovary of the flower changes into the fruit.
- A seed consists of an embryo, endosperm and seed coat.
- Seed dispersal is the process by which seeds move away from the parent plant to grow in new locations, facilitated by wind, water, animals and humans.

Activities guidelines

Activity 9.1

Observation and classification: Flowering and non-flowering plants – Guide learners to observe plants in their local environment (for example, school garden, park, around their homes). Instruct them to classify these plants as either flowering or non-flowering plants based on their reproductive characteristics.

Activity 9.2

Flower observation, illustration and discussion: Pollination – Provide learners with different types of local flowers (if possible) or use detailed diagrams. Instruct them to observe the flowers and identify their various parts (for example, anther, stigma, petal). Then, have them illustrate the process of pollination using a diagram, showing the transfer of pollen. Lead a discussion on the importance of pollination in plants for producing seeds and fruits.

Activity 9.3

Digital exploration and explanation: Fertilisation – Instruct learners to use digital tools (computers, smartphones, tablets) to watch an animation of fertilisation in plants. Following the video, have them explain the process of fertilisation using a diagram. Facilitate a class discussion on why fertilisation is essential for plant reproduction.

Activity 9.4

Seed and fruit examination and dispersal discussion: Provide learners with different types of seeds and fruits collected from the local environment (for example, dandelions, maples, coconuts, berries). Instruct them to examine these samples. Then, have them identify different methods of seed dispersal evident from the samples or their knowledge. Lead a discussion on the importance of seed dispersal for plant survival and spread.

Suggested answers

Exercise 9.1

1. True
2. False (The male parts are stamen, anther and filament; the female parts are carpel/pistil, stigma, style and ovary).
3. False (Pollen is produced by the anther, which is a male part).
4. False (Spores are produced by non-flowering plants).
5. True
6. False (Non-flowering plants reproduce without flowers).
7. True

8. False (Grafting is a method of vegetative propagation, not growing from seeds).
9. False (Pineapples reproduce by suckers, a type of vegetative propagation).
10. False (The stigma is part of the female reproductive system).

Exercise 9.2

1. Pollination is the transfer of pollen grains from the anthers of one flower to the stigma of another flower, either on the same plant or on different plants of the same species.
2. Insects like bees, butterflies, birds and flies help with pollination by carrying pollen from the anther to the stigma.
3. Wind contributes to pollination by transporting lightweight pollen from the anther to the stigma of flowers.
4. Anther
5. Carpel/Pistil
6. True
7. Stigma
8. **Plant reproduction** – It helps plants produce seeds and fruits, allowing them to grow and multiply.

   Biodiversity – It supports a wide variety of plant and animal life in ecosystems.

   Food supply – It provides food for humans and animals by helping grow fruits, vegetables and nuts. (Accept any relevant answer.)

Exercise 9.3

1. Fertilisation is when the male gamete (which is part of the pollen grain) fuses with the female gamete (the egg cell) inside the ovule.
2. Inside the ovule.
3. endosperm
4. endosperm
5. seed coat
6. ovary

Exercise 9.4

1. seed
2. embryo
3. endosperm
4. ovary
5. Wind dispersal, water dispersal, animal dispersal, human dispersal. (Any two)
6. Seed dispersal is important because it helps plants spread to new areas, preventing overcrowding and competition for resources near the parent plant and promoting biodiversity. (Accept any relevant answer.)

7. The main function of a fruit is to protect the developing seeds and assist in their dispersal.
8. Dandelion, maple trees. (Accept a relevant example for wind dispersal)
9. Ovary

Unit revision exercises

Multiple choice answers

1. C
2. B
3. C
4. D
5. B
6. C
7. B
8. B
9. C
10. B

Structured questions answers

1. Ferns, mosses, fungi. (Any one)
2. Wind dispersal, water dispersal, animal dispersal, human dispersal. (Any one)
3. Vegetative propagation / Spore formation. You may also accept asexual reproduction.
4. Pollination
5. Fertilisation
6. Seeds
7. Ovary
8. Fruit
9. Insects (like bees) act as agents of pollination by transporting pollen from the anther to the stigma of flowers.
10. Insects, wind, water, animals, humans. (Any two)
11. Carpel/Pistil

Unit 10: Plant nutrients

Unit objectives

By the end of this unit, learners should be able to:

a. state plant nutrients.
b. discuss plant nutrients.
c. explain functions of nutrients in plants.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 67-72.
- Science and Technology Grade 3-7 syllabus.
- Local environment, fertilisers.

Teaching notes

- Plants require nutrients to grow, develop and reproduce, mainly obtained from the soil, water and air.
- Key plant nutrients include Nitrogen (N), Phosphorus (P) and Potassium (K).
- Nitrogen is essential for leaf and stem growth, protein production and helping roots absorb nutrients.
- Phosphorus promotes early root growth, strengthens stems, improves flower and seed production and increases disease resistance.
- Potassium helps activate enzymes for cell growth, is involved in photosynthesis, regulates water balance, strengthens cell walls for disease resistance and enhances frost tolerance.
- Nutrient deficiencies lead to specific symptoms: Nitrogen (yellow leaves, poor growth); Phosphorus (poor root formation, purple leaves); Potassium (scorched leaf edges, fruit discoloration).

Activity guideline

Activity 10.1

Field observation and remedial measures discussion: Nutrient deficiency symptoms – Organise a visit to the school garden, a local farmer's garden or nearby crop fields. Instruct learners to carefully observe the plants and identify any visible nutrient deficiency symptoms (for example, yellow leaves, purple tints, scorched edges). After the observation, lead a class discussion on the remedial measures that can be taken to overcome the specific nutrient deficiencies they discovered (for example, adding appropriate fertilisers, compost).

Suggested answers

Exercise 10.1

1. Water regulation, fruit development, leaf growth. (Any of these that apply to potassium, for example, water regulation, fruit development.)
2. Yellow leaves.
3. Flowering, root growth. (Either)
4. Nitrogen
5. Phosphorus
6. Nitrogen

7. Potassium
8. Phosphorus
9. Yellow leaves (chlorosis), poor growth rate, stunted growth, premature leaf fall, slow growth. (Any three)

Unit revision exercises

Multiple choice answers

1. C
2. C
3. B
4. D
5. D
6. C
7. A
8. B
9. C
10. B

Structured questions answers

1. True
2. Seeds
3. Compost, manure, crop residues. (Any one)
4. Phosphorus
5. poor flowering
6. weak stems.
7. When plants lack nitrogen, their leaves turn yellow (chlorosis), they exhibit stunted growth and a slow growth rate and leaves may fall prematurely. (Any one)
8. Phosphorus contributes to plant health by promoting early root growth, strengthening stems, improving flower formation and seed production, increasing resistance to plant diseases and enhancing overall crop quality. (Accept any relevant answer.)
9. Nitrogen is used in the production of protein in grains and it helps roots take up nutrients and water, supporting overall growth and development.
10. Fertiliser

Unit 11: Animal reproduction

Unit objectives

By the end of this unit, learners should be able to:

a. describe mating.
b. define gestation period.
c. compare gestation periods for domestic animals.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 73-79.
- Science and Technology Grade 3-7 syllabus.
- Print media, digital tools.

Teaching notes

- Mating is the process of sexual reproduction between two animals, either of the opposite sex or hermaphrodites.
- Animals attract mates using sounds, actions (for example, peacocks spreading feathers) and colours.
- Animals reproduce by laying eggs (for example, birds, frogs, fish) or giving birth to live offspring (for example, dogs, cows, humans).
- Internal fertilisation occurs when sperm is deposited inside the female's body (for example, lions, cows), while external fertilisation happens outside, often in water (for example, fish, frogs).
- The gestation period is the length of time it takes for an embryo or foetus to develop in the uterus and be born, which varies by species and is often related to animal size.
- Examples of gestation/incubation periods: Cows (279–292 days), rabbits (28–32 days), chickens (21-day incubation).

Activities guidelines

Activity 11.1

Matching activity: Animal mating attraction – Conduct a matching activity where learners match each animal (for example, peacock, frog, bird, chameleon) with its specific method of attracting a mate (for example, spreading colourful feathers, croaking loudly, singing a song, changing colour) respectively.

Activity 11.2

Pair discussion: Types and differences of fertilisation – In pairs, instruct learners to discuss the two main types of fertilisation (internal and external) in different animals. Guide them to articulate the key differences between these two types of fertilisation.

Activity 11.3

Comparative activity and timeline: Gestation periods – Provide learners with information on the gestation periods of different animals (for example, cows, rabbits, chickens/poultry). Instruct them to compare these gestation periods and identify which animal would likely have more offspring at once. Encourage them to explain why they think this is the case. Then, have them draw a timeline illustrating the gestation/incubation periods for cows, rabbits and poultry.

Suggested answers

Exercise 11.1

1. Mating is the process of sexual reproduction between two animals, either of the opposite sex or hermaphrodites.
2. Sounds (singing, croaking), actions (dancing, spreading feathers), colours (changing colour). (Any two)
3. Animals that lay eggs have their young develop inside eggs outside the mother's body before hatching, while animals that give birth have their young develop inside the mother's body and are born live.
4. Birds, frogs, fish. (Any one)
5. Dogs, cows, humans. (Any one)

Exercise 11.2

1. Internal fertilisation occurs when the male animal deposits sperm inside the female's body, where fertilisation happens.
2. Lions, elephants, cattle. (Any two)
3. External
4. Internal fertilisation.
5. Offspring are unprotected and often preyed upon; limited to aquatic environments. (Any one)
6. Higher chance of offspring survival; parental care for offspring. (Any one)
7. Aquatic environments (water).

Exercise 11.3

1. 279-292 days (9 months)
2. 28-32 days (average 31 days)
3. 21 days
4. Larger animals tend to have longer gestation periods because their offspring require more time to develop fully inside the mother before birth.
5. Calving
6. It ensures the current litter grows well before the next litter arrives, as the mother needs time to recover and care for her young.
7. Generally, larger animals tend to have longer gestation periods, while smaller animals have shorter ones.
8. Incubation
9. Yes, a female rabbit (doe) can become pregnant again within hours after giving birth, but it is best to wait until her young are at least 4 weeks old before mating her again.

Unit revision exercises

Multiple choice answers

1. B
2. B
3. B
4. B
5. B
6. B
7. C
8. B
9. B
10. C

Structured questions answers

1. Fertilisation
2. Mating is the process of sexual reproduction between two animals, either of the opposite sex or hermaphrodites.
3. Gestation is the length of time it takes for an embryo or foetus to develop in the uterus and be born.
4. False (Poultry have an incubation period, not a gestation period like mammals).
5. False (A cow's gestation period is about 9 months, not 3).
6. The gestation period allows for the complete development of the embryo or foetus inside the mother's body, ensuring that the offspring are born relatively mature and have a higher chance of survival.
7. Smaller animals like rabbits tend to have shorter gestation periods because their offspring develop faster and are born less mature compared to larger animals, allowing for more frequent reproduction.
8. External fertilisation can lead to a lower survival rate of offspring because the eggs and sperm are released into the environment, where they are unprotected and often preyed upon.
9. Requires energy to find a mate; fewer offspring are produced at once. (Any one)
10. Requires less energy to find a mate; many eggs are fertilised at once. (Any one)

Unit 12: Ecological pyramid

Unit objectives

By the end of this unit, learners should be able to:

a. identify organisms in the levels of the ecological pyramid.
b. describe the ecological pyramid.
c. discuss the importance of the ecological pyramid.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, Page 80-86.
- Science and Technology Grade 3-7 syllabus.
- Locally available materials, digital tools, print media.

Teaching notes

- An ecological pyramid is a diagram that shows how energy and organisms are distributed in an ecosystem.
- It shows the flow of energy between trophic levels and the number or biomass of organisms at each level.
- The levels of an ecological pyramid from bottom to top are: Producers, primary consumers, secondary consumers and tertiary consumers.
- Producers (plants) make their own food and are at the base.
- Primary consumers (herbivores) eat producers.
- Secondary consumers (small carnivores/omnivores) eat primary consumers.
- Tertiary consumers (large carnivores/apex predators) eat secondary consumers.
- Importance of an ecological pyramid: shows energy flow, illustrates food chains, helps understand ecosystem balance and is easy to understand.

Activities guidelines

Activity 12.1

Group construction and discussion: Ecological pyramid levels – Divide learners into small groups. Instruct each group to construct their own ecological pyramid (can be drawn or built with simple materials). As they build/draw, they should discuss and label the different levels of the ecological pyramid (producers, primary consumers, secondary consumers, tertiary consumers) and provide examples of organisms for each level.

Activity 12.2

Class discussion: Importance of the ecological pyramid – Lead a class discussion on the importance of the ecological pyramid. Guide learners to explain how it shows energy flow, illustrates food chains and helps in understanding ecosystem balance.

Suggested answers

Exercise 12.1

1. An ecological pyramid is a diagram that shows how energy and organisms are distributed in an ecosystem, illustrating the relationship between organisms and the flow of energy between trophic levels.
2. Producers (plants).
3. A primary consumer is an animal that eats plants. They are herbivores and are directly dependent on producers.

4. Goats, buffalo, cows, elands, rhinoceroses, elephants. (Any two)
5. Lions, owls, hawks, sharks, vultures. (Any one)
6. Primary consumers.
7. Primary consumers.
8. Tertiary consumers.
9. Frog, snake, any small bird of prey for example, owl or hawk. (Any one)
10. Producers
11. Omnivores

Exercise 12.2

1. Shows energy flow, illustrates food chains, helps understand ecosystem balance, is easy to understand. (Any two)
2. False
3. True
4. True
5. False
6. True
7. False (energy decreases as you move up).
8. False (producers are at the base).
9. False (shows flow from producers to consumers).
10. True

Unit revision exercises

Multiple choice answers

1. B
2. C
3. B
4. D
5. B
6. A
7. D
8. A
9. C
10. C

Structured questions answers

1. Ecological pyramid.
2. A. Producers B. Primary consumers C. Secondary consumers D. Tertiary consumers
3. A. Plants (for example, grass, trees) B. Herbivores (for example, buffalo, cows, elephants) C. Small carnivores/omnivores (for example, frogs, snakes) D. Large carnivores/apex predators (for example, lions, vultures)
4. D
5. B
6. A (Producers, at the base, have the most energy).

Topic 4

Environmental awareness and conservation

Unit 13: Weather conditions

Unit objectives

By the end of this unit, learners should be able to:

a. define weather forecasting.
b. state the importance of weather forecast.
c. list weather instruments.
d. explain functions of weather instruments.
e. record weather conditions.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, Page 87-95.
- Science and Technology Grade 3-7 syllabus.
- Weather station, digital tools, local environment, print media.

Teaching notes

- A weather forecast is a prediction of future weather conditions based on the analysis of data such as temperature, wind, humidity, etc.
- It is important to know the weather in advance for planning activities and preparing for different weather events, benefiting farmers, sailors, aviators and tourists.
- Weather instruments are tools used to measure various weather conditions, including temperature (thermometer), rainfall (rain gauge), wind speed (cup anemometer), wind direction (wind vane) and humidity (hygrometer).
- Weather recording helps track climate changes, predict future weather, study patterns and is crucial for agriculture, disaster preparedness and research.

Activities guidelines

Activity 13.1

Class discussion: Weather forecasting methods – Facilitate a class discussion on both indigenous (traditional signs, observations) and modern (satellite, technology-based) weather forecasting methods.

Activity 13.2

Digital exploration and discussion: Weather instruments – Instruct learners to access the internet using their computers or smartphones. They should watch videos demonstrating different weather instruments and research how each instrument works and how it is used to measure specific weather conditions. Encourage them to discuss their findings with their friends.

Activity 13.3

Practical measurement/observation and group presentation: Recording weather conditions – Organise a practical session for measuring weather conditions. If the school has a weather station, divide the class into six groups, assigning each group one weather instrument (thermometer, hygrometer, rain gauge, sunshine recorder, wind vane or cup anemometer). Each group will use their assigned instrument to measure specific weather conditions. If a weather station is not available, learners should watch videos on how to measure and record weather conditions using these instruments. After data collection/observation, each group will discuss the structure and design of their instrument, how it is used and any challenges or observations made. Finally, each group will present their findings and understanding to the class.

Suggested answers

Exercise 13.1

1. A weather forecast is a prediction of future weather conditions based on the analysis of data such as temperature, wind, humidity and other atmospheric factors.
2. It helps people plan activities (for example, farmers, sailors, aviators, tourists) and prepare for different weather events (for example, cyclones, dangerous weather warnings).
3. Farmers, sailors, aviators, tourists. (Any two)
4. temperature
5. 48 or even for a week.
6. Temperature, wind, cloud cover, rainfall. (Any three)

Exercise 13.2

1. C
2. B
3. D
4. C

5 A
6 D
7 D
8 B

Exercise 13.3

1 C
2 B
3 D
4 A
5 D
6 D
7 D
8 B
9 D
10 B

Unit revision exercises

Multiple choice answers

1 A
2 C
3 B
4 B
5 B
6 A
7 C
8 D
9 B
10 B

Structured questions answers

1 **(a)** Climate - the average weather condition of an area for a long period.
(b) Weather station - a place where weather instruments are kept and used to record weather elements.
(c) Atmosphere - the air around us.
(d) Humidity - the amount of moisture in the atmosphere.

2

Instrument	Element of weather recorded
Hygrometer	Humidity
Anemometer	Wind speed
Wind vane	Wind direction
Rain gauge	Rainfall

3 Tracking changes in climate, predicting future weather conditions, studying long-term weather patterns, crucial for agriculture, disaster preparedness, supporting scientific research. (Any two)

Unit 14: Soil as an ecosystem

Unit Objectives

By the end of this unit, learners should be able to:

a. identify soil organisms.
b. extract soil organisms from garden soil.
c. record findings.
d. describe the importance of soil organisms.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 96-100.
- Science and Technology Grade 3-7 syllabus.
- Compost, garden, flower bed, apparatus, digital tools, local environmental.

Teaching notes

- An ecosystem is a system where living organisms depend on each other in their environment.
- The components of an ecosystem are soil, plants and animals, which depend on each other for continuous existence.
- Soil organisms include macro-organisms (visible to the naked eye like earthworms, termites, ants) and micro-organisms (visible only with a microscope like bacteria, fungi, viruses).
- Soil provides a habitat for these organisms.
- Importance of soil organisms: improve aeration and drainage, decompose plant and animal matter making nutrients available, help fix nitrogen, maintain ecosystem balance and prevent disease spread.

Activities guidelines

Activity 14.1

Model building: Creating an ecosystem – Instruct learners to build a mini-ecosystem. This could involve placing a layer of garden soil in a clear container, introducing some termites (if safely possible and accessible) or earthworms and planting small plants. Learners should observe the interactions over time.

Activity 14.2

Outdoor observation and environment preference discussion: Soil organisms – Guide learners to examine their surroundings or a school garden to identify any small organisms in motion on the soil surface. Instruct them to carefully dig in damp areas of the garden to observe the types of organisms that inhabit these environments. Following the observation, lead a discussion on what kind of environment (for example, moisture, light, organic matter) small organisms prefer to live in.

Suggested answers

Exercise 14.1

1. plants, animals.
2. Ants, earthworms, termites. (Learners may name others not in text such as millipedes, crickets, centipedes, mice, snails).
3. bacteria
4. microscope
5. nutrients

Exercise 14.2

1. Earthworms, centipedes, millipedes, scorpions, crickets, beetles, ants, termites. (Any three)
2. Bacteria, fungi.
3. Improve soil aeration, improve drainage, decompose plant and animal matter (making nutrients available), help fix nitrogen, help maintain ecosystem balance, prevent disease spread, mix the soil. (Any three)
4. Pesticides can kill beneficial living organisms in the soil, disrupting the ecosystem balance and reducing soil fertility.
5. Rhizobium bacteria are important in the soil because they help fix nitrogen in the soil, which is a crucial nutrient for plant growth.

Unit revision exercises

Multiple choice answers

1. B
2. D
3. B
4. C
5. A
6. D
7. D
8. C
9. D
10. D

Structured questions answers

1. Soil organisms are living organisms, both macro and micro, that live in or on the soil.
2. Macro living organisms.
3. Bacteria, fungi.
4. Improve soil aeration, improve drainage, decompose plant and animal matter (making nutrients available), help fix nitrogen, help maintain ecosystem balance, prevent disease spread, mix the soil. (Any three)
5. Microorganisms can cause plant diseases, leading to crop failure or reduced yields. They can also cause food spoilage. (Accept any relevant problem from the text, for example, diseases, food spoilage).
6. Rhizobium bacteria.
7. Earthworms, millipedes, crickets, centipedes, ants, mice, snails (macro-organisms); bacteria, fungi, viruses (micro-organisms). (Any one, focusing on decomposing organic matter is earthworms).

Unit 15: Uses of soil

Unit objective

By the end of this unit, learners should be able to:

a. identify uses of soil.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 101-105.
- Science and Technology Grade 3-7 syllabus.
- Local environmental, apparatus, buckets, water, digital tools, clay.

Teaching notes

- Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support plant life.
- Main uses of soil include:
  - **Agriculture**: provides foundation for growing crops, nutrients and retains water.
  - **Construction**: used in building foundations and making bricks.
  - **Pottery**: clay from soil is shaped and fired to make various items.
  - **Habitat**: provides a home for many living organisms like earthworms, insects and microorganisms.

Activities guidelines

Activity 15.1

Group discussion: Local uses of soil – Divide learners into small groups. Instruct them to discuss the different ways soil is used in their local environment. They should think specifically about agriculture, construction, pottery and how animals use soil for shelter. After the discussion, each group will present their findings to the class.

Activity 15.2

Practical activity: Moulding clay/pottery model – Provide learners with clay. Instruct them to try moulding a simple shape, such as a pot or a bowl. If possible and safe, guide them to bake the item in a controlled way or instruct them to create a model illustrating how pottery is traditionally made in their area.

Activity 15.3

Field trip: Observing soil use – Organise a field trip to a nearby farm or construction site (ensuring all safety protocols are followed). Instruct learners to observe how soil is used in farming (for example, for crops) or in building (for example, foundations, bricks). They should note how soil supports crops or how it is incorporated into construction activities.

Suggested answers

Exercise 15.1

1. Providing a foundation for growing crops, providing nutrients for plants, retaining water for plants. (Any two)
2. Soil is used in construction for building foundations and making bricks.
3. Clay.
4. Bowls, pots. (Any one)
5. Potters bake clay after moulding it to harden it and create durable items.
6. Earthworms, insects, microorganisms. (Any two). Also accept any other relevant answers such as termites, grubs among others.

Unit revision exercises

Multiple choice answers

1. B
2. B
3. A
4. B

5. B
6. B
7. B
8. B
9. C
10. B

Structured questions answers

1. Providing a foundation for growing crops, providing nutrients for crops, retaining water for plants. (Any two)
2. Clay from the soil is shaped into various forms (for example, bowls, pots) and then fired in a kiln to harden and create durable items.
3. Soil is used to build foundations for structures and is mixed with water to create mud bricks for houses and other buildings.
4. Clay
5. nutrients
6. Earthworm, ants, termites, millipedes, centipedes, crickets, scorpions and beetles. (Any one)
7. bricks
8. Adding fertiliser
9. home

Unit 16: Water conservation methods

Unit objectives

By the end of this unit, learners should be able to:

a. identify water conservation methods.
b. explain the importance of water conservation.
c. demonstrate responsible water usage.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 106-112.
- Science and Technology Grade 3-7 syllabus.
- Buckets, water, apparatus, digital tools, tap, dish.

Teaching notes

- Water conservation is the practice of using water efficiently to reduce unnecessary water usage and ensure its availability for future generations.

- Household water conservation methods include checking for leaks, installing water-saving shower heads, taking shorter showers, turning off water while brushing teeth, using plastic bottles in toilet tanks and recycling greywater.
- Outdoor water conservation methods include using native/drought-tolerant plants, grouping plants by water needs, mulching, installing rain barrels, watering in the morning or evening, using soil moisture meters, covering pools, sweeping driveways and planting trees.
- Importance of water conservation: sustains life, reduces energy use, protects the environment, lowers water bills and ensures a sustainable future.
- Responsible water usage involves using water only when needed, educating others, reporting/repairing leaks, tracking usage with digital tools and practising water-saving habits daily.

Activities guidelines

Activity 16.1

Water audit and presentation: Identifying water waste – Instruct learners to conduct a "water audit" at home or at school (if applicable to a specific area like school bathrooms, drinking fountains). They should identify areas where water is wasted. After collecting data, they should present their findings to the class and suggest specific ways to improve water conservation in those identified areas.

Activity 16.2

Group discussion: Preventing water wastage – In groups, instruct learners to discuss different ways people waste water both at home and outdoors. Following this, they should suggest concrete solutions to prevent each identified type of water wastage.

Activity 16.3

Pair demonstration: Saving water practices – In pairs, learners should demonstrate practical ways of saving water when performing daily tasks, such as using a tap, washing dishes or watering plants. This could involve showing how to turn off the tap while scrubbing, using a basin for washing or using a watering can instead of a hose.

Suggested answers

Exercise 16.1

1. Water conservation is the practice of using water efficiently to reduce unnecessary water usage and ensure its availability for future generations.
2. Check for leaks, install water-saving shower heads, take shorter showers, turn off water while brushing teeth, use a plastic bottle in toilet tank, recycle greywater. (Any two)
3. Sustains life, reduces energy use, protects the environment, lowers water bills, ensures a sustainable future. (Any two)

4. Fixing leaking taps is important because it reduces unnecessary water wastage, which helps in conserving water and lowering water bills.
5. False
6. True

Exercise 16.2

Water conservation Method	description
Rainwater harvesting	Collecting and storing rainwater for future use.
Drip irrigation	Watering plants with small amounts of water directly to roots.
Fixing leaks	Preventing water loss from broken pipes or taps.
Turning off taps	Avoiding water wastage while brushing teeth.
Watering plants in the evening	Reducing water loss due to evaporation.
Using a bucket to wash a car	Saving water instead of using a running hose.

Unit revision exercises

Multiple choice answers

1. B
2. B
3. C
4. C
5. B
6. B
7. C
8. B
9. A
10. B

Structured questions answers

1. Water conservation is the practice of using water efficiently to reduce unnecessary water usage and ensure its availability for future generations.
2. Checking for leaks, taking shorter showers, turning off water while brushing teeth, using plastic bottles in toilet tanks, recycling greywater. (Any three)
3. Watering in the morning or evening (to reduce evaporation), using native plants that need less water, grouping plants by water needs, using drought-tolerant grasses, mulching around plants, installing a rain barrel, using a soil moisture metre, covering pools. (Any two)
4. The process of pumping, transporting and treating water consumes significant energy; by conserving water, we reduce this demand, leading to lower electricity use and fewer carbon emissions.
5. Leaks should be fixed quickly to prevent unnecessary water wastage, which helps in water conservation and reduces water bills.

6. Rainwater harvesting is the practice of collecting and storing rainwater, typically from rooftops, for future use.
7. Water conservation helps nature by protecting the environment, preventing pollution, reducing overuse of natural water sources, mitigating water scarcity and preserving wetland habitats and biodiversity. (Any one)

Unit 17: Commercial land use

Unit objectives

By the end of this unit, learners should be able to:

a. define commercial land use.
b. discuss types of commercial land use.
c. outline the importance of commercial land use.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, Page 113-118.
- Science and Technology Grade 3-7 syllabus.
- Digital tools, print media, ideal environment.

Teaching notes

- Commercial land use refers to land that is used for business activities, including spaces for trade, manufacturing, leisure and farming.
- Four types of commercial land use are retail, industrial, recreation and agriculture.
  - **Retail**: shops, supermarkets, malls (sell goods directly to consumers).
  - **Industrial**: factories, warehouses (manufacturing/processing goods, usually away from residential areas due to noise/pollution).
  - **Recreation**: parks, stadiums, museums (leisure activities).
  - **Agriculture**: farming, keeping livestock (for commercial purposes).
- Importance of commercial land use: provides goods/services, creates jobs, generates revenue, improves standard of living, encourages social interactions, promotes land planning, supports green spaces and sustainable agricultural practices.

Activities guidelines

Activity 17.1

Group discussion: Commercial land use and daily life Divide learners into groups. Instruct them to discuss what commercial land use is and how it affects their daily lives. They should share specific

examples of commercial land use observed in their own community (for example, local shops, factories, parks, farms).

Activity 17.2

Pair discussion: Importance of commercial land use In pairs, learners should describe the importance of commercial land use. Guide them to discuss how commercial land use contributes to the economic, social and environmental well-being of communities.

Suggested answers

Exercise 17.1

1. Commercial land use refers to land that is used for business activities, including spaces designated for trade, manufacturing, leisure and farming.
2. Shops, supermarkets, shopping malls, markets. (Any two)
3. Industrial areas are located away from residential zones due to noise and pollution concerns.
4. Agriculture
5. Industrial
6. Examples from the community such as local park, sports stadium, museum, cinema. (Any two)

Exercise 17.2

1. Scenario 1: New office complex in a suburban area
   - Creation of new jobs in construction, retail and office administration. **Economic**
   - Improved access to business services and professional opportunities for local residents. **Social**
   - Increased traffic and potential pollution from construction activities. **Environmental**
2. Scenario 2: Green housing development
   - Reduced carbon footprint and energy consumption due to eco-friendly building designs. **Environmental**
   - Job creation in construction and sustainable technologies. **Economic**
   - Increased public spaces for leisure and community engagement. **Social**
3. Scenario 3: Redevelopment of a derelict warehouse site
   - Boost in property values and local business opportunities. **Economic**
   - Better land use and environmental regeneration by removing abandoned structures. **Environmental**
   - Improved quality of life for residents through access to shops, restaurants and recreational spaces. **Social**
4. Scenario 4: Expansion of a local farmers' market
   - Enhanced social connections within the community as people gather at the market. **Social**
   - More sustainable food practices and reduced transportation emissions. **Environmental**
   - Support for local farmers and small businesses through increased sales opportunities. **Economic**

Unit revision exercises

Multiple choice answers

1. D
2. B
3. C
4. A
5. B
6. B
7. A
8. A
9. A
10. A

Structured questions answers

1. Commercial land use refers to land that is used for business activities, including spaces designated for trade, manufacturing, leisure and farming.
2. Retail land use is important for communities because it provides goods and services directly to consumers, making essential items accessible and supporting local economies.
3. Industrial areas are located away from residential areas due to noise and pollution concerns and they often require large spaces. (Any two)
4. Retail: Shops, supermarkets, shopping malls. (Any one) Industrial: Factories, warehouses. (Any one) Recreational: Parks, sports stadiums, museums, entertainment facilities such as cinemas. (Any one)
5. Recreational land use improves people's lives by providing leisure activities that promote physical and mental well-being and encourage social interaction.
6. Economic, social, environmental.
7. Encourages proper land planning and zoning, supports green spaces, promotes sustainable agricultural practices. (Any two)
8. Proper land use planning is important for sustainable development because it helps balance current needs with future resource availability, reduces conflicts and ensures environmental protection. (Accept any relevant answer.)

Unit 18: Conservation of natural resources

Unit objectives

By the end of this unit, learners should be able to:

a. define natural resources.
b. identify types of natural resources.
c. explain types of natural resources.
d. describe the conservation strategies.
e. discuss the importance of conserving natural resources.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 119-124.
- Science and Technology Grade 3-7 syllabus.
- Local environment, digital tools, print media.

Teaching notes

- Natural resources are materials and substances found in nature that people use for survival and economic purposes.
- Two types of natural resources:
  - **Renewable resources**: naturally replenished over time (for example, water, forests, wind, sunlight).
  - **Non-renewable resources**: finite and cannot be replaced once used up (for example, minerals, coal, oil, natural gas).
- Conservation strategies include afforestation and reforestation, sustainable farming practices, water conservation and recycling/reusing materials.
- Importance of conserving natural resources: ensures availability for future generations, preserves biodiversity, reduces pollution, promotes sustainable development and builds economic resilience.

Activities guidelines

Activity 18.1

Group identification and classification: Local natural resources – Divide learners into groups. Instruct them to identify natural resources found in their local environment (for example, water in a stream, trees in a park, rocks). They should then discuss whether each identified resource is renewable or non-renewable. Finally, each group should present their findings to the class.

Activity 18.2

Group discussion and poster creation: Conservation strategies – In groups, instruct learners to discuss different ways people can conserve land and water. After their discussion, they should create a poster promoting various conservation strategies (for example, afforestation, sustainable farming, water conservation, recycling). Each group should then share their posters with the class.

Activity 18.3

Class dis cussion and paragraph writing: Importance of conservation – Lead a class discussion on the consequences of overusing natural resources. Guide learners to suggest various ways communities can protect natural resources. As a culminating activity, instruct learners to write a short paragraph explaining why conservation is necessary.

Suggested answers

Exercise 18.1

1. Natural resources are materials and substances found in nature that people use for survival and economic purposes.
2. Renewable resources can be naturally replenished over time, making them sustainable, while non-renewable resources are finite and cannot be replaced once used up.
3. Water, forests, wind, sunlight. (Any three)
4. Minerals (for example, iron, copper, gold), coal, oil, natural gas. (Any three)
5. Natural resources are important because they are essential for human survival (food, water), provide raw materials for industries and support economic purposes. (Accept any relevant answer.)

Exercise 18.2

1. Conservation is the careful management and protection of natural resources to prevent waste and destruction.
2. Afforestation is planting trees in areas where there were no previous forests.
3. Reforestation is planting trees in areas where forests were cut down.
4. Crop rotation, organic fertilisers, contour ploughing. (Any two)
5. Reducing waste, fixing leaks, harvesting rainwater. (Any one)
6. Recycling helps conserve resources by repurposing materials, thereby conserving raw materials and minimising environmental pollution.

Exercise 18.3

1. False
2. True
3. True
4. False
5. False
6. True

Unit revision exercises

Multiple choice answers

1. B
2. B
3. C
4. B

5. C
6. B
7. A
8. A
9. B
10. B

Structured questions answers

1. Natural resources are materials and substances found in nature that people use for survival and economic purposes.
2. **(a)** Water, forests, wind, sunlight. (Any one)
   (b) It can be naturally replenished over time through natural processes (for example, water cycle for water, regeneration for forests, atmospheric conditions for wind/sunlight).
3. **(a)** Minerals, coal, oil, natural gas. (Any one)
   (b) Non-renewable resources are finite meaning once they are extracted and consumed, they cannot be replenished on a human timescale.
4. The importance of conservation is to ensure the availability of resources for future generations, preserve biodiversity, reduce pollution, promote sustainable development and build economic resilience. (Any one)
5. Forests/land.
6. Reduces waste, conserves raw materials, minimises environmental pollution. (Any one)
7. Reducing waste, fixing leaks, harvesting rainwater. (Any one)
8. forests

Topic 5

Tools, equipment and implements

Unit 19: Uses of tools and safety

Unit objectives

By the end of this unit, learners should be able to:

a. identify the uses of tools.
b. explain safe handling of tools.
c. demonstrate safe handling of tools.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 125-132.
- Science and Technology Grade 3-7 syllabus.
- Locally available tools, digital tools, tool manuals, print media.

Teaching notes

- Tools are items used to do work or tasks in various settings, including cooking and food preparation and gardening and landscaping.
- Examples of cooking tools and their uses: knives (cutting), wooden spoons (stirring), sieve (straining), mortar and pestle (grinding), winnowing basket (separating grain from chaff).
- Examples of garden and landscaping tools and their uses: hoe (digging), pick (digging hard soils), garden fork (loosening soil), knapsack sprayer (applying chemicals), slasher (cutting long grass), sickle (cutting grass/harvesting).
- Safe handling of tools is crucial to prevent accidents and injuries.
- General safety practices include: keeping tools in good condition, using the correct tool for the task, examining tools for damage, operating tools according to instructions, wearing protective clothing, not playing with tools, storing tools properly and removing neckties when working.

Activities guidelines

Activity 19.1

Pair discussion and demonstration: Food preparation tools – In pairs, instruct learners to discuss the different types of tools used in food preparation and their specific functions (for example, knife for cutting, sieve for straining). Then, guide them to demonstrate how to safely use a mortar and pestle, a sieve and a wooden spoon.

Activity 19.2

Identification and demonstration: Garden and landscaping tools – Instruct learners to identify various garden tools (for example, hoe, rake, shovel) and explain their uses. Then, guide them to show the correct way to hold and use a garden fork and a hand trowel, emphasising proper posture and grip.

Activity 19.3

Practical demonstration and identification: Safe tool handling – Organise a practical session where learners practise safe tool handling. Under the supervision of an adult, learners should practise holding and using a garden tool safely. Instruct them to demonstrate the correct way to store kitchen and garden tools after use (for example, putting knives in a block, hanging garden tools on a rack). Finally, have them identify different types of protective gear (for example, gloves, safety glasses) used when handling various tools.

Suggested answers

Exercise 19.1

1. Knife
2. sifting, straining
3. Beating
4. winnowing basket
5. A mortar and pestle are used for grinding spices, herbs and grains.
6. A measuring cup is used for accurately measuring liquids and dry ingredients.
7. Pot
8. A colander is used for draining liquids from food, such as pasta or vegetables.
9. Mixing bowls

Exercise 19.2

1. digging
2. leaves
3. Slasher, sickle.

4. Digging or loosening the soil, turning the soil, cultivating, mixing compost or manure into the soil and harvesting root crops. (Any one)
5. Wheelbarrow.
6. A prunning shear is used for trimming plants, hedges, shrubs and small branches.
7. Watering can.
8. A hose pipe is used for watering the garden.
9. Gardening tools make planting, prunning and watering easier and more efficient. They promote healthy plant growth, improve soil, enhance outdoor spaces, save time, ensure safety and support sustainable gardening. (Any one)

Exercise 19.3

1. Damaged
2. Work suits, safety shoes, gumboots, gloves, masks, goggles. (Any two)
3. accidents
4. rack
5. False
6. gardening
7. True
8. False
9. cupboard

Unit revision exercises

Multiple choice answers

1. B
2. A
3. C
4. B
5. B
6. B
7. B
8. B
9. B
10. C

Structured questions answers

1. It is important to use tools for their intended purpose to prevent accidents and injury and to ensure the tool is used correctly without damage.
2. **(a)** Knives, wooden spoons, sieve, mortar and pestle, winnowing basket, pot, mixing bowls, measuring cups and spoons, colander, whisk. (Any two)
   (b) Knives: cutting, chopping, slicing. Wooden spoons: stirring hot foods. Sieve: straining liquids or sifting flour. Mortar and pestle: grinding spices, herbs, grains. Winnowing basket: separating grain from chaff. Pot: cooking stews, soups. Mixing bowls: combining ingredients. Measuring cups/spoons: measuring ingredients. Colander: draining liquids. Whisk: beating eggs, sauces. (Functions for the chosen tools)

3 **(a)** Hoe, pick, garden fork, hand fork, knapsack sprayer, slasher, sickle, watering can, bucket, hose pipe, shovel, wheelbarrow, hand trowel, rake, pruning shears. (Any two)

(b) Hoe: shallow digging, weeding. Pick: digging trenches, hard soils. Garden fork: digging/loosening soil. Knapsack sprayer: applying chemicals. Slasher: cutting long grass. Sickle: cutting grass/harvesting cereals. Watering can: watering seedbeds. Bucket: carrying water/manure. Hose pipe: watering garden. Shovel: digging/moving soil. Wheelbarrow: transporting soil/plants. Hand trowel: small-scale planting. Rake: gathering leaves. Pruning shears: trimming plants. (Functions for the chosen tools)

4 Keep all tools in good condition with regular maintenance; wash tools after use; examine each tool for damage before use; operate tools according to manufacturers' instructions; wear protective clothing; do not play with tools; keep tools in the storeroom when not in use; remove necktie when working. (Any one)

Unit 20: Measuring tools

Unit objectives

By the end of this unit, learners should be able to:

a identify the tools used for measuring temperature and mass.
b measure temperature and mass.
c record findings accurately.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 133-137.
- Science and Technology Grade 3-7 syllabus.
- Thermometer, balance, water, grains, fruits, vegetables.

Teaching notes

- Temperature is the degree of heat present in a substance or object, measured using a thermometer in degrees Celsius (°C).
- Types of thermometers: digital, mercury, alcohol-based.
- Mass is the amount of matter in an object, measured in kilograms (*kg*) using a balance.
- Types of balances: digital balances and beam balances.
- Accuracy is crucial for measuring tools, requiring careful handling and proper reading interpretation.

Activities guidelines

Activity 20.1

Observation, measurement and recording: Temperature – Provide learners with different types of thermometers (digital, mercury, alcohol-based). Instruct them to observe and identify these different types. Then, guide them to measure the temperature of water at different conditions (for example, cold tap water, room temperature water, warm water). Learners should accurately record their findings in a table.

Activity 20.2

Identification, weighing and recording: Mass – Provide learners with different types of balances (digital, beam). Instruct them to identify these different types. Then, guide them to weigh various objects, such as grains, fruits or vegetables, using a balance. Learners should accurately record the mass of each object in a table.

Suggested answers

Exercise 20.1

1. temperature
2. degrees Celsius
3. Digital, mercury, alcohol-based. (Any two)
4. digital
5. an accurate
6. False
7. True
8. False (Alcohol may evaporate over time).
9. Mercury thermometer

Exercise 20.2

1. Balance
2. kilograms
3. Digital balance, beam balance.
4. Beam
5. False
6. False
7. False
8. Digital balance
9. Laboratories, pharmacies, industries, schools, markets, farms. (Any one)

Unit revision exercises

Multiple choice answers

1. B
2. A
3. C
4. C
5. B
6. B
7. B
8. B
9. B
10. C

Structured questions answers

1. mass
2. **(a)** Digital thermometer, mercury thermometer, alcohol-based thermometer. (Any one)
   (b) It is used to measure temperature.
3. **(a)** Mass is the amount of matter in an object.
   (b) A balance.
4. False (The unit of temperature is degrees Celsius).
5. False (A beam balance does not require electricity).
6. False (Mercury is toxic if broken).
7. False (Alcohol-based thermometers may evaporate over time).

Unit 21: Digital devices

Unit objectives

By the end of this unit, learners should be able to:

a. name communication devices.
b. describe the function of communication devices.
c. group storage devices according to use.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 138-142.
- Science and Technology Grade 3-7 syllabus.
- ICT tools, smartphones, digital devices, print media.

Teaching notes

- Communication devices allow people to connect with others by sending and receiving information.
- Examples of communication devices: Smartphones (portable, calls, messages, internet, camera, GPS, multimedia storage) and Two-way radios/walkie-talkies (direct voice communication, useful without network coverage).
- Storage devices are used to save and retrieve data, keeping information for later use and preventing loss.
- Types of storage devices:
  - **Internal storage devices**: built inside devices (for example, internal hard drives in computers, solid-state drives (SSDs) in laptops/tablets).
  - **External storage devices**: separate and portable (for example, USB flash drives for quick transfers, memory cards in smartphones/cameras, external hard drives for large data amounts).

Activities guidelines

Activity 21.1

Identification, function and discussion: Communication devices Instruct learners to identify different types of communication devices (for example, smartphones, two-way radios) and state their functions. In groups, learners should discuss how smartphones, in particular, have changed the way people communicate in modern society.

Activity 21.2

Listing, grouping and discussion: Storage devices Instruct learners to list different types of storage devices (for example, internal hard drives, SSDs, USB flash drives, memory cards, external hard drives). They should then group these devices according to their use (internal vs. external). In pairs, learners should discuss why storage devices are important in daily life (for example, for saving work, photos, entertainment).

Suggested answers

Exercise 21.1

1. Two-way radio
2. calling, browsing
3. Smartphone
4. False
5. send, receive

Exercise 21.2

1. Save, retrieve.
2. The function of an external hard drive is to store large amounts of data and to be portable for use with multiple devices.
3. USB flash drive, memory card, external hard drive. (Any one)
4. storing data
5. Hard drive
6. inside
7. False (Memory cards are used in smartphones and cameras, not typically for internet access in computers).
8. False (Internal storage is built-in; external is removable).
9. Memory card

Unit revision exercises

Multiple choice answers

1. B
2. C
3. C
4. B
5. D
6. A
7. D
8. C
9. B
10. C

Structured questions answers

1. Send and receive information.
2. Smartphone, two-way radio.
3. A storage device is a tool used for saving and retrieving digital data.
4. external.
5. Internal storage devices.
6. USB flash drive.
7. External hard drive.

Unit 22: Digital tools

Unit objectives

By the end of this unit, learners should be able to:

a. create a flyer promoting a school event.
b. design a certificate of excellence.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 143-154.
- Science and Technology Grade 3-7 syllabus.
- Microsoft publisher, Adobe Indesign, computers.

Teaching notes

- A flyer is a promotional document designed to advertise an event, service or product containing key information and attractive visuals.
- Microsoft Publisher and Adobe InDesign are commonly used to create flyers.
- Steps to create a flyer: open Publisher, select flyer template, replace info, insert images, arrange text/images, experiment with fonts, check for errors, save as PDF.
- Certificates are used to recognise achievements, participation or excellence, including recipient's name, award details and official signature.
- Steps to design a certificate: open Publisher, select award certificate template, enter details, modify design (colours/fonts), insert logos, save/print.
- Typography, graphics and alignment improve document appearance.

Activities guidelines

Activity 22.1

Practical creation: School event flyer – Provide learners with access to Microsoft Publisher (or similar desktop publishing software). Instruct them to create their own flyer promoting a school event of their choice (for example, sports day, school play, science fair). They should follow the steps outlined in the learner's book, including choosing a template, replacing information, inserting images and ensuring proper alignment and typography.

Activity 22.2

Practical design: Certificate of excellence – Using Microsoft Publisher (or similar software), instruct learners to select a certificate template. They should then design a "Certificate of Excellence" for another learner in the class, including the recipient's name and relevant award details. Guide them to modify the text, colours and images to enhance the certificate's appearance.

Suggested answers

Exercise 22.1

1. advertising
2. Microsoft Publisher
3. text and images
4. False (Flyers should contain key info and attractive visuals, not necessarily a lot of text).
5. Event name, date, time, venue, contact information. (Any two)

Exercise 22.2

1. recognition
2. Microsoft Publisher
3. Recipient's name, achievement details, an official signature.
4. a recipient's name.
5. text and colours
6. A template provides a pre-designed layout, which helps create documents quickly and easily.

Unit revision exercises

Multiple choice answers

1. B
2. C
3. A
4. A
5. A
6. A
7. A
8. A
9. C
10. A

Structured questions answers

1. Microsoft Publisher, Adobe InDesign
2. advertising
3. Event name, Date, Time, Venue, Contact information. (Any two)
4. Certificates are used to recognise achievements, participation or excellence.
5. Recipient's name, achievement details, official signature. (Any two)
6. False
7. True

Unit 23: Career opportunities

Unit objectives

By the end of this unit, learners should be able to:

a. state career opportunities in ICT.
b. describe the roles of ICT personnel.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 155-159.
- Science and Technology Grade 3-7 syllabus.
- Print and electronic media, resource person.

Teaching notes

- ICT offers various career opportunities, including Desktop Publisher, Document Designer, Web Publisher and Print Designer.
- **Desktop publisher**: Uses software (for example, Microsoft Publisher, Adobe InDesign) to design and format printed materials like magazines, books and brochures, ensuring visual appeal.
- **Document designer**: Structures and formats reports, presentations and official documents using software (for example, Microsoft Word, PowerPoint) to enhance readability and appearance.
- **Web publisher**: Creates and manages online content (text, images, audio, video) for websites and blogs using publishing software (for example, WordPress, Joomla), ensuring accessibility and visual appeal.
- **Print designer**: Creates visual content for printed materials (for example, advertisements, posters, business cards, packaging) using software (for example, Adobe Illustrator, Photoshop), combining colours, fonts and images.

Activities guidelines

Activity 23.1

Group discussion: Roles of ICT careers – Divide learners into groups. Instruct them to discuss the specific roles and responsibilities of different ICT careers, including desktop publishers, document designers, web publishers and print designers.

Activity 23.2

Educational tour and report: ICT company visit – With the help of the teacher, organise an educational tour to an ICT company or a department that utilises these roles (for example, a publishing house, a web design firm, a school's IT department). During the tour, encourage learners

to ask questions to the resource persons about their jobs and to respond to any questions posed to them. After the tour, instruct learners to write a short report summarising what they learned about how different professionals work in ICT.

Suggested answers

Exercise 23.1

1. software
2. Reports, presentations, official documents. (Any one)
3. The main function of a print designer is to create visual content for printed materials such as advertisements, posters, business cards and packaging.
4. Advertisements, posters, business cards, packaging. (Any one)
5. Adobe Illustrator, Photoshop, Adobe InDesign. (Any one)
6. printed
7. Magazines, books, brochures, posters. (Any one)
8. False (They also work with text and layouts).
9. Text, images, audio, videos. (Any one)
10. False (It involves more than just text, including images, audio and video).

Unit revision exercises

Multiple choice answers

1. B
2. D
3. C
4. B
5. C
6. C
7. B
8. A
9. A
10. B

Structured questions answers

1. A career is a profession or occupation undertaken for a significant period of one's life.
2. **(a)** Web publishers: WordPress, Joomla, Adobe Dreamweaver. (Any one)

   (b) Desktop publishers: Microsoft Publisher, Adobe InDesign. (Any one)
3. A document designer is responsible for structuring and enhancing the layout and appearance of reports, presentations and official documents, ensuring they are well-structured and professionally formatted.

4. Web
5. Desktop publisher (Based on the image which shows a person working on a desktop publishing layout).
6. Print designer
7. Desktop Publisher
8. A desktop publisher primarily designs and formats printed materials like books and magazines, focusing on layout and visual appeal, while a print designer creates visual content for a wider range of printed materials like advertisements, posters and packaging, often combining colours, fonts and images. (Accept any relevant distinction from the text).
9. WordPress

Topic 6 Energy and fuels

Unit 24: Solar energy

Unit objectives

By the end of this unit, learners should be able to:

a. identify solar-powered gadgets.
b. explain the concept of solar energy.
c. describe the importance of solar energy.
d. identify safety precautions when using solar energy.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 160-165
- Science and Technology Grade 3-7 syllabus.
- Digital tools, print media, solar panel, local environment, solar gadgets

Teaching notes

- Solar energy is energy from the sun that can be converted into electricity and it is a renewable source of clean energy.
- Solar panels capture sunlight using photovoltaic cells and convert it into electricity to power devices.
- Solar-powered gadgets include solar space heaters, solar water heaters (geysers), solar dryers, solar lamps, solar calculators, solar mobile phone chargers and solar fans.
- Importance of solar energy: renewable, eco-friendly (fewer emissions), cost-effective (reduces electricity bills), accessible in remote areas (without national grid) and reduces dependency on fossil fuels.
- Safety precautions: avoid touching exposed wires, install panels in safe/stable locations, keep gadgets dry/away from water, ensure only trained professionals handle repairs and do not look directly at the sun during installation.

Activities guidelines

Activity 24.1

Pair listing, observation and discussion: Solar-powered gadgets – In pairs, instruct learners to list different solar-powered gadgets they find in their home or community (for example, solar lamps, solar calculators, solar geysers). They should then observe how these solar-powered gadgets work (for example, how they absorb sunlight). Following their observations, they should discuss the benefits of using these gadgets. Finally, each pair should share their findings with the class.

Activity 24.2

Group discussion and paragraph writing: Importance of solar energy – Divide learners into groups. Instruct them to discuss how solar energy benefits communities (for example, providing electricity, reducing bills, being eco-friendly). As a follow-up, each group should write a short paragraph explaining how solar energy improves daily life in various aspects.

Activity 24.3

Group discussion and demonstration: Solar energy safety – In small groups, instruct learners to discuss the safety measures that should be followed when using solar-powered devices and solar panels. Guide them to demonstrate safe handling practices of solar-powered gadgets in class (for example, showing how to keep them dry, not touching exposed wires).

Suggested answers

Exercise 24.1

1. the sun
2. A solar space heater is designed to let in as much sunlight as possible to heat the walls and floor inside a house, trapping the heat inside.
3. A solar water heater uses sunlight to heat water and store it in a tank for bathing, dishwashing and washing clothes.
4. Solar dryers are instruments that heat air to a constant temperature with solar energy to extract humidity from agricultural products, improving drying efficiency and product quality.
5. It reduces home energy costs for heating water.
6. Solar lamps, solar-powered calculators, solar mobile phone chargers, solar fans. (Any two)
7. Solar panels absorb sunlight and convert it into electricity using photovoltaic cells.
8. They provide clean, renewable energy, reduce electricity bills and are accessible in remote areas. (Any one)
9. Renewable
10. Black

Exercise 24.2

1. It is a renewable source; it is eco-friendly (does not produce harmful emissions); it is cost-effective; it is accessible in remote areas; it reduces dependency on fossil fuels. (Any two)
2. renewable
3. Solar energy helps reduce pollution because it is eco-friendly and does not produce harmful emissions.
4. Solar energy is useful in remote areas because it can provide electricity to areas without a national grid.
5. After installation, solar panels reduce electricity bills.
6. Coal, oil, natural gas. (Any one)

Exercise 24.3

1. Solar panels should be installed in a safe, stable location to prevent accidents, theft and damage.
2. Exposed wires from solar panels.
3. Keep solar-powered gadgets dry and away from water; ensure only trained professionals handle repairs; do not look directly at the sun while setting up solar panels. (Any one)
4. It is dangerous to expose solar devices to water because they may get damaged and there is a risk of electrical hazards.
5. Only trained professionals.
6. dangerous

Unit revision exercises

Multiple choice answers

1. C
2. B
3. B
4. A
5. B
6. A
7. B
8. B
9. B
10. A

Structured questions answers

1. Solar energy is energy from the sun that can be converted into electricity and heat.
2. Solar lamps, solar-powered calculators, solar mobile phone chargers, solar fans, solar water heaters, solar dryers. (Any two)
3. Avoid touching exposed wires; install panels in a safe, stable location; keep solar-powered gadgets dry and away from water; ensure only trained professionals handle repairs; do not look directly at the sun. (Any two)

4. electricity
5. Renewable source; eco-friendly; cost-effective; accessible in remote areas; reduces dependency on fossil fuels. (Any one)
6. If a solar gadget stops working, it should be handled by trained professionals to ensure safety and proper repair.
7. Solar energy is useful in remote areas because it can provide electricity to places that do not have access to a national grid.
8. Using solar energy helps the environment by not producing harmful emissions, thus contributing to a cleaner environment and combating climate change.

Unit 25: Renewable and non-renewable fuels

Unit objectives

By the end of this unit, learners should be able to:

a. discuss renewable and non-renewable fuels.
b. explain the importance of fuel conservation.
c. state the advantages and disadvantages of renewable and non-renewable fuels.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 166-171.
- Science and Technology Grade 3-7 syllabus.
- Local environment, reource person, digital tools, print media.

Teaching notes

- **Renewable fuels**: replenished naturally over time (for example, solar, wind, hydropower, biomass, geothermal energy).
  - **Advantages**: environmentally friendly (fewer emissions), sustainable, combat climate change, reduce energy costs.
  - **Disadvantages**: higher initial costs, weather-dependent, may require large land areas, storage/distribution challenges.
- **Non-renewable fuels**: take millions of years to form and cannot be easily replaced (for example, coal, oil, natural gas).
  - **Advantages**: high energy output, quick/reliable, widely available.
  - **Disadvantages**: cause pollution, non-sustainable, depletion leads to shortages.
- **Fuel conservation**: essential for environmental protection, energy sustainability, reduced reliance on non-renewable sources, cost efficiency and a healthier environment.

Activities guidelines

Activity 25.1

Group discussion, identification and poster creation: Renewable fuels – Divide learners into groups. Instruct them to discuss different types of renewable fuels (solar, wind, hydropower, biomass, geothermal) and their uses. Guide them to identify which of these renewable fuels are commonly used in their community. As a creative output, each group should create a poster showcasing different types of renewable energy sources and highlighting their benefits.

Activity 25.2

Pair discussion and research presentation: Non-renewable fuels – In pairs, instruct learners to discuss the advantages and disadvantages of using non-renewable fuels. They should also research how fossil fuels are extracted and investigate the environmental impact of their use. Each pair should then present their findings to the class.

Activity 25.3

Class discussion, suggestion and drama: Fuel conservation – Lead a class discussion on indigenous beliefs in their community that promote fuel conservation. Encourage learners to suggest practical ways to reduce fuel consumption in daily life. As a creative activity, organise learners to create and perform a short drama illustrating the importance of conserving fuels.

Suggested answers

Exercise 25.1

1. Solar energy, wind energy, hydropower, biomass, geothermal energy. (Any two)
2. Solar energy
3. Wood, crop waste, animal dung. (Any two)
4. Wind energy is considered renewable because wind is an inexhaustible resource driven by atmospheric conditions and is naturally replenished.
5. Environmentally friendly (produce fewer emissions), sustainable, help combat climate change, reduce energy costs over time. (Any one)
6. moving water.

Exercise 25.2

1. A non-renewable fuel is a fuel/source of energy that cannot be replaced easily once used up.
2. Coal, oil, natural gas. (Any two)
3. Cause pollution, contribute to climate change, take many years to form (not sustainable), depletion leads to shortages. (Any two)

4. Provide high energy output, are a quick and reliable source of energy, are widely available and used for transportation, heating and electricity. (Any one)
5. Oil
6. Natural gas is preferred over coal for cooking because it is a clean-burning fossil fuel.

Exercise 25.3

1. Fuel conservation is important for environmental protection (reducing pollution/emissions), energy sustainability (ensuring future supply), reducing reliance on non-renewable sources, cost efficiency and creating a healthier environment. (Any relevant reason)
2. Using energy-efficient appliances, reducing unnecessary driving, using public transport, turning off lights/electronics when not in use, insulating homes. (Any two related to reducing consumption)
3. Using renewable energy sources (like solar and wind) helps the environment by producing fewer emissions and pollutants, thus combating climate change and creating a cleaner environment.
4. False (Conservation means using resources wisely).
5. True
6. True
7. False (Renewable fuels are naturally replenished and do not easily run out).

Unit revision exercises

Multiple choice answers

1. C
2. B
3. C
4. B
5. B
6. C
7. B
8. C
9. D
10. C

Structured questions answers

1. Renewable fuel is a fuel that can be replenished naturally over time.
2. Coal, oil, natural gas. (Any two)
3. Solar energy, wind energy, hydropower, biomass, geothermal energy. (Any two)

4. Environmentally friendly (fewer emissions), sustainable, help combat climate change, reduce energy costs over time. (Any one)
5. Solar energy is considered renewable because it comes from the sun, which is an abundant and inexhaustible natural source that does not deplete over time.
6. Conserving fuel helps the environment by reducing environmental damage, including air pollution and greenhouse gas emissions, which contribute to climate change and by creating a cleaner, healthier environment.
7. Cause pollution and contribute to climate change; take many years to form and are not sustainable; depletion over time can lead to energy shortages. (Any one)

Topic 7

Disaster risk management and resilience

Unit 26: Natural hazards

Unit objectives

By the end of this unit, learners should be able to:

a. identify natural hazards.
b. explain the effects of natural hazards.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 172-178.
- Science and Technology Grade 3-7 syllabus.
- Digital tools, print media, resource person.

Teaching notes

- Natural hazards are extreme events in nature that can cause harm to people, property and the environment.
- Examples include heatwaves, cyclones, earthquakes, floods, landslides and droughts.
  - **Heatwave**: prolonged high temperatures, causing dehydration, headaches and damage to vegetation.
  - **Drought**: prolonged low rainfall, leading to water shortages, starvation of livestock and deficiency diseases in humans.
  - **Floods**: excessive rainfall causing water bodies to overflow, damaging homes/infrastructure, risking lives, causing food/water shortages and spreading diseases.
  - **Cyclones**: powerful storms with strong winds and heavy rainfall, causing widespread destruction.
  - **Landslides**: movement of rocks/soil down slopes, burying homes/roads, causing loss of life.
  - **Earthquakes**: sudden shaking of ground due to earth's crust movement, causing buildings to collapse.
- Effects of natural hazards: loss of life, property damage, health issues (diseases, injuries), economic losses, displacement and environmental damage (soil erosion, biodiversity loss).

Activities guidelines

Activity 26.1

Group discussion: Types and causes of natural hazards – Divide learners into groups. Instruct them to discuss different types of natural hazards (for example, heatwave, cyclone, earthquake, flood, landslide, drought). Guide them to identify the causes of each type of natural hazard. Each group should then present their findings to the class.

Activity 26.2

Pair discussion: Effects of natural hazards – In pairs, learners should discuss the various effects of natural hazards on people, animals and the environment (for example, loss of life, property damage, health issues, economic losses, displacement, environmental damage).

Suggested answers

Exercise 26.1

1. A natural hazard is a threat posed by changes in environmental conditions that could be harmful to the environment and living organisms. A natural hazard is an extreme event that occurs in nature and can cause harm to people, property and the environment.
2. Heatwave, cyclone, earthquake, flood, landslide, drought. (Any one)
3. Earthquake
4. Flood
5. excessive heat
6. strong winds
7. Eline, Dineo, Idai. (Any one)
8. Landslide
9. False (Drought occurs when there is little or no rainfall).
10. True

Exercise 26.2

1. Cholera, typhoid, dysentery, bilharzia. (Any two)
2. Drought (due to lack of water), floods (damage crops), cyclones (destroy crops). (Any one)
3. Earthquakes can cause buildings and infrastructure to collapse, resulting in casualties and economic damage. They can also cause landslides.
4. Kwashiorkor, marasmus. (Any one)
5. False
6. True
7. True

8. A landslide can bury homes, roads and farmlands, causing loss of life and displacement.
9. When natural habitats are destroyed, biodiversity is lost or reduced.

Unit revision exercises

Multiple choice answers

1. C
2. D
3. C
4. C
5. C
6. C
7. D
8. B
9. B
10. A

Structured questions answers

1. Earthquake, flood, heatwave, cyclone, landslide. (Any one)
2. Drought
3. cyclone
4. Drought
5. True
6. True
7. True
8. Heatwaves can weaken the body, cause dehydration, trigger headaches and increase the risk of heatstroke and respiratory illnesses. Severe heatwaves can be fatal.
9. Kwashiorkor, marasmus. (Any one)

Unit 27: Safety and evacuations

Unit objectives

By the end of this unit, learners should be able to:

a. discuss safety measures.
b. state the importance of safety procedures.
c. describe evacuation procedures.
d. practise evacuation procedures.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 179-184
- Science and Technology Grade 3-7 syllabus.
- Digital tools, digital devices, print media, local environment, resource person

Teaching notes

- Safety measures are steps taken to prevent accidents and reduce risks.
- Important safety measures: keeping emergency exits clear, following safety signs, walking instead of running, avoiding hazardous materials, wearing safety gear and reporting unsafe conditions.
- An evacuation procedure is a planned process for safely moving people away from danger.
- Key components of evacuation: emergency exits (clearly marked routes), designated routes (paths to follow, avoiding lifts) and assembly points (safe gathering locations).
- Steps for effective evacuation: stay calm, listen to instructions, use emergency exits, follow designated routes, gather at assembly point and wait for further instructions.
- Regular practice of evacuation drills improves quick and efficient response during real emergencies.

Activities guidelines

Activity 27.1

Identification, discussion and observation: Safety measures and hazards – Instruct learners to identify safety measures observed at school, home and public places. In groups, they should discuss why safety procedures are important in daily life. As a practical exercise, learners can observe and record any safety hazards present in their environment.

Activity 27.2

Pair outline and observation: Evacuation procedures – In pairs, instruct learners to outline the steps involved in an evacuation procedure. They should then observe the nearest emergency exits in their school and describe their locations, noting any relevant signage.

Activity 27.3

Practical drill and group discussion: Practising evacuation – Organise and conduct an evacuation drill for the class, simulating an emergency scenario. After the drill, instruct learners to reflect on the experience individually. Then, in groups, they should discuss how the evacuation procedures can be improved based on their observations and experiences during the drill.

Suggested answers

Exercise 27.1

1. Safety measures are steps taken to prevent accidents and reduce risks in different environments.
2. Walking instead of running in hallways; avoiding hazardous materials; wearing appropriate safety gear; reporting unsafe conditions. (Any two)

3. It is important to keep emergency exits clear at all times to ensure quick and safe escape during emergencies.
4. decrease
5. safety
6. Any safety sign seen and its meaning for example, “High Voltage” – warns that an area or equipment has dangerous electrical current that could cause shock. “Wet Floor” – indicates a slipping hazard and warns people to walk carefully to avoid falling. “Exit” – shows the way out of a building, especially in case of an emergency. “Skull and Crossbones” – indicates danger due to poisonous or toxic substances; warns people to avoid contact or ingestion to prevent serious harm or death.
7. False (Safety procedures are necessary everywhere, including school, home and public places).
8. Gloves, masks, goggles. (Any one)
9. Report unsafe conditions immediately to a teacher, supervisor or responsible authority.
10. False

Exercise 27.2

1. An evacuation procedure is a planned process of safely moving people away from danger.
2. It is important to follow a designated evacuation route to ensure a safe, orderly and efficient exit, avoiding hazards and confusion.
3. The purpose of an assembly point is to provide a safe location where people can gather after evacuating, ensuring everyone is accounted for and to receive further instructions.
4. calm
5. Running in different directions.
6. Emergency exits should always be clear of obstacles to ensure quick and safe escape during emergencies, preventing blockages that could endanger people.
7. Wait for further instructions from authorities or safety personnel.
8. Fire, earthquake, flood, chemical spill, bomb threat. (Any one)
9. False (Avoid using lifts during an emergency).
10. Green emergency exit sign with an arrow and running figure.

Unit revision exercises

Multiple choice answers

1. B
2. B
3. B
4. A
5. B
6. B
7. B
8. A
9. B
10. B

Structured questions answers

1. Safety is the condition of being protected from harm or danger.
2. Keeping emergency exits clear, following safety signs, walking instead of running in hallways, avoiding hazardous materials, wearing safety gear, reporting unsafe conditions. (Any two)
3. Emergency exits should be kept clear to ensure quick and safe escape during emergencies, preventing blockages that could endanger people.
4. The purpose of an evacuation procedure is to safely move people away from danger.
5. Evacuation drills are necessary because they help people respond quickly and efficiently during real emergencies, allow them to understand procedures and identify any issues in the plan. (Any one)
6. False
7. Assembly point.
8. It is important to follow safety signs because they provide instructions and warnings that help prevent accidents and ensure protection from harm or danger.
9. Wait for further instructions from authorities or safety personnel.

Unit 28: Emergency professionals

Unit objectives

By the end of this unit, learners should be able to:

a. list emergency responders.
b. discuss their roles in keeping the community safe.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 185-190.
- Science and Technology Grade 3-7 syllabus.
- Digital tools, toy helmets, badges.

Teaching notes

- Emergency professionals work to protect people, property and the environment from harm by responding quickly to dangerous situations.
- Key emergency responders and their roles:
  - **Civil Protection Unit (CPU):** Rescues flood victims, provides food/shelter, conducts disaster preparedness workshops and aids drought victims.
  - **Police officers**: Maintain law and order, control crowds, investigate crimes, assist in road accidents (direct traffic, call for medical help).

- **Firefighters**: Extinguish fires, rescue people from burning buildings, conduct fire safety drills, assist in highway accidents and provide aid during floods.
- **Health personnel (paramedics, doctors)**: Provide first aid/emergency care, treat injured, lead vaccination campaigns and educate on health/safety.
- **Traditional leaders**: Resolve conflicts, organise food donations for disaster victims and work with agencies to implement safety measures.

- Overall roles of emergency professionals: rescuing, providing first aid/medical care, maintaining peace, educating on safety and working together.

Activities guidelines

Activity 28.1

Group discussion and story sharing: Roles of emergency responders – Divide learners into groups. Instruct them to discuss the roles of different emergency responders (for example, Civil Protection Unit, police officers, firefighters, health personnel, traditional leaders). Encourage learners to share stories of real-life situations where these emergency responders helped people.

Activity 28.2

Educational tour and report: Local emergency responders – The facilitator organises an educational tour to local emergency responders (for example, fire station, police station, clinic). During the tour, learners should ask questions to learn about their jobs and observe demonstrations of how they use their equipment. Instruct learners to take notes on how different professionals respond to emergencies. After the tour, they should write a short report on what they learned.

Suggested answers

Exercise 28.1

1. Firefighter
2. floods and disasters
3. Paramedics, doctors, nurses. (Any two)
4. Traditional leaders resolve conflicts, organise food donations for families affected by disasters and work with government agencies to implement safety measures.
5. False (Police officers work outside stations, for example, at accident scenes).
6. Fires, highway accidents, floods. (Any two)
7. water, food.

Exercise 28.2

1. Hospitals, clinics.
2. Food
3. Maintain law and order, control crowds, investigate crimes, assist in emergencies (for example, road accidents). (Any two)

4. False (Traditional leaders also help during emergencies).
5. Police officer, firefighter, paramedic, doctor, nurse. (Any one)
6. Fire safety education is important because it teaches people how to prevent fires and how to act during a fire emergency, which helps save lives and properties.
7. Civil Protection Unit (CPU).
8. False (Police officers assist in various situations, including road accidents and national events).

Unit revision exercises

Multiple choice answers

1. B
2. B
3. C
4. B
5. B
6. C
7. A
8. C
9. C
10. C

Structured questions answers

1. The role of a police officer is to maintain law and order, control crowds during national events, investigate crimes and assist in emergencies like road accidents.
2. **(a)** Paramedic, doctor, nurse. (Any one)
   (b) They provide critical medical assistance, including first aid and emergency care, treat injured people at hospitals and clinics and lead vaccination campaigns.
3. **(a)** The Civil Protection Unit responds to disasters by rescuing families during floods, providing food, setting up temporary shelters for flood victims and conducting disaster preparedness workshops.
   (b) It is important because it helps save lives, reduce disaster impact and provide essential support to affected communities.
4. True
5. Food, shelter.
6. safety, order.
7. Resolving conflicts, organising food donations for disaster victims and working with government agencies to implement safety measures. (Any one)
8. Emergencies.

Unit 29: Psycho-emotional support

Unit objectives

By the end of this unit, learners should be able to:

a. explain what psychosocial support entails.
b. outline the impact of hazards.
c. identify the needs of victims.
d. classify the types of psychosocial support needed.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 191-199.
- Science and Technology Grade 3-7 syllabus.
- Fisrt Aid kit, videos, digital tools, drawing and painting materials.

Teaching notes

- Psychosocial support helps people cope with sadness, worry or stress from difficult situations by providing care and encouragement.
- Support can include talking to counsellors, sharing feelings with groups, engaging in relaxing activities and getting support from trusted adults.
- Man-made hazards (for example, war, accidents, pollution, factory disasters) cause emotional distress, loss of homes/jobs, health problems and displacement.
- Hazard victims have needs in emotional well-being, mental health, social support and physical rehabilitation.
- Service provision to affected people occurs in stages: immediate response (first aid, emergency shelter), medium-term support (counselling, therapy) and long-term rehabilitation (learning new skills, reintegration).
- Resilience is the ability to recover from difficulties and adapt positively.

Activities guidelines

Activity 29.1

Pair discussion: Personal experiences with emotional support – In pairs, instruct learners to discuss a time when they personally felt sad or worried. They should identify who helped them feel better and describe what that person did to support them emotionally.

Activity 29.2

Video observation and class discussion: Disaster effects and support needs – As a class, watch a short video on the effects of disasters on people's emotions. Following the video, facilitate a class discussion where learners share their feelings about what they observed. Guide them to consider and discuss what sort of help the people in the video might need.

Activity 29.3

Group role-play: Supporting fire victims – Divide learners into groups. Instruct them to role-play a scenario where they are volunteers helping people after a fire. They should discuss and then enact what they would do and say to make the fire victims feel safe and cared for, addressing their emotional needs.

Activity 29.4

Individual reflection and creative expression: Helping others – Instruct learners to think about a time when they helped someone, even in a small way. They should reflect on what they did to help that person feel better or safer. Guide them to consider which stage of service provision (immediate, medium-term, long-term) their help falls under. As a creative expression, learners can write a few sentences or draw a picture illustrating how they helped.

Suggested answers

Exercise 29.1

1

Psychosocial support	Example
(a) Talking to a counsellor.	Speaking to someone trained to help with emotions.
(b) Group support.	Sharing feelings with classmates after a difficult experience.
(c) Fun activities.	Playing games and telling stories to feel better.
(d) Trusted adults.	Getting advice from a teacher when feeling upset.

2 Listen to them without judgment, offer comfort, suggest talking to a trusted adult, engage them in a fun activity. (Any one)

3 Psychosocial support is help given to people who feel sad, worried or stressed because of difficult situations such as care and encouragement to feel better and regain confidence.

4 counselling, therapy.

5 After experiencing a disaster for example, flood, fire, earthquake or in situations causing stress, worry or sadness. (Any relevant situation)

6 Counsellors, therapists, teachers, community leaders, trusted adults, medical health personnel. (Any relevant professional/person)

7. Psychosocial support is important after a disaster because it helps victims cope with trauma, emotional distress and regain their confidence, enabling them to recover and return to normal lives.

Exercise 29.2

1.

Man-made hazard	Effect
(a) Pollution	People get sick from dirty air and water.
(b) War	Buildings and homes are destroyed and families must move.
(c) Factory accident	Workers lose their jobs because the workplace is damaged.
(d) Road accident	People are injured or lose their lives due to unsafe driving.

2. War, road accidents, pollution, factory disasters. (Any two)
3. Emotional distress such as fear, sadness, worry. (Any one)
4. Provide emotional support such as counselling, comfort; offer practical help such as food, shelter, medical care; help with reintegration into community. (Any relevant answer)

Exercise 29.3

1. Emotional well-being, mental health, social support, physical rehabilitation. (Any two)
2. well-being
3. mental
4. social
5. physical
6. Provide comfort/encouragement, offer medical care for injuries, help find safe shelter, offer social support, suggest talking to a counsellor. (Any two relevant actions)
7. False
8. True

Exercise 29.4

1.

Type of service	Example
(a) Immediate response.	Giving someone a bandage for a small cut.
(b) Medium-term support.	Talking to a counsellor about how you feel after a disaster.
(c) Long-term rehabilitation.	Learning new skills to return to work or school.

2. immediately
3. in the long term
4. counselling

5. First Aid is an important service for disaster victims because it provides immediate treatment for injuries, which can be critical for saving lives and preventing further harm.
6. Health personnel (paramedics, doctors), Civil Protection Unit, counsellors, therapists. (Any one)

Unit revision exercises

Multiple choice answers

1. B
2. B
3. D
4. C
5. C
6. A
7. B
8. B
9. C
10. B

Structured questions answers

1. War, accidents, pollution, factory disasters. (Any two)
2. Emotional distress (scared, sad, worried), loss of homes/jobs, health problems, displacement. (Any two)
3. Medium-term
4. resilience
5. False
6. False
7. False
8. Counselling is important for disaster victims because it helps them manage their emotions, process trauma and develop coping strategies to recover from distressing experiences.

Unit 30: Emotional resilience (Psycho-emotional support after a disaster)

Unit objectives

By the end of this unit, learners should be able to:

a. identify sources of support when affected by a disaster.
b. explain the importance of emotional resilience.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 200-205.
- Science and Technology Grade 3-7 syllabus.
- Puppet idols, posters, music player.

Teaching notes

- Emotional resilience is the ability to adapt and recover from emotional distress.
- Sources of emotional support after a disaster include family, school (teachers, counsellors), community (friends, religious groups) and government (agencies providing psychological First Aid).
- Ways of coping with emotional trauma: talking about feelings, engaging in relaxation activities (deep breathing, singing, playing games), maintaining a routine, seeking professional help (counsellors, therapists) and expressing emotions through art or journaling.
- Importance of emotional resilience: helps adapt to change, manage stress effectively, stay positive, build strong relationships and improve mental/physical health.

Activities guidelines

Activity 30.1

Group identification and explanation: Sources of emotional support – Instruct learners to identify three distinct sources of emotional support (for example, family, school, community, government). In groups, they should then explain how each of these sources helps provide support during or after a disaster.

Activity 30.2

Group discussion: Managing emotions after disasters – In groups, instruct learners to discuss common emotions that might arise after experiencing disasters (for example, fear, sadness, stress, anxiety). Guide them to brainstorm and discuss various healthy ways these emotions can be managed (for example, talking, relaxation, routine, professional help).

Activity 30.3

Role-play and discussion: Emotional resilience in action – Organise role-play scenarios where characters experience and manage emotions like fear, stress and anxiety. During the role-play, emphasise characters actively seeking comfort and support from others. After the role-play, facilitate a discussion on the importance of seeking comfort and support from others when facing difficult situations.

Suggested answers

Exercise 30.1

1. Family, school, community, government. (Any two)
2. Teachers, counsellors, classmates.
3. Support system
4. Psychological First Aid, counselling services, emergency assistance. (Any two)
5. False
6. comfort, reassurance
7. Guidance, encouragement, structured routines to help cope with emotions. (Any relevant answer)

Exercise 30.2

1. Individuals
2. Counsellors, therapists. (Any one)
3. Talking about feelings, engaging in relaxation activities, maintaining a routine, seeking professional help, expressing emotions through art or journaling. (Any two)
4. Deep breathing, singing, playing calming games. (Any one)
5. False
6. True
7. Talking about feelings after a disaster can reduce stress and promote healing by allowing individuals to share their experiences and emotions.
8. stress, anxiety, sadness.

Exercise 30.3

1. Emotional resilience
2. Emotional resilience
3. Deep breathing
4. solutions
5. relationships
6. physical
7. feelings
8. with family
9. True
10. Use coping mechanisms like deep breathing; talking to someone about feelings; doing something enjoyable. (Any one)

Unit revision exercises

Multiple choice answers

1. A
2. B

3. A
4. B
5. B
6. B
7. B
8. C
9. D
10. C

Structured questions answers

1. Family, school, community, government.
2. Talking about feelings, engaging in relaxation activities, maintaining a routine, seeking professional help, expressing emotions through art or journaling. (Any two)
3. Counsellor, therapist. (Any one)
4. stress
5. True
6. True

Topic 8 Educational technology and innovation

Unit 31: Research and innovation

Unit objectives

By the end of this unit, learners should be able to:

a. identify search engines.
b. state the benefits of using search engines.
c. research using different search engines.
d. conduct effective research and innovation.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 206-212.
- Science and Technology Grade 3-7 syllabus.
- Digital tools, ICT tools, print media.

Teaching notes

- A search engine is a digital tool that helps users find information on the internet by typing keywords or phrases.
- Popular search engines: Google, Bing, Yahoo, DuckDuckGo.
- Benefits of search engines: quick access to information, wide range of topics, access to reliable sources, educational resources and promotion of innovation and creativity.
- Effective research steps: define topic, use keywords, evaluate sources, take notes, compare information.
- Tips for effective research: use specific keywords, check multiple sources, look for .gov/.edu/.org domains, avoid sources without author/date.
- Innovation is the creation of new ideas, methods or products, driven by gathering knowledge and creating new ideas based on research.

Activities guidelines

Activity 31.1

Practical exploration and pair discussion: Identifying search engines – Instruct learners to open a web browser on a computer or tablet. Guide them to type "search engines" into the search bar and identify at least three different search engines from the results. In pairs, learners should then discuss which search engine they find most useful and explain the reasons for their choice.

Activity 31.2

Research, comparison and discussion: Reliability of sources – Instruct learners to research a topic of interest (for example, "how bees make honey," "the history of rockets") using a search engine. They should identify at least three different sources (websites) from the search results. Then, they should compare the reliability of these sources, discussing what makes some sources more trustworthy than others. Finally, lead a class discussion on how search engines help in learning new things.

Activity 31.3

Practical research, comparison and verification discussion: Internet history – Instruct learners to research the history of the internet using at least two different search engines. They should compare the results obtained from each search engine and note any differences or unique information presented. Lead a class discussion on the importance of verifying information by comparing findings from multiple sources.

Suggested answers

Exercise 31.1

1. A search engine is a digital tool that helps users find information on the internet.
2. Google, Bing, Yahoo, DuckDuckGo. (Any three)
3. DuckDuckGo
4. find
5. True
6. False (Yahoo is a search engine and online platform, not for cooking).
7. Keywords or phrases.
8. Bing

Exercise 31.2

1. Quick access to information, availability of wide range of topics, they provide reliable sources of information, they provide educational resources, they promote innovation and creativity. (Any two)

2. Search engines offer academic materials such as articles, research papers, e-books and instructional videos, making it easier for learners, educators and learners to gain knowledge on different subjects.
3. seconds
4. False
5. False
6. Check for website domains ending in .gov, .edu or .org; look for sources that list the author or date of publication. (Any one)
7. Articles, research papers, e-books, instructional videos. (Any two)
8. Search engines promote innovation by providing access to new ideas, industry trends and diverse perspectives, which helps individuals and businesses develop innovative solutions, enhance productivity and create unique content.

Exercise 31.3

1. Define your topic.
2. It is important to use keywords when searching to narrow search results and find specific, relevant information.
3. Websites with domains ending in .gov, .edu or .org. (Any two)
4. False
5. False
6. False
7. You should compare information from different sources to ensure the accuracy and reliability of the information.

Unit revision exercises

Multiple choice answers

1. B
2. B
3. B
4. C
5. C
6. B
7. C
8. A
9. C
10. B

Structured questions answers

1. A search engine is a digital tool that helps users find information on the internet.
2. Google, Bing, Yahoo, DuckDuckGo. (Any three)
3. Quick access to information, availability of wide range of topics, reliable sources of information, educational resources, promotion of innovation and creativity. (Any two)

4. It is important to verify sources when conducting research to ensure that the information obtained is accurate, trustworthy and up-to-date.
5. .gov, .edu, .org. (Any two)
6. By offering academic materials (articles, research papers, e-books, videos) and making it easier for learners and educators to gain knowledge on different subjects. (Any two)
7. Define your topic, use keywords, evaluate sources, take notes, compare information. (Any one)
8. Innovation is the creation of new ideas, methods or products.

Unit 32: Robotics and coding

Unit objectives

By the end of this unit, learners should be able to:

a. list the robotics design process.
b. describe the robotics design process.
c. design and develop games using scratch.
d. discuss careers in robotics.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 213-224.
- Science and Technology Grade 3-7 syllabus.
- Digital tools, robotics models, resource person.

Teaching notes

- Coding is the process of writing instructions (code) that a computer or robot can understand and follow to perform specific tasks.
- Key coding concepts:
  - **Algorithm**: a step-by-step set of instructions.
  - **Loops**: repeating a set of instructions multiple times.
  - **Conditional statements**: commands that allow a robot to make decisions based on situations.
  - **Debugging**: finding and fixing errors in a program.
- Robotics design process includes three steps: Planning, Building and Testing.
  - **Planning**: identifying problems and brainstorming solutions.
  - **Building**: creating a prototype using various materials.
  - **Testing**: checking if the robot functions as expected and debugging.
- Game development in Scratch involves creating characters (sprites), backgrounds (stages), actions controlled by coding blocks and user interactions (clicks/key presses).

- Careers in robotics: Research and Development (new ideas/inventions), Design and Engineering (building/improving robots), Robotics Engineer (combines hardware/software) and Software Developer (writing code for tasks).

Activities guidelines

Activity 32.1

Practical exploration: Simple game creation in scratch – Provide learners with access to the Scratch platform. Instruct them to explore the interface and create a simple game where a character (sprite) moves when clicked (or when a specific key is pressed), demonstrating basic coding blocks and user interaction.

Activity 32.2

Group discussion and drawing: Household robot design – Divide learners into groups. Instruct them to discuss how they would design a robot that could assist with household chores (for example, cleaning, organising). They should brainstorm ideas for its functions, appearance and movement. Following their discussion, each group should create a simple drawing or sketch of their robot design.

Activity 32.3

Practical game development: Catching objects in scratch – Guide learners through the process of creating a basic game in Scratch. The game should involve a player scoring points by catching objects (sprites) that appear on the screen, incorporating elements like character movement, object appearance and score tracking using coding blocks.

Activity 32.4

Research and presentation: Famous robotics engineers – Assign learners to research a famous robotics engineer (for example, Grace Hopper for programming, Alan Turing for theoretical computing or contemporary robotics pioneers). They should gather information on the engineer's contributions to the field of robotics. Learners will then present their findings to the class.

Suggested answers

Exercise 32.1

1. Coding is the process of writing instructions (code) that a computer or robot can understand and follow to perform specific tasks.
2. Scratch
3. The purpose of loops in coding is to tell the computer to repeat an action multiple times without writing the same instruction repeatedly.
4. Debugging is the process of finding and fixing errors (mistakes) in a program to ensure it runs correctly.
5. Conditional statements help a computer or robot make choices based on a situation, allowing them to react differently to various conditions.

Exercise 32.2

1. Planning, building, testing.
2. During the planning phase, we identify the problem the robot will solve, brainstorm different ideas for its design and features and choose the best solution.
3. Testing is an important part of the process to check if the robot works correctly, ensuring it functions as expected and allowing for debugging if something does not work.
4. A prototype is an early or rough version of a product or system, used for testing and improving before creating the final version.
5. Metal, plastic, wires, motors. (Any two)
6. A robot that helps doctors perform surgeries more accurately.

Exercise 32.3

1. stories
2. sprites
3. background
4. move
5. keyboard presses

Exercise 32.4

1.

Career	Description
(a) Research and development	Creates robots that help in healthcare and other fields.
(b) Design and engineering	Builds robots, designs their shape and chooses materials.
(c) Robotics engineer	Combines hardware and software to create functional robots.
(d) Software developer	Programs robots to perform specific tasks like navigation.

2.

Career	Example
(a) Research and development	Developing a robot to help doctors perform surgeries more accurately.
(b) Design and engineering	Building a robot to assemble cars in a factory.
(c) Robotics engineer	Working on a robot that picks up boxes in a warehouse and moves them.
(d) Software developer	Writing the code for a robot vacuum cleaner to navigate and clean a room.

Unit revision exercises

Multiple choice answers

1. B
2. D
3. B
4. C
5. B
6. B
7. B
8. B
9. B
10. B

Structured questions answers

1. robots
2. algorithm
3. Coding
4. debugging
5. Research and development, design and engineering, robotics engineer, software developer. (Any two)
6. planning
7. prototype
8. Repeat
9. sprite
10. Conditional
11. Planning, building, testing.
12. The role of a software developer in robotics is to write the code that makes robots perform specific tasks, such as recognising objects, making decisions and responding to their environment and to test this code.
13. Testing is important in the robotics design process to check if the robot works correctly.

Unit 33: Cyber security

Unit objectives

By the end of this unit, learners should be able to:

a. explain the dangers associated with using the internet.
b. suggest ways of ensuring cyber security.
c. design posters on cyber wellness.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 225-233.
- Science and Technology Grade 3-7 syllabus.
- Posters, digital devices, digital tools.

Teaching notes

- Cyber wellness refers to the responsible and safe use of the internet, involving understanding risks, protecting personal information and ethical online behaviour.
- Common online risks/dangers:
  - **Cyberbullying**: using digital platforms to harass or spread harmful content.
  - **Phishing scams**: fraudulent attempts to get sensitive information by pretending to be trustworthy.
  - **Identity theft**: stealing personal data to commit fraud.
  - **Malware attacks**: malicious software (viruses, spyware) designed to harm devices or steal data.
  - **Online predators**: individuals exploiting or harming others online, often targeting children/teenagers.
- Ways to ensure cyber security (best practices): create strong passwords, enable Two-Factor Authentication (2FA), avoid sharing personal details online, be cautious with unknown links, install/update antivirus software, think before posting, be aware of scams and log out of accounts.

Activities guidelines

Activity 33.1

Class and pair discussion: Internet dangers and safety – Lead a class discussion on the different dangers and risks associated with using the internet (for example, cyberbullying, phishing scams, malware). Following the class discussion, divide learners into pairs and instruct them to create a list of practical ways to stay safe online. Each pair should then present their findings to the class.

Activity 33.2

Group role-play: Safe and unsafe internet use – Divide learners into groups. Instruct each group to create and perform a short role-play scenario that demonstrates both safe and unsafe internet use practices. The role-plays should highlight the consequences of unsafe practices.

Activity 33.3

Poster design: Promoting cyber wellness – Provide learners with materials for poster design (for example, large paper, markers, coloured pencils). Instruct them to design posters that promote cyber wellness and highlight best internet practices (for example, strong passwords, thinking before posting, identifying scams). Once completed, the posters should be displayed around the classroom or school to raise awareness among peers.

Suggested answers

Exercise 33.1

1. stress
2. sensitive
3. social media
4. viruses, spyware, ransomware. (Any two)
5. False
6. True
7. True
8. False
9. False
10. Cyber wellness refers to the responsible and safe use of the internet, involving understanding the risks associated with online activities, protecting personal information and practising ethical behaviour in digital spaces.

Exercise 33.2

1. uppercase and lowercase letters, numbers.
2. log out
3. hover over it
4. https://
5. True
6. False
7. False
8. True
9. You should think before posting online because your old posts can be traced back to you like footprints and negative remarks or personal details could damage your reputation or compromise your privacy.

Unit revision exercises

Multiple choice answers

1. B
2. A
3. B
4. B
5. B
6. B
7. C
8. B
9. B
10. B

Structured questions answers

1. identity theft
2. malware
3. personal names
4. Two-factor authentication
5. Cyberbullying
6. True
7. False
8. True
9. The best practice for creating a secure password is to include a mix of uppercase and lowercase letters, numbers and special characters.
10. Cyber wellness refers to the responsible and safe use of the internet, involving understanding online risks, protecting personal information and practising ethical behaviour in digital spaces.

Unit 34: Technology design and safety

Unit objectives

By the end of this unit, learners should be able to:

a. state safety rules when using tools.
b. design an artefact.
c. make an artefact.

Suggested teaching materials/aids

- PlusOne Science and Technology Grade 5 Learner's Book, page 234-240.
- Science and Technology Grade 3-7 syllabus.
- Tools and equipment, materials, artefacts, resource person.

Teaching notes

- Safety rules when using tools: ensure comfortable workspace, take regular breaks, keep tools/materials organised, use protective gear, follow manufacturer instructions, maintain tools well, be mindful of electrical safety.
- Artefacts are physical or digital items created through a design process, serving a function or solving a problem.
- Key steps in designing an artefact: identify purpose/requirements, choose suitable materials/tools, sketch design/create drafts, select best techniques, plan construction steps.
- Steps in creating an artefact: gather materials/resources, set up workspace, follow design plan, use tools safely, check for functionality/quality, make adjustments.

Activities guidelines

Activity 34.1

Identification and discussion: Safety rules for tools – Instruct learners to identify different safety rules that should be followed when handling design tools (for example, keeping workspace organised, wearing protective gear, following instructions). Facilitate a discussion on why each of these rules is important for preventing accidents and ensuring safety.

Activity 34.2

Artefact design and presentation: Sketching a product – Instruct learners to choose an artefact they would like to design (for example, a simple tool, a mechanical model or a product prototype like a new type of pencil holder). They should then create a rough sketch of their design, incorporating basic features and functionality. Learners will present their design to the class, explaining its purpose, how it works and their material choices.

Activity 34.3

Practical creation and presentation: Making an artefact – Instruct learners to collect the necessary materials and resources for their chosen artefact design. Guide them through setting up their workspace safely. Using appropriate tools, they should assemble and create their artefact, following their design plan. After completing their artefact, learners will present their finished product to the class, discussing any challenges they faced during its creation and how they overcame them.

Suggested answers

Exercise 34.1

1. workspace
2. breaks
3. tools

4. safety glasses
5. accidents
6. accidents
7. electrical
8. Ensure your workspace is comfortable, take regular breaks, keep tools/materials organised, use protective gear, follow manufacturer instructions, ensure tools are well-maintained, be mindful of electrical safety. (Any one)

Exercise 34.2

1.

Step	Description
1	Identify the artefact's purpose and requirements.
2	Choose suitable materials or tools for your design.
3	Sketch your design or create a draft.
4	Select the best techniques and tools for building the artefact.
5	Plan the steps to construct the artefact effectively.

2. False
3. True
4. False
5. Mechanical models, digital products like apps or websites, tools and gadgets, prototypes of engineering designs, 3D printed items, automobiles, electronics and industrial systems. (Any two)

Exercise 34.3

1.

Step	Description
1	Gather materials and tools.
2	Set up the workspace.
3	Follow the design plan.
4	Use tools safely to create the artefact.
5	Check for quality and functionality.
6	Make improvements if needed.

2. False
3. True
4. False
5. True

Unit revision exercises

Multiple choice answers

1. C
2. B
3. B
4. C
5. C
6. C
7. D
8. A
9. A
10. C

Structured questions answers

1. organised
2. manufacturer's instructions.
3. purpose
4. regular breaks
5. sketch
6. functionality
7. protective gear.
8. The final step in creating an artefact is checking for functionality and quality and then making any necessary adjustments or improvements.
9. Identify the purpose and requirements; choose suitable materials/tools; sketch the design/ create drafts; select the best techniques; plan the steps to construct the artefact. (Any two)