Lighthouse - series

Natural Sciences & Technology

Grade 5 Learners Guide

ACSI Association of Christian Schools International

INSTITUUT VIR CHRISTELIKE ONDERWYS

Natural Sciences

&

Technology

Grade 5

Learner's guide

The ICO Waterstroom series has been translated into English by Anchorage Curriculum Solutions

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Term 1

Life and Living things

Life and Living things

Values

View of God: (Who is God?)	Creator. Maintainer. A God of order. God create orderly and structured. Provider. Almighty. Caregiver.
View of man: (Who am I?)	Unique. Created in the image of God. I am a temple of the Holy Spirit. Not only do I live for myself, but I am in a relationship with my Creator, neighbour and nature.
View of creation: (What must I do?)	Rule as steward over creation. We need to take care of our bodies and apply it to the glory of God and our neighbours. One leans about God in creation. We are amazed at the beauty. Acquire knowledge.

Knowledge

→ New words:

Use a dictionary, the Internet or any other source to look up the definition of the new words.
Write it down.

→ **Scientific knowledge:**

Study the classification model.

Skills

1. How to draw a natural science and technology sketch:
   Use a grey pencil, a ruler and an eraser (try not to erase a lot). Captions are written neatly, below each other on the right-hand side.
   Do not colour the sketch. Work neatly. Caption lines may not cross.
2. **Scientific investigation: Research.**
   Consult various sources such as textbooks, magazines and the Internet. Read about the specific topic and write down what you have learned in your own words.
3. **Scientific investigation:** Data analysis**.**
4. **Construction and scientific knowledge:**
   - Draw a food chain
   - Identify structures

Unit 1: Plants and animals on earth

Introduction

God is the Creator of the universe. He created the earth with land surfaces and water surfaces. God made the earth so perfect that everything is interdependent, and everything and everyone has a place. He meticulously created every plant, animal and human being. He created the sun that gives us energy and the atmosphere that protects us.

The earth consists of 71% water and 29% land. All living organisms can only survive on earth because it has liquid water, sufficient heat from the sun and an atmosphere with gases.

In Grade 4, you learned that all energy comes from the sun. Plants use sunlight and water to produce their own food through photosynthesis. Herbivores eat plants for energy, and carnivores eat herbivores for energy. An omnivore's food is plants and animals that provide energy. It is called a food chain because energy is transferred from one organism to another.

Figure 1: Birds eat berries

He created a home for all organisms. It is called their habitat. The plant and animal habitats are where that plant or animal is usually found. Every plant and animal is specially created to survive in its specific habitat.

This term, you will learn about the different plants and animals on earth and how man arranges them. You will learn more about the vertebrates and their skeletons and structures and the life cycles of living organisms.

Activity 1: Plants, animals and their habitats

Let's see what you can remember from last year. Answer the questions below.

1. What is a habitat?
2. Name four different types of habitats on earth and two types of animals that live in that habitat.
3. What is an ecosystem?

The Bible teaches us that God created man in His image. It means that man radiates God's glory. The first man, Adam, could radiate God's glory before he was affected by sin. After the fall, man became completely apostate from God. Even though man is now a sinner, there is something of the glory of God left in him. Through His redemptive work on the cross, Jesus Christ renewed the believer in the image of God. It means that the believer can once again display the glory of God. To be a Christian means to set up your whole life to glorify God as an image-bearer. Our assignment as image-bearers is to rule over the plants, animals and the rest of creation with responsibility towards Him. It is, therefore, necessary to have knowledge of creation to carry out the assignment in the correct way. The more we know, the better we can protect the earth.

1.1 Different plants and animals

Biodiversity refers to all plants and animals and their habitats on earth. South Africa has a large variety of indigenous plants and animals and their habitats are found across the country. South Africa is even recognized worldwide as one of the countries with the greatest biodiversity.

There are different types of habitats where plants and animals are commonly found. Each of these habitats houses plants and animals that are adapted to survive in that area. Some plants and animals are only found in some country regions because that is the only place where that plant or animal can survive. Let's look at the indigenous plants and animals and the habitats in which they live.

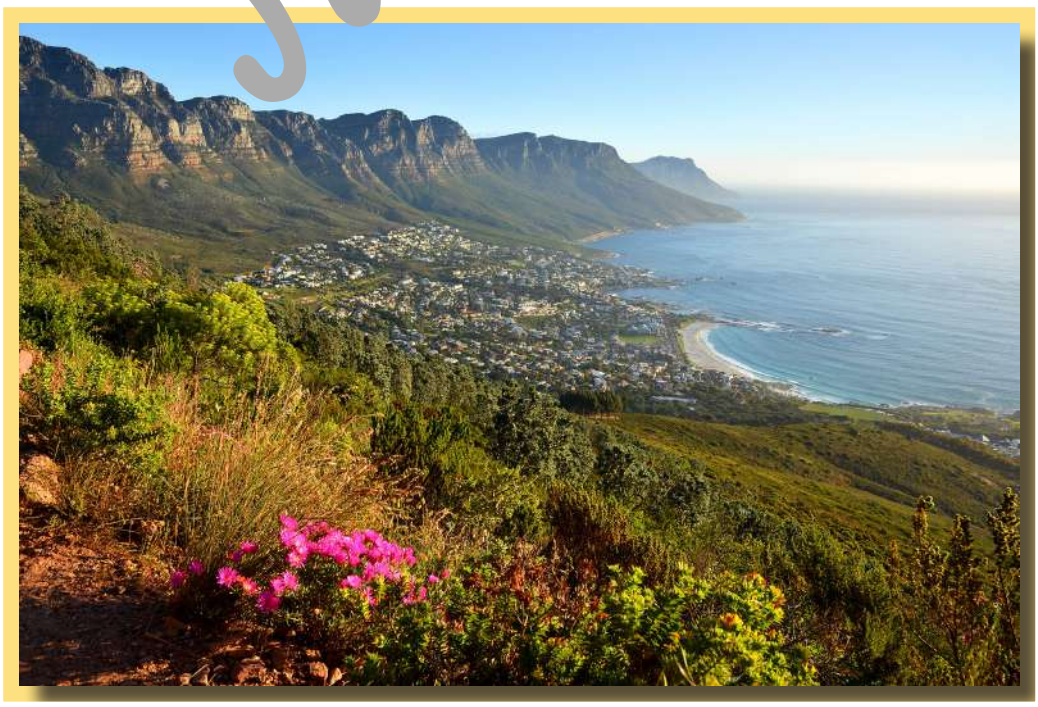


Figure 2: Fynbos is only found in the Cape and is unique to South Africa.

1. Desert: Kalahari Desert

Figure 3: Quiver tree

Deserts are the driest places on earth, with the least rain and significant temperature differences. During the day, it is scorching hot, and during the night, it is freezingly cold. Animals like the Kalahari Lion, brown hyena, bat-eared fox, gemsbok, meerkat and Cape cobra are found in the driest part of the Kalahari.
The Lord created all these animals so that they could survive without water for a long time and obtain their water from food. Their bodies can tolerate the heat of the desert (gemsbok), or they are able to hide in the ground during the day where it is cool (meerkats, snakes). Plants have a deep root system (camel thorn) or can store water for a long time.

Figure 4: Meerkats

Figure 5: Gemsbok

2. Grasslands

Grasslands are vast plains made up of grasses and a tree every now and then. It is the second largest habitat in South Africa. Large herds of herbivores such as blue wildebeest, impalas and zebras live here as well as carnivores such as lions, cheetahs, foxes and wild dogs. Grasslands are also the home of smaller mammals, birds and reptiles. How do the animals adapt to this habitat? Many of the animals' hair blends into the grassland, so that they are well camouflaged is. Large herbivores will stay together in groups for safety. Long grasses allow predators to get close and sneak up to their prey. Small mammals mostly dig their shelters under the ground, while the birds find their homes in trees or grasses.

Figure 6: Lion

Figure 7: Secretary bird

Figure 8: Zebra

3. Forests: Knysna Forest

Forests are densely vegetated areas. Forests have the largest biodiversity of all habitats. The trees purify the air and provides oxygen for humans and animals, as well as food, shelter and medicine. The stinkwood and yellowwood are indigenous trees that grows in the Knysna Forest. The animals found here are the last surviving elephant cow, leopards, wild boar, baboons and bushbuck. The colourful Knysna lourie, wood owl, Cape eagle-owl and Knysna scrub warbler are also animals that can be found in the forest.

Figure 9: Knysna Lourie

Figure 10: Stinkwood

Figure 11: River in the Knysna Forest

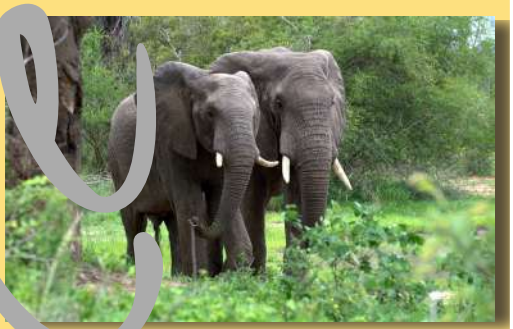


Figure 12: Knysna elephant

The rainforest houses many animals, so the competition for food is also great. Animals protect themselves by camouflaging or having bright colours to warn predators that they are toxic, even if they are not actually toxic. Other animals live high in the trees to protect themselves.

4. Water: Atlantic, Southern and Indian Oceans

South Africa is surrounded by three oceans. It causes cold, hot and tropical temperatures in the oceans around us, and therefore, South Africa has an especially rich biodiversity in its oceans. Marine animals' bodies are adapted to be able to move forward in the water easily. Marine animals have a smooth body covering and sometimes fins. For underwater breathing, marine animals have gills. They can absorb oxygen through their skin or hold their breath for a very long time. Kingklip, steenbras, catfish, sea cucumbers and squid are indigenous sea creatures.

Figure 13: Sea bamboo

Sea plants that are indigenous to South Africa are sea bamboo. They are plants and can even form an under water forests.

Figure 14: Catshark

Figure 15: Starfish

DID YOU KNOW?

The ocean produces the most oxygen on earth. Out of every ten breaths we take, seven come from the sea, no matter how far we live from the sea.

Activity 2: Habitats

Kalahari Desert

1. What are the two major challenges for animals living in a desert?
2. In what ways can plants survive in the desert?
3. Do research: How does the Kalahari lion differ from the lions that live in less dry areas of South Africa?
4. Do research: How is a snake adapted to handle the heat of the sand?

Grasslands

1. How do the large herbivores (zebra, the wildebeest) protect themselves from predators?
2. Look at figure 6. How was he adapted to his habitat?
3. Do research: Why are the grasslands the perfect hunting grounds for a cheetah?

Knysna Forest

1. In what ways are the animals in the forest adapted to survive?
2. Of what use is a forest to people?
3. Do research: Why is only one elephant cow left in the Knysna Forest?

Oceans

1. Why does South Africa have a very rich marine biodiversity?
2. Do research: What important role do sea bamboos play in their habitat.

1.2 Interdependence

When one is dependent on something, you cannot without it. Man is dependent on God in everything. Without His will, we will not be able to take one step. A new born baby is dependent on his parents for food, a warm bed, a safe home, a bath and making sure he is clean. He cannot do it alone, and if someone does not do it for him, he will not survive.

Figure 16: Parasite plant: Bird vine

God designed the whole creation so that animals and plants are dependent on each other. We call it interdependency, which means that two or more things depend on each other for survival. Animals and plants are interdependent. Animals need plants for food and shelter. Animals help plants by spreading their seeds. When an animal rubs against a plant, the plant's seeds can stick to the animal's fur and then fall off again later. When the conditions are right, the seed will germinate and start to grow. The animal, therefore, helped the plant to reproduce. Some plants also need other plants to grow. Figure 16 shows the bird vine plant. This plant does not have a good root system and therefore uses the tree to stay alive. The bird vine gets water and nutrition from the tree.

Many animals are also dependent on other animals for survival. Carnivore is dependent on other animals for food. Oxpeckers eat ticks from rhinos, buffalo, giraffe and other animals. Some fish eat the parasites that grow on sea turtles' shells.

Figure 17: Giraffe with oxpeckers

Plants and animals also depend on non-living resources in their environment for survival. Water, sunlight, sand, rock and land are non-living resources. Plants need sunlight, oxygen, and water to grow. Animals drink water and lay eggs in the sand or find shelter under a rock.

Figure 18: Sea turtle with fish eating the parasites

Activity 3: Interdependency

1. In what way are you dependent on plants and animals? Write down as many things as you can.
2. Do research on the following animals and write down what each of these animals need to survive (living and non-living resources).
   a. Elephant
   b. Lizard
   c. Meerkat
   d. Earthworm
   e. Clownfish
3. Study the following picture and then answer the questions that follow.

   a. Make a list of all the living organisms.
   b. Make a list of all the non-living resources.
   c. Make a list of all the plants and animals that are interdependent.
   d. What will happen if all the plants die?
   e. What will happen if all the animals die?
   f. What will happen if all the non-living resources are taken away?

God is a God of order. In Genesis, we read that God created the earth, plants, animals, and then man as the crown of creation and image-bearer of God. Lots of textbooks and people will try to teach you that man is also an animal, in other words, not the image-bearer of God. In the classification model of living organisms, humans are placed among vertebrates and declared mammals. We know that this does not correspond to the Bible. God clearly says in Genesis that he first created the plants, fish, birds and animals, and then, on the sixth day, he created man in His image.

To better study living organisms, they are all divided into groups. Animals are divided into two main groups: Vertebrate and invertebrate. The organisms in each group have the same kind of features.

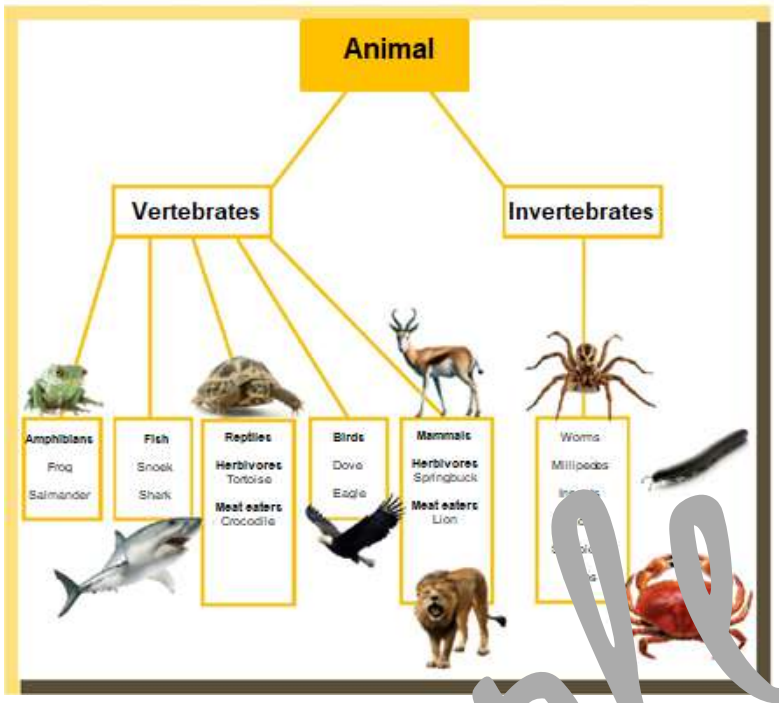


Figure 19: Classification model: Animals

1.3 Animal species

God uniquely created each animal. Some animals have skeletons their bodies, and others have hard shell on the outside to protect bodies.

Vertebrates

Mammals, birds, fish, reptiles and amphibians are all vertebrates, meaning animals with a backbone. The spine is made up of many vertebrae. Other parts of the skeleton are connected to the spine. We call it an internal skeleton. The endoskeleton is covered with muscle and soft tissue and grows with the animal. It supports the animal's body from the inside and consists of bone and cartilage. Cartilage is bone found in joints. Although it is ductile, it still very strong.

Invertebrates

Invertebrates are animals that have no backbone or skeleton in their bodies. Instead, some have a hard outer shell for protection called an exoskeleton. The exoskeleton cannot grow with the animal. The animal must first shed its skin, and then a new soft exoskeleton grows until it becomes thicker and harder. Other invertebrate animals do not have hard parts in their bodies at all. They only have a soft body, like the worm. It we also call it a hydro skeleton. Invertebrates are the largest group of animals, and they come in all shapes and sizes.

Figure 20: Centipede

Figure 21: Earthworm

Figure 22: Jellyfish

Figure 23: Snail

Figure 24: Ants

Figure 25: Grasshopper

Figure 26: Scorpion

Figure 27: Starfish

Activity 4: Animal species

1. Compare endo and exoskeletons and complete the table by filling in the differences.

	Endoskeleton	Exoskeleton
Position of skeleton		
Function of skeleton		
Growth		

2. Look at figures 20-23 on p. 17.
   a. What is one characteristic that the animals share?
   b. Describe each animal's body shell. Is it a hard shell (exoskeleton) or a soft body?
3. Do research, and write your own definition for the following words:

   a. Vertebrates
   b. Invertebrates
   c. Endoskeleton
   d. Exoskeleton

4. What does it mean when we say that man is the crown of creation?
5. Why do you think it is necessary to have knowledge of creation?

Unit 2: Animal skeletons

Introduction

The Bible often refers to the human body as a skeleton or 'bones'. God created women from a man's skeleton (ribs). In Ezekiel 37, Ezekiel is led by the Lord to prophesy over the dead bones. Ezekiel did as the Lord said, and the bones began to live. Muscles, flesh and skin grew over the bones, and the Spirit of God began to live inside the bones. A dry, barren pit full of bones came to life and became human, just as the Lord commanded. It just proves to us again that God is in control of everything and that nothing is impossible for God.

People are also vertebrates. Vertebrates have bones inside their bodies, and invertebrates don't have bones. Think a little about your skeleton. What does your skeleton look like, and why does it look like that?

Term 2

Matter and Materials

Matter and Materials

Values

View of God: (Who is God?)	Creator. Provider. Almighty. Caregiver.
View of man: (Who am I?)	Ability and command given by God to delve into creation, and rule over it.
View of creation: (What must I do?)	Take out of creation to the glory of God and to the salvation of my neighbor.

Knowledge

→ **New words:**
- Use a dictionary, the internet or any other source to look up the definition of the new words. Write it down.

→ **Scientific knowledge:**
- Properties are the things that make an object unique (how the object looks, smells, feels and moves).

→ **Technology and the environment:**
- How to process materials.

Skills

1. **Safety during experiments**
   Always ask an adult to help you or to assist you when you do an experiment.
2. **Scientific investigation**
   Test for magnetism.
3. **Data analysis**
   Draw a flow chart.
   Explain.
   Compare.
4. **Construction and scientific knowledge**
   Make a clay pot.

Unit 1: Metals and non-metals

Introduction

In Grade 4, you learned that matter's most common forms or phase states are solids, liquids, and gases. Metals and non-metals are two different classes of materials. Each of these classes has its own unique characteristics. A property is something special about a material.

Even in Bible times, humans knew how to mine and use the things God created on the earth. One such example is found in 1 Samuel 17, where we read the story of David and the Philistine Goliath. Goliath wore armour consisting of 5000 shekels of copper (about 57 kilograms). The blade of his spear alone weighed 600 shekels (about 6.8 kilograms) and was made of iron. Goliath was therefore clothed with some of the strongest metals. He also had a sword and a spear with him as weapons and a shield to protect him. King Saul also gave David a metal suite to put on, but David could not walk in the suit, so he went to Goliath with only five smooth river stones that he picked up in the stream and his slingshot. Stone is not a metal. Goliath thought that David was ridiculous but David hit Goliath in the head with the first pebble. Goliath fell, and David walked up to him, took Goliath's sword and killed him. David acted by the power of God. The Israelites defeated the Philistines that day.

God provides. He created the earth with everything we to mine and develop it to the glory of God and the salvation of our neighbours.

Therefore, we must have the proper knowledge to perform the cultural mission obediently.

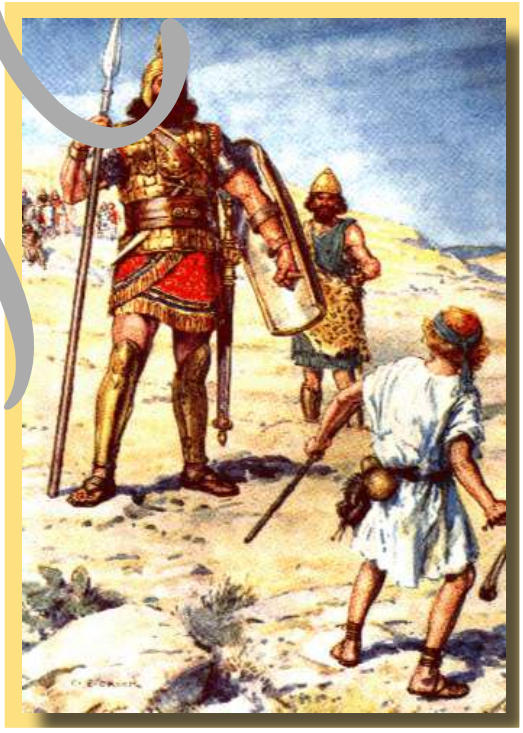


Figure 1: David and Goliath

1.1 Properties of metals

When you look around you, you see hundreds of things that have been made of many different materials. Have you ever wondered why something is made of a certain material and why the producers decided to make it from that material? Briefly discuss the following two questions with your friend.

Figure 2: Copper ore

- Why are pots and pans made of metal?
- Why are the handles not made of metal but plastic or rubber?

Metals are minerals and are found in rocks underground. Rocks that contain metals are called ores. Ore is extracted from the earth's crust and separated from the valuable stones by heating the rocks. The earth's crust is the earth's outer surface on which we live. Metals have many properties that make them useful for many products.

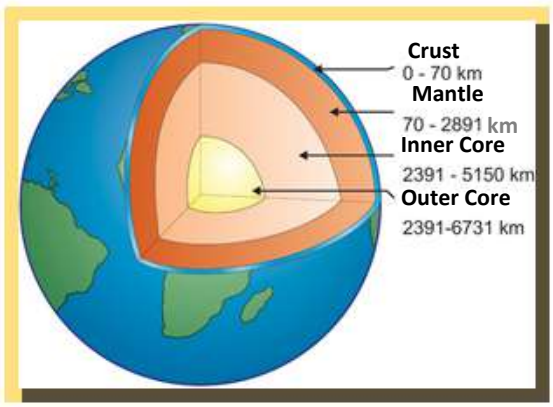


Figure 3: Layers of the earth

Let's look at the properties of metals. A property is a characteristic or quality of something or someone. When you want to know if something is a metal or non-metal, you can check if it has the following properties:

1. **Shiny** Shiny means that metals shine. It can reflect light well. Some metals lose their shininess but can regain it when polished.
2. **Ductile** Most metals are ductile. It means that the metal can bend or be drawn into thin wires. Electrical wires are usually made of copper.
3. **Conductor** Metals can conduct heat and electricity well.
4. **Hard** Hardness is the ability to resist scratches or breakage. Gold is an exception because pure gold is very soft.
5. **Malleable** Metals can be formed by heating them or hitting them with a hammer. It can also be rolled into thin rolls like tin foil.
6. **Melts** Metals can melt but only at a very high temperature (about 1500˚C!). Therefore, we can use metal pots over the fire or on the stove without them melting.
7. **Strong** Metals are strong. It means that it can carry heavy weight without breaking.

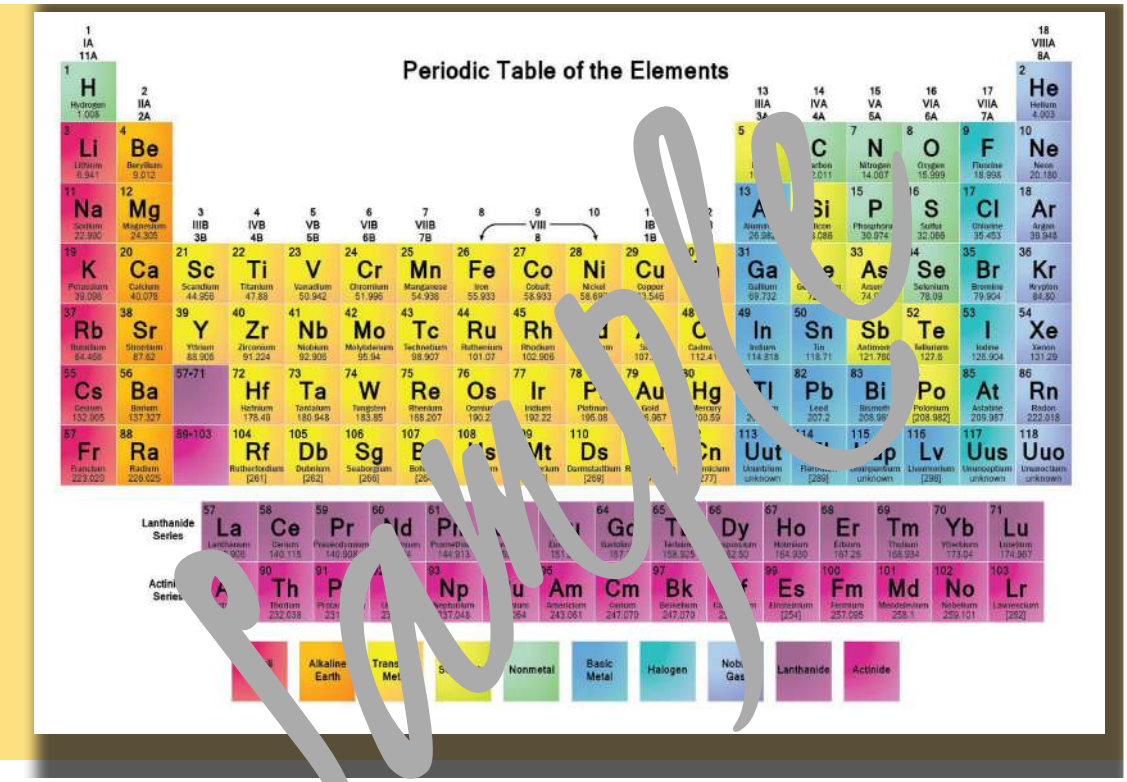
Many times, metals are fused to form a new metal. We call it an alloy. Steel is an example of an alloy. Steel consists of iron and other elements such as carbon, manganese, vanadium and tungsten. More than 1.3 billion tons of steel are produced per year. Steel is the most common material in the world.

Look at the table on p. 40. We call this the periodic table. It is a table that names and describes all the elements on earth. In high school, you will learn a lot from the periodic table. Luckily, you do not have to know all the difficult names of the elements right now.

Figure 4: Melting Furnace

Pay attention to all the pink squares. The pink and dark blue squares represent metals. Can you believe there are so many metals on earth?
God is a God of order. He created laws in nature, and man discovered these laws. Therefore, we can name the creation (science application) and rule over it.

1.2 Common metals



Iron is a metal that is used a lot because it is very strong and hard. Many tools are made of iron. The only problem is that iron can rust. Water, oxygen and air can cause iron to become red-brown, rusty and very brittle. When iron rusts, it no longer possesses the same characteristics as before. Gold is a heavy, soft and precious stainless metal that cannot rust and is always shiny. Gold is used in jewellery or to make precious objects. Gold has been around for thousands of years, and there are also many references to gold in the Bible. In the Old Testament (Exodus), we read the guidelines for establishing the tabernacle. Like the Ark of the Covenant, many articles were made of wood and then covered with pure gold.

Figure 5: Iron wrench

Figure 6: Gold

While God spoke to Moses on the mountain, the Israelites assembled themselves a calf of gold to worship. Moses burned the golden calf in the fire, finely ground it and sprinkled it on the water the Israelites had to drink (Exodus 23:20). It could only happen because the gold was very soft. Did you know gold is one of South Africa's primary sources of income?

Figure 7: Silver coin

Silver is a precious metal with a shiny white colour used to make jewelery and some kitchenware. Silver has already been used for more than 8000 years.

Copper is a reddish-brown metal that is stretchable and used since 6000 B.C. Goliath's armour was, among other things made from copper. Nowadays, copper is mainly used in electrical wires because it conducts electricity so well. Copper is also used for ornaments, jewelery and wind instruments such as a trumpet.

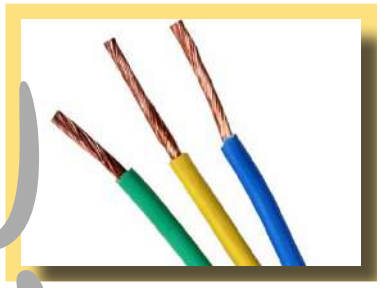


Figure 8: Copper wire

Aluminium is abundant on earth. Aluminium is a very light and robust silver-coloured metal that does not rust. Many things, from aircraft parts to soft drink cans, are made of aluminium.

Figure 9: Aluminium

Activity 1: Metals

1. Complete the table by filling in yes or no for each property.

Metal	Hard	Strong	Ductile	Malleable	Stretchable	Shiny
Coin						
Nail						
Pin						
Steel wool						
Copper wire						

2. Write down the definition of the following words:
   a. Ductile
   b. Malleable
   c. Stretchable
   d. Alloy
   e. Characteristics

Activity 1: Metals (continues)

f. Conductor
g. Crust
h. Steel

3. List three metals in your environment with which you are familiar and give two examples for each metal of products made from it.
4. Why are coins made of metal?
5. Why is a cast iron pot used to make "potjiekos"?
6. What are the properties of a cast iron pot?

Activity 2: Cleaning metals

There are quite a few household items known for cleaning metals and making them shiny. We're going to experiment to see which of these items works best. You need about three or four of the following products: Tomato sauce, Tabasco sauce, baking powder, lemon and salt, toothpaste, vinegar, Worcestershire sauce and dish soap. Use what you have in the house. Don't go and buy new stuff. You can also use other products.

You also need five dull metals. A 5c piece works well. Use a soft cloth to polish the metal.

1. Now take each metal and rub it with a different detergent.
   Use a new metal for each detergent. Then complete the table.

	Metal	Cleaning product	After you polished it: very shiny, shiny, dull
1			
2			
3			
4			
5			

2. Which cleaning product worked best?
3. Write down the ranking of cleaning products from the best to the worst.
4. What else can you do to get the metal clean?

Term 3

Energy and Change

Values

View of God: (Who is God?)	Creator. God created the earth out of nothing. Just by speaking, He made everything.
View of man: (Who am I?)	Provider. I was created with gifts to explore creation.
View of creation: (What must I do?)	Cultural obligation. Discover. To the glory of God and my neighbour.

Knowledge

→ New words:
- Use a dictionary, the internet or any other source to look up the definition of the new words. Write it down.

→ Scientific knowledge:
- There is stored energy in fuels.
- Formation of fossil fuels.

→ Technology and the environment:
- Input and output energy. Safety around fires and electricity.

Skills

1. **How to draw a Science and Technology sketch:**
   a. Use a grey pencil, a ruler and an eraser (try not to overdo it). Labels are neatly written in pen and below each other on the righthand side. Do not colour in the sketch. Work neatly. Label lines may not cross.

2. **Scientific investigation: Research**
   a. Consult various sources such as textbooks, magazines and the internet. Research the specific topic and write down what you have learned in your own words.

3. **Data analysis**

4. **Construction and scientific knowledge**
   a. Draw circuits and flow charts.
   b. Follow the technological process.
   c. Build a wheel-and-axle mechanism.

Unit 1: Stored energy in fuels

Introduction

On day four of creation, God made the sun, moon and stars. The sun is the primary source of light and energy on earth. The sun provides heat and light energy to us. The faithful God provides that plants get energy from the sun and produce their own food. People and animals eat plants and other animals for energy.

People consume a lot of energy to be able to work, and for all the devices we use. We take energy out of fuel. Fuels are something that can store and burn energy. Through burning fuel, the energy can be extracted and used. Our primary energy source (the sun) is a sphere with burning gases. It provides us with heat and light energy. In Grade 4, you learned about light energy, heat energy, sound energy, kinetic energy, electrical energy, chemical energy and stored energy. In this unit, we will focus on stored energy.

1.1 Fuel

When we hear the word fuel, we immediately think of the fuel we use to drive our cars. Petrol and diesel are not the only examples of fuel. Coal, natural gas, lamp oil (paraffin), wood and candle wax are also examples of fuel. The energy in fuels is stored energy that comes from the sun. We use fuel as a source of energy. When we burn these fuels, we get useful output energy such as heat and light.

Figure 1: A vehicle uses fuel

Food

Just as cars need energy to keep moving, people also need energy. We eat plants and animals to get energy. Many of the foods we eat contain stored energy. It is energy stored inside the food. Carbohydrates such as bread, pasta and potatoes contain more stored energy than, for example, fruit, lettuce, fish and meat. You can see how much energy food gives you on most of the products we buy nowadays. There is information of the nutritional value of the food on the packaging. The energy is given in calories (Cal) or in joules (J). A packet of chips has 160 calories (about 669J).

Figure 2: Nutritional value on packaging

Fossil fuels (coal, oil and gas)

Fossil fuels take many years to form. These fuels are called fossil fuels because they were formed from plants and animals living many years ago. The energy is still stored in these plants and animals, and therefore, we can still use it today. Coal consists of dead plants that have turned into rock. Oil and gas consist of dead plants and animals stored deep beneath the earth's crust. Candle wax and paraffin are made from petroleum. Because fossil fuels take so long to form, they can be depleted. We call these fuels non-renewable. Most electricity in South Africa is generated by burning coal in power stations. When the coal burns, it boils water, and this steam causes large turbines to run. The turbines generate power, which is the electrical energy we use in our homes. Almost 80% of the world's energy comes from fossil fuels. Therefore, we must use electricity sparingly. Solar energy, wind energy that drives wind turbines, and hydroelectric energy all are called renewable energy sources. These energy sources can be used repeatedly and cannot simply run out. Hydroelectric energy is generated using hydro power. South Africa also has a nuclear power station named Koeberg, located in the Western Cape.

Figure 3: Nuclear power station

The formation of fossil fuels:

1. Many years ago, parts of the earth's land surfaces were more like swamps.
2. Animals and plants die and move to the bottom of swamps and oceans.
3. A layer of spongy material forms what we call peat.
4. The peat is covered with sand, clay and other minerals.
5. It forms a sedimentary rock.
6. Many layers of these rocks squeeze all the water out of the peat, and coal, oil or natural gas is formed.

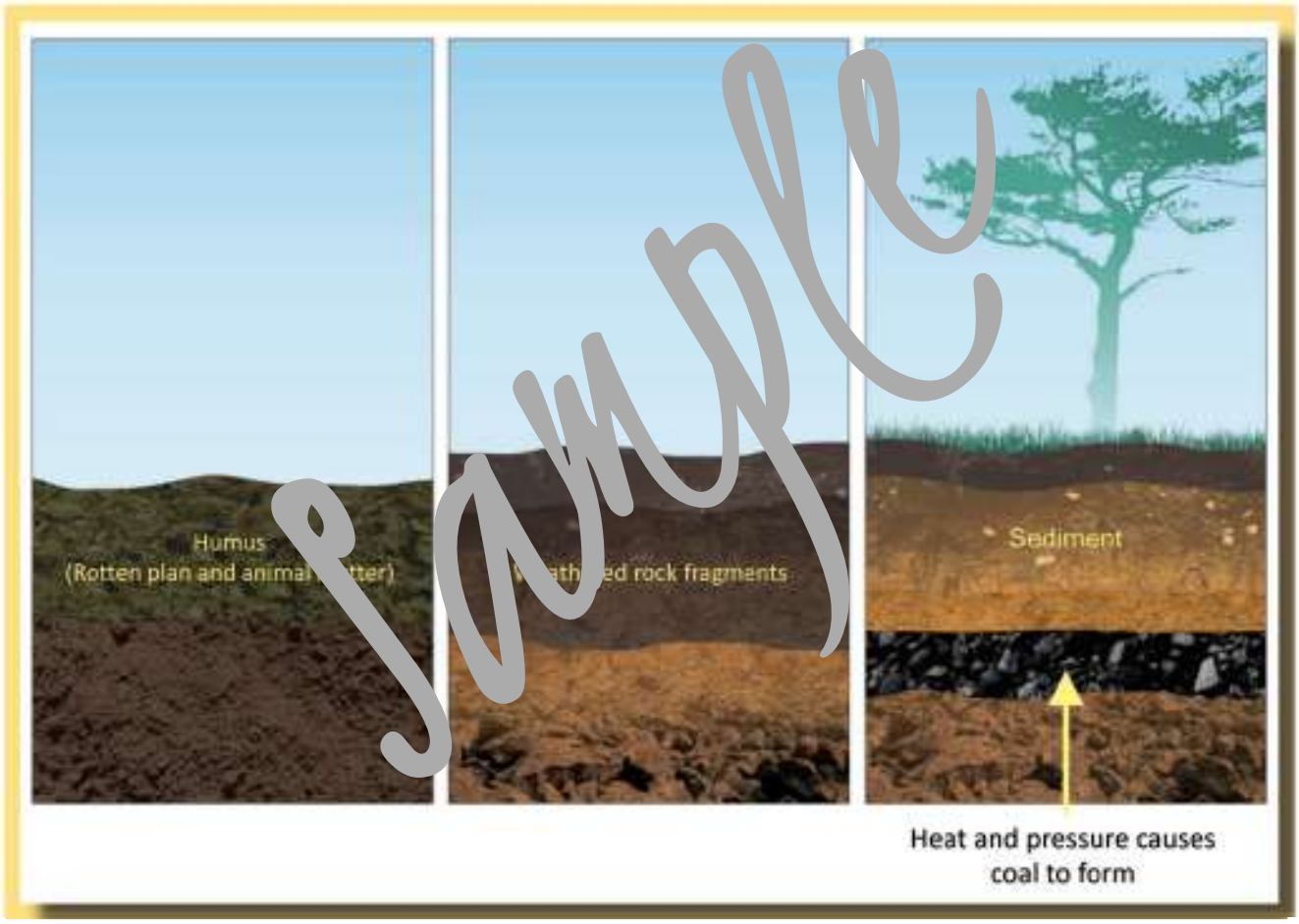


Figure 4: Coal formation

Input and output energy

Fuel cannot just start burning on its own. Input energy is needed for the fuel to start burning. To light a candle, we need a match. The input energy of the candle is, therefore, the match. The output energy of the candle is light and heat energy. The light and heat energy was stored in the candle wax. When we lit the wax, the energy was released in the form of light and heat.

Figure 4: Match and candle

Activity 1: Nutritional value of food

Do research at home on the amount of energy the food in your cupboards has. Draw the following table in your book and write down the energy content of at least five products.

Number	Product	Energy (per 100g)
bv.	Frito's chips	160 cal
1		
2		
3		
4		
5		

Activity 2: Input and output energy

1. Complete the following table:

Fuel	Input ene	ut energy	Uses
Wood	Matche	t ar heat	Heating and barbeque
Coal			
Petrol			
Paraffin			
Gas			
Candle wax			

2. Write the definition of the following words in your workbook and give an example of each:
   a. Primary source of energy
   b. Stored energy
   c. Fuel
   d. Calories
   e. Joule
   f. Renewable fuels
   g. Non-renewable fuels
   h. Fossil fuels
   i. Input energy
   j. Output energy
3. Explain in your own words how coal is formed.

Figure 6: Coal

Figure 7: Mine Vehicle

Figure 8: Coal- or conveyor belt

1.2 Burning fuel

When we make a fire to barbecue meat on in a fireplace, we use a match to ignite the wood. Moses was tending sheep when he came across the burning bush of thorns at Horeb. Moses approached to see why the bush was burning without it being consumed. God then spoke to Moses and told him to lead the children of Israel out of Egypt. Can you imagine what this thorn bush looked like to Moses? God reveals Himself as almighty and one who can even submit fire to His power. Fire can be very dangerous to humans and animals, but it can be very good for plants, humans, and animals when under control. It is therefore important to be aware of the properties of fire.

Fuel needs heat and oxygen to burn. Matches and lighters are heat sources that can be used to ignite something and, at the same time, provide the little heat needed for the fire to ignite. As soon as the fire burns, it gives off heat. Oxygen is in the air around us and helps the fuel to start and keep burning. In activity 3, you will see what happens when oxygen is taken away.

Figure 9: Fire triangle

Activity 3: Burning fuel

What happens to fire when we take the oxygen away?

Make sure there is an adult nearby to help you. Be very careful when working with the candle.

You will need: a candle, 4 different sizes of glass flasks, matches and a stopwatch.

A. Draw the table, as shown below, in your book. Measure the height of each flask and add it to the table.

B. Light the candle, place a flask on top of the candle and use the stopwatch to find out how long it takes for the candle to suffocate. Repeat the experiment with each of the flasks.

1. Complete the following table during the experiment:

Flask	Height of flask	How long did it take for the candle to stop burning?
1		
2		
3		
4		

2. For which flask did the candle burn the longest?
3. Why did the candle stop burning when it was covered with the flasks?
4. What do fuel need to burn?

1.3 Fire safety

Fortunately, fire is also very useful to us. There is nothing as enjoyable as sitting around a campfire when we go camping. The campfire gives us heat and light. We make a fire when we "braai" or cook on a coal stove. Fire is dangerous when the field around the fire is very dry. A field fire can do a lot of damage. We need to be very careful when working with fires or with something that is flammable.

Follow these safety precautions:

1. Never play with matches or lighters. Let an adult light the fire.
2. When a fire breaks out in your home, try to go to the nearest exit immediately and get away from the fire.
3. Create an emergency plan for the house. If something should happen, everyone should immediately know how to react and where to go.
4. Know the fire department's emergency number and store it on your phone.

Fires can be a destructive enemy or a good friend. It plays a vital role in the cycles of nature that the Creator has put in place to give new life to the earth and ensure that there is always a balanced variety of plant and animal life.

Activity 4: Analyse fire hazards

Examine the following pictures:

A

B

D

1. Write the letters of the picture in your book.
2. Write next to each letter why it is unsafe and what can be done to solve the problem or make it safer.

Activity 5: Causes of fire

Cause of Knysna fires known

The cause of the devastating fires in Knysna and Plettenberg Bay, which destroyed hundreds of properties and burned thousands of hectares of land, was announced Monday. The fire was caused by human activity and fuelled by strong winds and drought, mountain winds and vegetation. Clear evidence has been found that the fire resulted from man-made fires. The evidence includes pinecones, which were probably used as lighters, and planks stacked on top of each other.

Activity 5: Causes of fire (continue)

A candle was the cause of the house fire

The house fire that started in Durban resulted from a burning candle said the KwaZulu-Natal police. The house had no electricity, and the mother of the family decided, at nine o'clock in the evening, to light a candle for light. The candle was placed near a curtain, and the curtain started to burn. The whole house burned down.

1. Read the newspaper articles and list the causes of the fires.
2. Suggest ways in which these fires could have been prevented or avoided.

When a fire breaks out in your home or school, call the fire brigade immediately. An adult must know where the fire extinguishers are and how to use them. It's good that you also know where they are if something should happen. Here are two examples of what fire extinguishers might look like at your school or home.

Figure 10: Fire hose

Figure 11: Fire extinguisher

Here are some of the causes of fires in our area.

1. Cigarettes: Many people throw cigarette butts out of the car windows, and it can cause a fire if the grass is dry. Some people also fall asleep with their cigarettes in their hands. The blanket, mattress or sofa can then quickly catch fire.
2. Heaters: Fireplaces and gas heaters are very dangerous. Curtains, bedding, sofas and blankets should be far from the heaters. A fireplace must also have a screen in front so that a piece of coal cannot fall on the carpet and catch fire.
3. Making food: When cooking, you should never leave the food pots alone. There should also be no dishcloths or kitchen towels near the stove. Oil is also very dangerous and can ignite quickly.

Activity 6: Safety near a fire

1. What does a fire need to be able to burn?
2. What should you do if there is a fire in your house?
3. What precautions can you take to prevent a fire from breaking out in your home?
4. Make a mind map about fire safety. Write down all the ways you can prevent a fire. You can research this and add even more information to what is in the textbook.

Unit 2: Energy and electricity

Introduction

A man named Benjamin Franklin did a very dangerous experiment in 1752 when he discovered static electricity in lightning. He tied a key to a kite's rope and flew the kite during a storm. The lightning struck the kite. Benjamin Franklin grabbed the key and was shocked. He concluded that lightning contains electricity that can be conducted. Many people who also tried to do the experiment did not survive. Lightning is very dangerous and has a lot of electrical energy that can shock a person, and the person can die.

Figure 12: Benjamin Franklin

Electricity is a form of energy. Many **devices** require electrical energy as the input energy for the device to operate. When you turn on the television, the electrical energy changes into sound and light energy (this is the image you can see). When you turn on the kettle, electrical energy changes into heat energy that causes the water to boil.

1.2 Cells and batteries

Figure 13: Batteries

We cannot destroy energy, but we can store it for later use. The energy we store is called chemical energy. We store chemical energy in **cells.** This energy then changes to electrical energy. Two or more cells that are connected are called a battery. **Batteries** come in different shapes and sizes. Motor vehicles, flashlights, wristwatches and hearing aids all require batteries.

Circuits conduct electrical energy to where we need it. Look at the simple example of a circuit:

Term 4

Planet Earth and Space

Values

View of God: (Who is God?)	God is a God of order; God creates orderly and structured. Planner. God created the cosmos for His glory.
View of man: (Who am I?)	Provider. Maintainer. Almighty. Caregiver. Perfectly wise. God reveals Himself through Jesus Christ, who even subjects nature to Him. Sinful, but Jesus Christ restored it. Dependent. Unique. May study creation.
View of creation: (What must I do?)	Preserve. Stewardship. Discover. Namegiver. Cultural assignment.

Knowledge

→ Scientific knowledge:
- The earth rotates around its own axis and orbits the sun

→ Scientific Investigation:
- Parts of the atmosphere.
- Equipment to predict the weather.
- Sedimentary rocks.

Skills

1. How to draw a Science and Technology sketch:
   a. Use a grey pencil, a ruler and an eraser (try not to overdo it). Labels are written neatly in pen and placed below each other on the right-hand side. Do not colour in the sketch. Work neatly. Label lines may not cross.
2. Scientific investigation: Research
   a. Consult various sources such as textbooks, magazines and the Internet. Research the specific topic and write down what you have learned in your own words.
3. Scientific Investigation
   a. Identify different types of clouds
4. Data analysis

Unit 1: Planet Earth

Introduction

Planet earth is the third planet from the sun. You learned in Grade 4 that if the earth were just a little closer or farther from the sun, we would not be able to survive on the planet. Revelation 4 verse 11 says: "You are worthy, O Lord, to receive the glory and the honour and the power, for you created everything and by your will, they existed and were created." God created the earth and everything on it, and therefore, every day that we live is a gift from God. Just as Psalm 118 verse 24 says, "This is the day which the Lord has made; let us rejoice and be glad in it." God created day and night, and He also made the seasons. In this unit, we will learn how day and night and seasons happen.

1.1 The earth moves

The earth has two movements. The earth rotates around its own imaginary axis and orbits the sun.

The earth rotates around its own imaginary axis

The earth is a sphere that constantly rotates around its axis. This imaginary axis is tilted slightly as the earth rotates around its axis, the sun shines on one half of the earth, which is day. On the other half of the earth, it is night. The earth rotates around its axis once every 24 hours. It is what we call a day. A day has 24 hours and includes night.

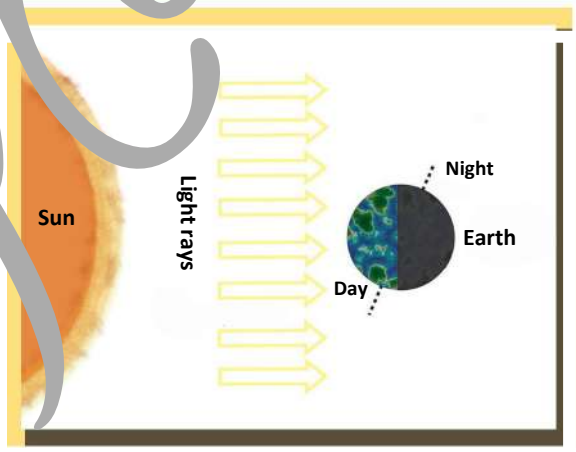


Figure 1: Day and night rotation

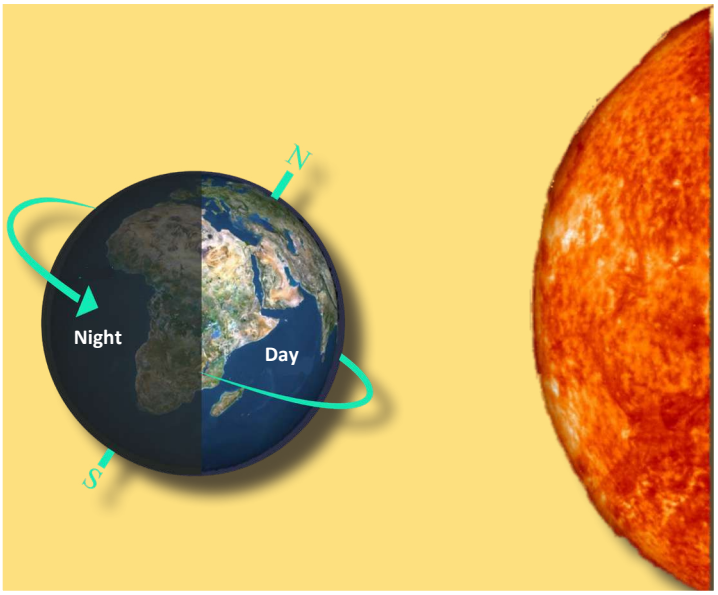


Figure 2: Day and night rotation

The earth orbits the sun

The earth orbits the sun in an oval movement. It takes the earth 365¼ days (1 year) to orbit the sun once. Just like the earth, seven other planets orbit the sun. The revolution around the sun and the tilted axis of the earth cause seasons.

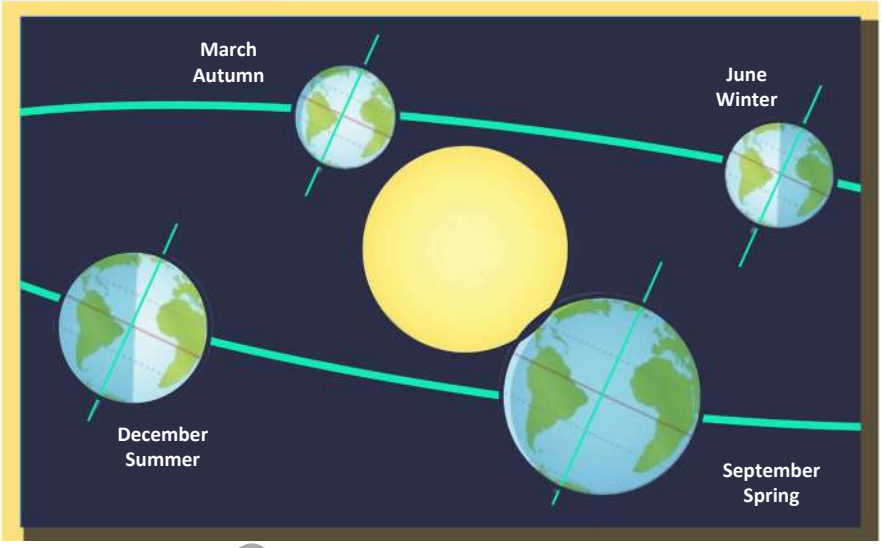


Figure 3: Seasons in the southern hemisphere

South Africa is in the southern hemisphere of the earth. During December, the sun shines more perpendicular to the southern hemisphere. We then have summer. The sun no longer shines so perpendicularly to the southern hemisphere from March onwards, so it is autumn. By June, the sun is shining perpendicular to the northern hemisphere so there is summer, and we have winter in the southern hemisphere. From September onwards our days start to get longer and the nights shorter because we get more daylight. It is spring.

Activity 1: The Earth Moves

1. Look at figure 2 of the earth on the previous page. Was it day or night in South Africa in the representation of the rotation of the earth?
2. Is it day or night in Madagascar?
3. In Egypt, it is daytime. Do you think it is morning or evening? (Look closely at the arrow pointing in which direction the earth is moving)
4. Name the two movements that the earth performs.
5. How long does it take the earth to move around its axis once?
6. How long does it take the earth to orbit the sun once?
7. Write down the definition of the following words:
    a. Imaginary
    b. Revolution
    c. Tilted
8. Draw a sketch or write a paragraph that explains the following:
    a. How do day and night originate?
    b. How do the seasons originate?

Grade 5 Learners Guide

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