Natural Sciences

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Learner's Book 7

MACMILLAN
Solutions for all Natural Sciences

Grade 7 Learner’s Book

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First published 2013
13 15 17 19 18 16 14
0 2 4 6 8 10 9 7 5 3 1
Published by
Macmillan South Africa (Pty) Ltd
Private Bag X19
Northlands
2116
Gauteng
South Africa

Typeset by Boss Repro & Design Studio
Cover image from VMS Images
Cover design by Deevine Design
Illustrations by Robyn Cook, James Graddidge, Nikki Miles, Sean Strydom, Alex van Houwelingen
Photographs by: AAI Fotostock: pg 6, 23, 65, 125, 153, 154, 161, 162, 184, 202, 212, 239, 267, 329, 330
AfriPics: pg 5, 23, 49, 124, 156, 167, 328, 329
Brand X Pictures: pg 310
Diffusion Images: pg 6
Digital Vision: pg 18
Ernst Schmidt: pg 51 (right)
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Richard Brooksbank: pg141, 143
Science Photo Library: pg 58, 68, 120, 135, 155, 181, 193
Sherry Neville: pg 95, 98, 210
Stockbyte: pg 321
The Bigger Picture: pg 140
VMS Images: pg 46, 55, 103, 105, 108, 122, 129, 132, 140, 256, 283
King Features Syndicate: pg 324

With special thanks to Ernst Schmidt and Jacana for use of photograph on page 51 taken from Trees and Shrubs of Mpumalanga and Kruger National Park.

ISBN PDF: 978-1-4310-2595-4
WIP PDF: 4528M000

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How to use the Learner’s Book

Welcome to the Solutions for All Natural Sciences Grade 7 Learner’s Book.

The content in the Solutions for All Natural Sciences Grade 7 Learner’s Book is organised according to topics and each topic is structured in the same way:

**Topic opener page:** The topic starts with a full colour picture of something that is related to the content of the topic. ‘What you will learn about in this topic’ lists the content to be covered in the topic. There is also a section called ‘Let’s talk about ...’ which gives you an opportunity to start thinking about new things you will learn about in the topic.

**Units and lessons:** Each topic is divided into units that are broken up into lessons. A lesson consists of content and then a classroom activity, sometimes there is a practical task. Some of the classroom activities might be started in class but completed at home. The lessons break the work up in little chunks of information. This helps you to make sure you know and understand a certain section of the work before moving on to the next new section. One practical task per term is a suggested Formal Assessment Task. You could be assessed on these tasks, so watch out for them.

**Extra practice:** The extra practice at the end of each topic has been included as an additional activity. Use the questions for extra practice.

**Summary:** Each topic ends with a summary of the work covered in the topic. You could use these summaries as study notes, just to recap what you should know at the end of the topic.

Other features to look out for are:

**Word bank:** These contain difficult words that you may not understand or that you may have encountered for the first time. An explanation for the word is given to enable you to understand its meaning better. Always keep a dictionary handy because if you understand a word learning will be a lot easier.
Illustrations and photos: The illustrations and photos have been included to help you understand the written text. Use the illustrations and photos when working through the text. When you see something you will remember it a lot better.

The publisher and authors wish you all the best in your study of Natural Sciences in Grade 7.

Good luck!
Let's talk about biosphere

Look at the picture on this page showing the components of the biosphere. What does the term ‘bio’ mean? What does the term ‘sphere’ mean? Using your definition of the two words above, write a sentence on the meaning of biosphere.
Unit 1 The biosphere – the blanket of life

What you already know

In Grade 4 you learnt about the seven life processes. You also learnt that all organisms that were living and are now dead form the dead organic matter in the soil. You learnt that organisms such as plants need certain conditions to grow.

In Grade 6 you learnt that nutrients are recycled. For example photosynthesis is the process of plants using carbon dioxide from the air and giving off oxygen into the air. Animals and people use the oxygen from the air for breathing and breathe out carbon dioxide, which is used by plants for photosynthesis. You also learnt that there are many different ecosystems, such as rivers and mountains.

Check myself

1. List the seven life processes.
2. Discuss how living things are adapted to their environment.

Lesson 1
The components of the biosphere

The biosphere refers to that part of the Earth where all organisms live. Life is found mainly around the edges between land (lithosphere), air (atmosphere) and water (hydrosphere) which are capable of supporting life. It does not penetrate very far below the land surface, or very high into the atmosphere or except for a few animals very deep under the ocean.

Word bank

biosphere: parts of the earth and its atmosphere and in which living organisms exist
lithosphere: the outer part of the earth, consisting of the crust and upper mantle
atmosphere: the air or climate in a specific place
hydrosphere: parts of the Earth made up of water, including oceans, lakes, rivers, etc. as well as water in the atmosphere
The biosphere is like a blanket of life surrounding the Earth. There is a delicate balance between land, water, air and living things (organisms) such as plants, animals and microorganisms.

**The atmosphere**

The atmosphere is made up of a mixture of gases, water vapour and particles. The important gases that help sustain life are oxygen, carbon dioxide and nitrogen.

- Nitrogen is an essential part of proteins which are used to build cells and control reactions in the body.
- Oxygen is used to produce energy in the body for activities such as running.
- Carbon dioxide is used by plants during photosynthesis to produce sugar.

The variety of organisms that live permanently in this part of the biosphere is limited to small organisms such as bacteria. Birds and flying insects use the atmosphere as a means of transport and are adapted by having wings.
The lithosphere (soils and rocks)

The lithosphere is made of various types of rocks and soil. It consists of the continents, the oceanic floor as well as the firm upper mantle. It provides nutrients, habitat and shelter for organisms. Organisms that die become the organic matter that provides nutrients for the living organisms. These nutrients are recycled over and over again. Organisms that live here can either live on the surface, such as lion and rhino, or under the soil surface, such as earthworms and moles. Others such as bats live in caves.

The hydrosphere (water)

The hydrosphere consists of all water above and below the surface of the Earth, as well as the water vapour in the air. Besides being a habitat for organisms, it is believed that life first evolved in the hydrosphere about 3.6 million years ago. Many organisms are well adapted to this part of the biosphere, including organisms such as dolphins, sharks, starfish and coral.

The biosphere (all life)

The biosphere consists of seven global biomes, which are Desert, Tundra, Taiga, Savannah, Grassland, Forest and Rainforest. Biomes are influenced by climatic and soil conditions, which in turn influence the groups of plants and animals that live in it. Since there is such a diversity of habitats, this has provided the opportunity for organisms to adapt and specialise.

In Grade 4 you learnt that there are many different kinds of living things (the variety of living things is called biodiversity). All living things are able to carry out the seven life processes.
The seven life processes

1. **Movement:**
   Everyone knows what movement is. A dog runs and a moth flies. But how do plants move?

   ![Figure 1.2 Movement is life in process.](image)

2. **Respiration:** To be able to carry out the life processes organisms need energy. Respiration is how plants and animals make energy. Which part of your body do you think uses the most energy?

   ![Figure 1.3 Respiration is life in progress.](image)
3. **Sensitivity:** Our surroundings are always changing. Organisms need to be able to sense these changes and respond correctly in order to survive. What sense does a snake use to be able to hunt a mouse in the darkest of nights?

4. **Growth:** As we get older we get bigger. More cells such as muscle and skin cells are made. How do you know that plants grow?

5. **Reproduction:** Animals and plants have to produce individuals similar to themselves. If no reproduction occurs, there would soon be no more animals and plants on Earth. What is the term used for a species that does not exist on Earth anymore? Can you think of one South African animal that has disappeared forever? Can you name one that may soon disappear forever if we don’t do something to conserve it?
6. **Excretion:** The body is similar to a city. Much like a city that produces waste and litter, the body too produces waste which must be removed. Look at the figure below and name one substance that plants excrete that is useful to humans.

![Figure 1.7 Excretion is life in process.](image)

7. **Nutrition:** Nutrition is the ability to feed. The common egg-eater snake is able to swallow eggs whole. The eggs may be three times the size of its head. What does this amazing snake do to get the egg into its mouth?

![Figure 1.8 Nutrition is life in process.](image)
Classroom activity 1

How will you survive in a bio-dome for two years?

Discuss and answer the questions that follow. Imagine there is a virus that is killing millions of people in all the countries of the world and the only way to survive is in a bio-dome.

Figure 1.9 Bio-dome of the future

- The bio-dome needs to exclude all material from outside except sunlight, as the virus is thought to be able to survive on dead animals for a long time. Ask yourselves: ‘What do we need to put into the bio-dome and why?’
- Only healthy non-infected people will be allowed to live there. You will decide who and how many.

Think about the factors listed and the questions on the following page. Discuss them in your groups.
Key objective 1:
How would plants and animals in the bio-dome get their food (nutrition)?
1. What substances do plants need to grow? What will plants contribute to the bio-dome?
2. What foods should be in the bio-dome? Make a food pyramid to work out the types of food needed for a balanced diet.
3. How will you ensure these foods are available to the people in the bio-dome?
4. What types of plants, animals and habitats should be put in the bio-dome?

Key objective 2:
Water is vital for all living things. How do we make sure they all get enough in the bio-dome?
1. Where are the water sources in the outside world? (Think of the water cycle)
2. How will you recycle water to ensure you have enough?

Key objective 3:
All nutrients are recycled within a biosphere.
1. What substances are needed for respiration in animals and plants? (Compare this with what plants need to make food – key objective 1)
2. What would happen to the carbon dioxide and oxygen levels if we had:
   a) too many animals
   b) too many plants
3. What living things would be needed to recycle dead plants and animals?
Key objective 4:
How do people get the energy needed to live in the bio-dome? (What actual energy is needed to live in the dome? How can someone keep warm? Is electricity needed?)

Copy the following table into your workbook and give one positive and one negative aspect about using each energy resource.

<table>
<thead>
<tr>
<th>Energy resource</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydroelectric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fossil fuel (oil and coal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Which form of power generation would you use in your dome?
2. Why would you use that type?

Key objective 5:
What else could be put in the bio-dome to ensure people could happily live in there for two years?

Lesson 2
Requirements for sustaining life

For life to exist certain requirements must be fulfilled. Once the conditions are favourable, these conditions must be sustained in order for living things to survive for a long time.

The most suitable conditions (optimum conditions) must therefore ensure that the seven processes are fulfilled.
Energy requirements for sustaining life

The main source of energy is the light from the Sun. Not only is it important for plants to make food by photosynthesis but it provides heat and is the driving force of winds. Heat over the sea causes water to evaporate, which in turn forms clouds, which are moved over the land by winds to fall as rain.

The light energy gathered by green plants is changed into chemical energy in the form of sugar (glucose). This glucose is used by the plants and animals in order to produce energy to build cells and carry out everyday activities.

The Sun provides light energy for the green plants to produce food such as sugar (glucose). The plants are eaten by herbivores that are able to use that food produced by the plant as a source of energy to carry out their own activities. Herbivores may then be eaten by another animal (carnivore). Every time something eats something else, the energy is passed on to the next organism. This is the basis of a food chain and the flow of energy through an ecosystem.

Most of the energy is lost as it is passed on from one organism to the next. Fortunately the Sun is a renewable source of energy so as long as we protect our natural environment, we should have plenty of food and oxygen.

Figure 1.10 Flow of energy through a food chain

**Word bank**

- **herbivore**: an animal that feeds only on plants
- **carnivore**: an animal that feeds on the flesh of other animals
Gas requirements for sustaining life

If you were to heat your house on a cold day you would need fuel such as wood and oxygen in order to burn the wood. Living organisms also need gases to produce energy and food.

The three most important gases needed to sustain life are oxygen, carbon dioxide and nitrogen. Unlike energy, these materials can be recycled and used over and over again.

Nitrogen is converted by bacteria in the soil into a nutrient called nitrates (a substance used in fertilisers). Using this nutrient, plants are able to make proteins, which help with animal growth and development.

Carbon dioxide and oxygen are recycled through the environment through two processes: photosynthesis and respiration.

Plants photosynthesise in order to convert the light energy into a usable form of energy in the form of sugar. The carbon in the carbon dioxide gas is used to make sugar molecules and oxygen is released into the atmosphere. During respiration the energy that sugar contains can then be used by plants or passed on to other organisms. To release that energy oxygen is needed and carbon dioxide is released into the air.

Water requirements for sustaining life

Water is an important part of all living organisms and their environments. All living organisms depend on water for their survival. Unfortunately many societies waste this precious resource.

Figure 1.11 Important gases for sustaining life
Our bodies need water for many reasons:
- Water keeps the body cool.
- The body breaks down food so that it can be absorbed into our bodies, this occurs within water.
- Water keeps us hydrated as our body consists of roughly 60% of water.
- The blood in our veins flows with the help of water.

The environment depends on water to function properly. As we have seen, plants need water to produce food in photosynthesis. Water also helps recycle nutrients, for example nutrients that have sunk to the bottom of the ocean are taken back to the surface in water currents by a process called upwelling.

Water provides many habitats and has the greatest variety of organisms.

**Practical activity 1**

**Investigating the requirements for germination**

You will be sprouting (germinating) and growing a new plant from a seed. Important variables include: temperature, moisture, light, oxygen and soil.

**Aim:**
To investigate the effect of temperature, moisture, light, oxygen and soil on germination.

**You will need:**
- cotton wool/paper towel
- seedlings
- notebook
Experimental design
In order to record the importance of these variables, you will work in groups of four. Each group will manipulate one of the important variables.

Ask yourselves questions such as the following:
- Do seeds grow faster under light or dark conditions?
- Will seeds grow in water or other liquids (for example cola)?
- Will seeds grow in a refrigerator?
- Will seeds grow in plastic coverings?
- Do seeds grow in different soil types (for example loam, clay or sandy soil)?

Method:
1. Keep a day-to-day record, in order to monitor progress of the seeds’ growth.
2. Which of the variables are a requirement for the seeds to grow?
3. You are required to do the following: write an investigative question, formulate a hypothesis, design a test for your theory, record data and draw conclusions.

Soil requirements for sustaining life
Soils are made by the weathering of rocks by water, wind and temperature. The type of soil depends on the size of the particles. Larger particles form sandy soil whereas smaller particles form a clay-like soil. Loam is a combination of all soil types and includes leaf litter and other decomposing material.

Animals such as earthworms, moles and dung beetles are also important as they aerate the soil and help return nutrients back to the soil.
Animals depend on soil for food, protection (against the heat or predators) and shelter. Plants depend on soil for water, support and mineral salts.

South African soils on average develop at 1 mm per 40 years, but unfortunately erosion caused by human activity is resulting in more soil to be lost than made. Pollution of soil occurs by littering and the use of poisonous chemicals such as pesticides. Wetland soils and plants act as natural filters. These catch sediments and break down various pollutants. This makes the water leaving the wetland quite a bit cleaner than when it came in, thus supplying cleaner water to the user at no cost. The capture of sediments by wetlands serves to prolong the life of dams and the life of other water carrying devices such as pumps, used by farmers for irrigation.

**Temperature conditions for sustaining life**

Temperature has a great influence on the distribution of plants and animals. Areas can be hot and dry, cold and dry, cold and wet or hot and wet. Organisms have special adaptations to suit certain conditions, for example aloes are well adapted for hot, dry arid conditions.

**Classroom activity 2**

**The effect of light on the growth of plants**

An experiment was carried out to investigate the distribution of plants around a tree and to determine if the amount of light would affect plant growth.

The number of plants were taken along a transect running from the base of the tree in the shade out into the field where it was much brighter.
A **quadrat** was positioned directly under the tree and the number of plants within the quadrat was counted. The amount of light was also measured using a light sensor, placed at the centre of the quadrat. Measurements were taken again every two metres and recorded in the table.

<table>
<thead>
<tr>
<th>Distance from tree (m)</th>
<th>Amount of light (lux)</th>
<th>Number of plants in quadrats</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>550</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>630</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>750</td>
<td>14</td>
</tr>
<tr>
<td>10</td>
<td>900</td>
<td>29</td>
</tr>
</tbody>
</table>

1. Draw a line graph to show the numbers of plants against distance from the tree.
2. Look at the table above, what conclusion can be made with regard to the effect of light on the growth of plants?
3. Were there any results that didn’t fit the pattern? If so, explain which ones they were.
4. What can you do to improve the reliability of your results, so that you can make a firm conclusion?
5. Based on these results, what other environmental factor(s) might you decide to measure in order to explain the distribution of these plants?
Adaptations of living things

The hooked beak of a bird of prey is an adaptation to rip the flesh off its prey. We may say a living organism has adapted to its environment, meaning that over many generations it has changed to suit the environment it lives in, or the food it eats, or the way it reproduces.

An **adaptation** is any characteristic or feature that helps the organism survive and reproduce. Every living thing is adapted to its environment. A wide range of different environments means there is also a wide range of adaptations. Some adaptations are commonly used by a large number of species. For example, there are many animals that use wings to fly.

Predators such as lions and prey such as impala have many adaptations to help them find food or protect themselves from being eaten. Carnivores have eyes in the front of their head so that they can judge distances accurately whereas herbivores have eyes on the side of their head so that they can have better all round vision. Predators also tend to have better developed brains than their prey. This is because they need to select their victim and plan their method of capture. Prey tends to have better developed sensory organs, such as a strong sense of smell, in order to detect predators early.

A special kind of adaptation is camouflage, the ability of an animal to blend in with its surroundings using both shape or colour, or both. Examples of camouflage are looked at in the table on the following page.

---

**Word bank**

adaptation: any characteristic or feature that helps the organism survive and reproduce
<table>
<thead>
<tr>
<th>Animal</th>
<th>Type of camouflaging adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chameleon</td>
<td>The chameleon can change colour depending on the surface that it is on.</td>
</tr>
<tr>
<td>Figure 1.13</td>
<td></td>
</tr>
<tr>
<td>Stick insect</td>
<td>The stick insect is the colour of bark and stands very still.</td>
</tr>
<tr>
<td>Figure 1.14</td>
<td></td>
</tr>
<tr>
<td>Crocodile</td>
<td>The crocodile’s skin is rough making the crocodile like a log so that it can get close to its prey without being seen.</td>
</tr>
<tr>
<td>Figure 1.15</td>
<td></td>
</tr>
</tbody>
</table>

All plants need a regular supply of water to survive. Some soils have adequate water; other soils are very dry or very wet. Certain plants have become adapted to live in these different types of soils. We can divide plants into three main groups according to their water needs.

Some plants that grow in very hot places where water is scarce are called **succulents**. They must absorb and store as much water as possible and prevent water loss. An example of a succulent plant is an aloe. Aloes have the following adaptations:
- shallow branching roots to absorb even the smallest amount of water

**Word bank**

**succulents:**
plants with leaves or stems that store water that grow in very hot dry places where water is scarce
• thick fleshy leaves to store water
• a thick waxy layer on the leaves to prevent water loss
• leaves with thorns to stop animals from eating them and minimise water loss
• the ‘beard’ or dead leaves that hang down along the stem help protect the aloe during fires.

Figure 1.16 An aloe is adapted to grow in areas where there is little water.

Classroom activity 3

Design an imaginary creature that is adapted to survive in the habitat described below. Make a drawing and label all of the creature’s important features. Give your creature a name.

Imaginary habitat:
• cold and windy weather
• steep, rocky ground
• small animals that live in dark caves on cliffs
• tall trees with berries on their highest branches that grow on the steep slopes.
You will need to think about:

- what the creature eats
- how it moves around and where it lives.
- how it is protected from the weather.

Extra practice

Figure 1.17 A tropical fish tank

Many people keep tropical fish at home in a fish tank. The environmental conditions have to be carefully controlled in order to keep the fish alive.

1. Explain what each of the following pieces of equipment are needed for:
   a) Thermostat (3)   b) Heater (1)
   c) Water filter (2)   d) Air pump (2)
2. Suggest two reasons why it is important to have plants in the aquarium. 
   \(2 \times 2 = 4\)

3. Imagine that you were setting up a tropical fish tank at home. What resources would you have to provide to keep your fish alive and healthy? 
   \(3\)

4. List the names of five living organisms that you might put into your tank. 
   \(5\)

Adaptations for survival

The table below gives the names and adaptations of some organisms. Complete the table, giving two reasons for each adaptation.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Adaptation</th>
<th>Reason for adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td>• Scales • Fins • Gills</td>
<td>(2 \times 3 = 6)</td>
</tr>
<tr>
<td>Bat</td>
<td>• Large ears • Large wings • Feet with claws</td>
<td>(2 \times 3 = 6)</td>
</tr>
<tr>
<td>Snake</td>
<td>• Forked tongue • Scales • Fangs with poison glands</td>
<td>(2 \times 3 = 6)</td>
</tr>
</tbody>
</table>

Total: 38 marks
Summary

- The biosphere is where life exists and includes the lithosphere (soil and rocks), hydrosphere (water), and atmosphere (gases).
- It also includes all living organisms and dead organic matter.
- There are many different kinds of living things including plants, animals and micro-organisms.
- All living things can carry out the seven life processes.
- The seven life processes are movement, respiration, sensitivity, growth, reproduction, excretion and nutrition.
- Living things need energy, gases, water, soil and favourable temperatures.
- Living things are suited (adapted) to the environment in which they live. For example, fish have fins to move easily through water.
Look at the pictures on this page. They show some of the many different kinds of living things found on Earth. Identify and list as many of the living organisms as you can. Divide the list into plants and animals. Now divide it further into animals that have a backbone and animals that do not. Which of the animals have an exoskeleton? Which of the plants produce flowers and which produce cones? In this topic you will learn about how biologists classify all living things into groups to make sense of the variety of living organisms on Earth. In particular, you will learn how animals and plants are classified.
Unit 1 Classification of living things

What you already know

In Grade 4 you learnt that there are many different kinds of living things, including plants and animals. You learnt the difference between living and non-living things. You learnt that there are many different habitats on Earth.

Check myself

1. Study Figure 2.1. It shows a selection of living and non-living things.
   a) List the living things and the non-living things in all the pictures.
   b) List the seven life processes that all living things can carry out.
2. Name three habitats found in South Africa.

Lesson 1

The concept of classification

Classification

Classification is the sorting of things into groups based on shared characteristics. Things with the same characteristics are placed in the same group. Things with different characteristics are placed in different groups.
Classification systems

A **classification system** is a system of groups each with their own set of characteristics. You can make different classification systems for different purposes. For example, Figure 2.2 shows that you could classify the same foods in two different ways. You could classify them based on their flavour as either sweet, sour or salty. Alternatively you could classify them based on how they are stored either as fresh, tinned, dried or frozen.

**Word bank**

**classification system:** a system of groups each with their own set of characteristics

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Figure 2.2 Two classification systems for the same foods: a) Classification system based on taste b) Classification system based on storage method
Classroom activity 1

1. Define the term classification.
2. Figure 2.3 shows a selection of everyday objects. Classify them in three different ways based on each of the following observable features:
   a) shape
   b) colour
   c) use.

3. Draw a classification diagram for each of the three classification systems in Question 2.

Lesson 2
Classifying living things

Biologists classify living things into different groups based on their characteristics. This allows us to see how the millions of different types of living organisms are similar or different to each other.

Biodiversity

Biodiversity (bio = living, diversity = variety) is the variety of all living organisms and habitats on Earth.
There is an enormous variety of living organisms on Earth, ranging from tiny bacteria to large plants and animals. There is also an enormous variety of habitats on Earth. A habitat is the place where a living organism can live and survive, such as a forest, desert, wetland or ocean.

So far, biologists have identified about 1,75 million different types of living organisms on Earth. However, biologists estimate that there could actually be between 3 and 100 million different types of living organisms on the planet.

**The importance of classifying living organisms**

Due to the enormous biodiversity of living organisms on Earth, biologists find it useful to sort and classify living organisms into groups. Living organisms are classified according to their shared characteristics. Living organisms with the same characteristics are placed in the same group and those with different characteristics are placed in different groups.

Classifying living organisms helps us to:
- make sense of the enormous biodiversity of living organisms
- show how living organisms are related to each other
- identify living organisms.

**The Five Kingdom classification system**

Over the years, as biologists have learnt more about living organisms, they have designed many different classification systems for living organisms. Today biologists are still debating the best way to classify living organisms. One of the most commonly used classification systems is the Five Kingdom classification system. In the Five Kingdom classification system, living organisms are sorted and classified according to their shared characteristics.
The Five Kingdom classification system classifies all living organisms into one of five main groups, called kingdoms (Figure 2.4):

- **Kingdom Monera:** This kingdom includes very tiny organisms made of only one cell. These organisms are so small that they can only be seen with the aid of a microscope. They include bacteria and blue-green bacteria (sometimes called blue-green algae).

- **Kingdom Protista:** This kingdom includes a wide range of organisms made of either one cell or many cells arranged simply together. They are larger than the organisms in Kingdom Monera. The three main types of protists are protozoa, algae and slime moulds.

- **Kingdom Fungi:** This kingdom includes organisms made of many cells. They get their food from decaying plant and animal materials. They include tiny microscopic yeasts, larger moulds and mushrooms.

- **Kingdom Plantae (The Plant Kingdom):** This kingdom includes organisms made of many cells arranged to form complex plants. They make their own food by the process of photosynthesis. They include algae, mosses, ferns, cone-bearing plants and flowering plants.

- **Kingdom Animalia (The Animal Kingdom):** This kingdom includes organisms made of many cells arranged to form complex animals. They get their food by eating plants or animals. They can move. They include sponges, worms, starfish, jellyfish, snails, insects, spiders, crabs, fish, amphibians, reptiles, birds and mammals.
Figure 2.4 The Five Kingdom classification system
Differences between plants and animals

You have learnt about the Five Kingdom classification of living organisms. In Grade 7 you will focus on the Plant Kingdom and the Animal Kingdom.

Differences between plants and animals:

- **Movement:** Plants do not move from place to place. They do make other movements though for example: they will turn towards sunlight or trap flies like a venus fly trap. They stay rooted in the ground where they grow. Animals can move from place to place by walking, creeping, hopping and flying.

- **Nutrition:** Plants make their own food by the process of photosynthesis. During photosynthesis, the plant uses energy from sunlight to turn carbon dioxide from the air and water from the soil into glucose and oxygen. The glucose is food for the plant. Animals cannot make their own food. They have to eat plants or other animals for food.

- **Reproduction:** Plants can reproduce by seeds or spores, which grow into new plants when conditions are right. Plants can also reproduce by forming new plants from their leaves, stems or roots. Animals can only reproduce by fertilised eggs which grow into young animals.

- **Growth:** Plants continue to grow throughout their lifespan, especially certain parts, such as the tips of stems and roots. Animals stop growing at a certain stage in their life. Only some parts of animals keep growing, for example, the hair and nails.

- **Response to the environment:** Plants respond to the environment by slow growth movements. For example a plant will slowly grow towards a source of light. Animals respond quickly to the environment because of their well developed nervous system and ability to move. For example, if an animal hears a loud noise, it rapidly moves away from the noise.
Classification groups within the Kingdoms

Kingdoms are the largest classification group. Kingdoms are sub-divided further into smaller and smaller classification groups called phyla/divisions, classes, orders, families, genera and species (Figure 2.5). Moving downwards from kingdom to species, the similarities in living organisms increase and the differences decrease. Species is the smallest, most specific classification group. Living organisms that belong to the same species are so much alike that they can breed with each other to produce offspring.

Each type of living organism is named by its genus and species name. For example, humans belong to the genus *Homo* and the species *sapiens*, so our biological name is *Homo sapiens*. You always write the name of the genus with a capital letter and the name of the species with a lowercase letter. These names are also always underlined or in italics. Figure 2.6 shows the classification of a bird called the cape sparrow (*Passer melanurus*), using the seven classification levels as follows.

- Kingdom: Animalia (animals)
- Phylum: Chordata (animals with a backbone)
- Class: Aves (birds)
- Order: Passeriformes (song birds)
- Family: Passeridae (sparrows)
- Genus: *Passer* (true sparrows)
- Species: *Passer melanurus* (cape sparrow)
Figure 2.6 Classification of the cape sparrow based on the seven different classification levels

<table>
<thead>
<tr>
<th>KINGDOM</th>
<th>PHylum</th>
<th>CLASS</th>
<th>ORDER</th>
<th>FAMILY</th>
<th>GENUS</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANIMALIA</td>
<td>CHORDATA</td>
<td>AVES</td>
<td>PASSERIFORMES</td>
<td>PASSERIDAE</td>
<td>PASSER</td>
<td>PASSER MELANURUS</td>
</tr>
</tbody>
</table>

- > 1 000 000 species
- ± 40 000 species
- ± 1 000 000 species
- ± 8 700 species
- ± 5 200 species
- ± 125 species
- ± 8 700 species
- 27 species
- 1 species
Classroom activity 2

1. Discuss the term biodiversity.
2. Explain why it is useful to classify living organisms.
3. a) Name the five kingdoms in the Five Kingdom classification system.
   b) Give two examples of living organisms in each of the five kingdoms.
4. Arrange the following classification levels into ascending order: *species*, *phylum*, *class*, *family*, *order*, *kingdom*, *genus*.
5. Copy and complete the table showing the basic differences between plants and animals:

<table>
<thead>
<tr>
<th>Plants</th>
<th>Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement</td>
<td></td>
</tr>
<tr>
<td>Nutrition</td>
<td></td>
</tr>
<tr>
<td>Reproduction</td>
<td></td>
</tr>
<tr>
<td>Growth</td>
<td></td>
</tr>
<tr>
<td>Response to the environment</td>
<td></td>
</tr>
</tbody>
</table>
Unit 2 Diversity of animals

What you already know

In Grade 4 you learnt that there are many different kinds of animals. Some have bones that form a skeleton inside their body and some do not have bones. Some have a hard outer covering called an exoskeleton. There are visible differences in the structures of different animals, including size, shape, body covering and sensory organs. You learnt about the basic structures of an animal including a head, body, tail, limbs and sensory organs.

Check myself

Study this list of animals: fish, millipede, frog, spider, lizard, bird, cat, ant, earthworm, crab.
1. Which of the animals has a skeleton made of bones?
2. Which of the animals has an exoskeleton?
3. Describe the body covering of each of the animals.

Lesson 1
Classification of animals

In Unit 1 you learnt that all living organisms can be classified into one of five kingdoms: Kingdom Monera (bacteria), Kingdom Protista, Kingdom Fungi, Kingdom Plantae and Kingdom Animalia. In this unit you will learn more about the classification of animals in the Kingdom Animalia (the Animal Kingdom).

Vertebrate and invertebrate animals

The animals in the Kingdom Animalia are divided into two main groups: vertebrates and invertebrates.