

Lighthouse

- series

Natural Sciences & Technology



Natural Sciences & Technology

Grade 4

Learner's guide

The ICES Water Protocol series has been translated into
English by Anchorage Curriculum Solutions





Introduction

The Lighthouse series is an excellent, value-driven Christian curriculum. The purpose of the curriculum is to guide students to have a thorough knowledge and understanding of the subject content and principles so that they are equipped to apply the new knowledge together with their gifts and talents in God's service and their community.

Pupils are guided throughout their school careers to see the following three core values as a basis for the content in each subject in an integrated manner.

- **View of God:** Revelation. God reveals Himself in Jesus Christ to man.
- **View of man:** Sculpting. God created man as a unique being in God's image. God stepped into a covenant relationship with man, and therefore, man can step into a covenant relationship with God. From this covenant relationship, man is not just an individual but is part of a community, connected to God and neighbours.
- **View of creation:** Calling. God gave man a cultural mission to cultivate, inhabit and preserve His creation. Man must obey and answer to his unique calling and tasks on earth. This calling is carried out through individuals with unique gifts within a community.

Each core value is processed in finer detail throughout the learning content so that learner can finally answer three questions:

1. Who is God? (Revelation)
2. Who am I? (Self-image)
3. What must I do? (Calling)

The value-driven natural science and technology textbook for Grade 4 has been compiled by ICO and complies with the CAPS learning outcomes required by the department of education. It is also enriched with extra content.

This textbook covers several aspects of God's creation and the human abilities to utilize it, such as transforming nature into culture.

The following concepts regarding science are taught to the pupils so that they are finally able to answer the three core questions:

- Learn to distinguish between the Creator and the creation. The border between the Creator and the creation is the laws of nature established by God.
- Christian natural science distinguishes between matter, the plant kingdom, the animal kingdom, and humankind. The creation was created as a unit but with lots of variety. Man was created in the image of God and is not an animal.

- According to Christian philosophy, there is no contradiction between faith and science. True faith will not contradict actual science and vice versa.
- As believing scientists, we must test our assumptions against the Word of God. Our results should be consistent with the guidelines we find in the Bible.

The following concepts regarding technology are taught to the pupils:

- Man must ensure that God's creation is preserved, and that God and his fellow men are served by it.
- Pupils learn that technology is not merely human inventions. It forms an integral part of creation, and for that reason, when exploring possibilities, the order, balance and interdependence of creation must not be disturbed or abused.
- Man's attitude and disposition determine what he does. Technology can be used to spread the gospel, but it can also be used to practice idolatry. Technology must always serve to be in line with man's first calling, and that is to serve God and his neighbours.

ICO's prayer is that this book will contribute to equipping students to go out into the world and live as believers, according to their calling.

January 2020





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Natural Science and technology go hand in hand. God created all things, and He instructed man to rule over the earth, yes, over all the plants, fish, birds and animals. He also commanded us to inhabit and cultivate the earth. God gave man the ability to process things to be helpful for us.

Lots of people received talents to create and invent new things. We glorify the Lord and make life easier for our neighbours and us with these inventions. Good examples of these inventions are the light bulb, the telephone, electricity and the computer. People use their knowledge about technology and science to invent new things and experiment with them. During this year, you will learn new things to broaden your understanding of God's creation and how to nurture it and care for it. You will also learn how to do experiments and carry out assignments.

The technological process

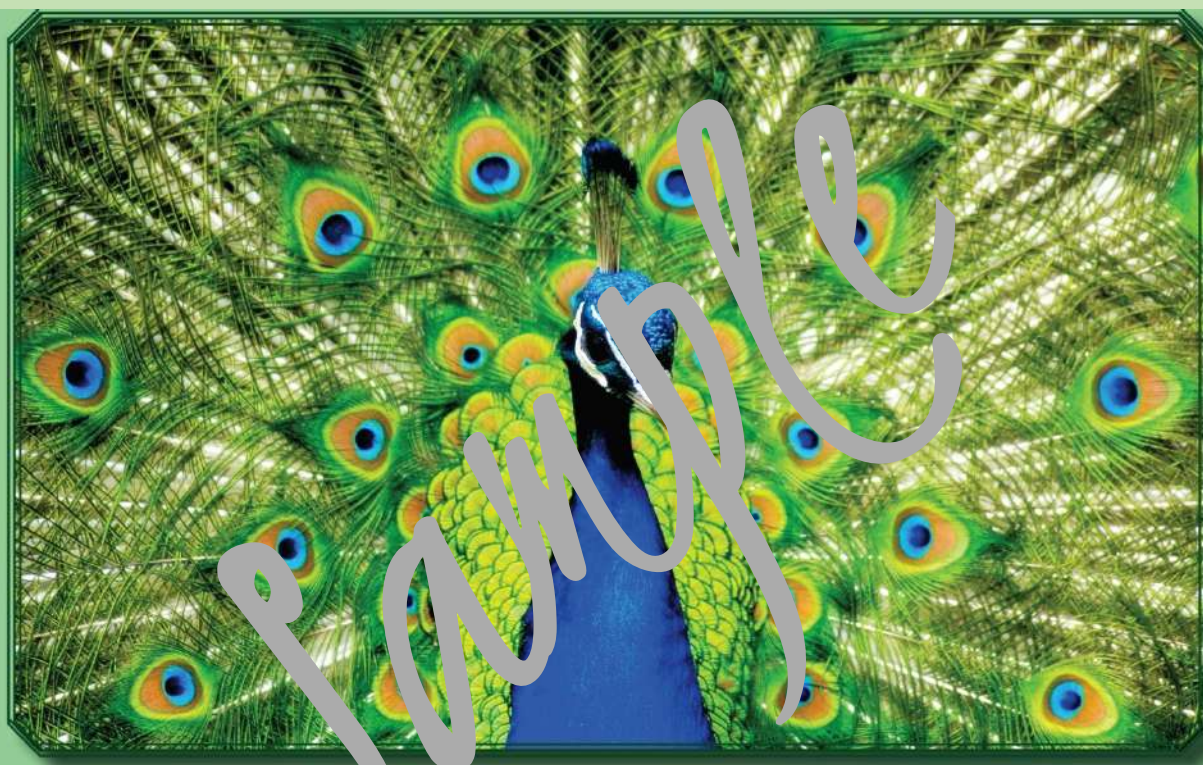
God reveals Himself as a God of order. We see this in the creation story in Genesis but also throughout the Bible. God called us to deal with His creation in an orderly manner. Therefore, when we make plans to design or build something, it happens in an orderly fashion. We call this the technological process. It is advisable to follow the following steps of the process to get reliable results.

1. **INVESTIGATE:** Here you need to investigate the problem you need to solve. Research the problem and gather knowledge about it to make sure you understand it.
2. **DESIGN:** How are you going to solve the problem? Here you must plan what the object will look like, what materials you will need to make it and how big the object will be.
3. **MAKE:** Here you must make the object. Work neatly. Do not rush to finish. Work carefully and make sure you do everything according to your design and specifications. Does your object work as planned, or do you need to make changes or improvements?
4. **EVALUATE:** Before the teacher assesses you, you must evaluate yourself to ensure you have done everything according to the specifications.
5. **COMMUNICATE:** Show the object you made to your friends and teacher and explain how you did it.



Term 1

Life and Living things





LIFE AND LIVING THINGS

Values



View of God: (Who is God?)	God is the Creator of the universe. Maintainer. Provider. Ruler
View of man: (Who am I)	Dependent on God. Created in the image of God.
View of creation: (What must I do?)	Cultural mission – inhabit, cultivate and preserve. Stewardship - I must use my mind to the glory of God and my neighbours.

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:

- We explore different ways of strengthening structures.

→ Technology and the environment:

- Characteristics of animals and plants.



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: Build an animal shelter.





LIFE AND LIVING THINGS

Unit 1: Life and non-living things

Introduction

God is the Creator of the universe. In Genesis 1, we read that God created the heavens and the earth in 6 days according to a specific order. First, God created all the non-living things, including the separation between light and darkness and between water above and below the earth. On day three, God separated the land and the water, and He created plants. After that, God created the sun, moon and stars. He created the birds and the fish on day five, and on day six, He created animals and humans. God created man to inhabit, cultivate and preserve the earth. God is the Creator, Sustainer and Ruler of the cosmos.

1.1 Living things

Living organisms (humans, plants and animals) can carry out seven life processes.

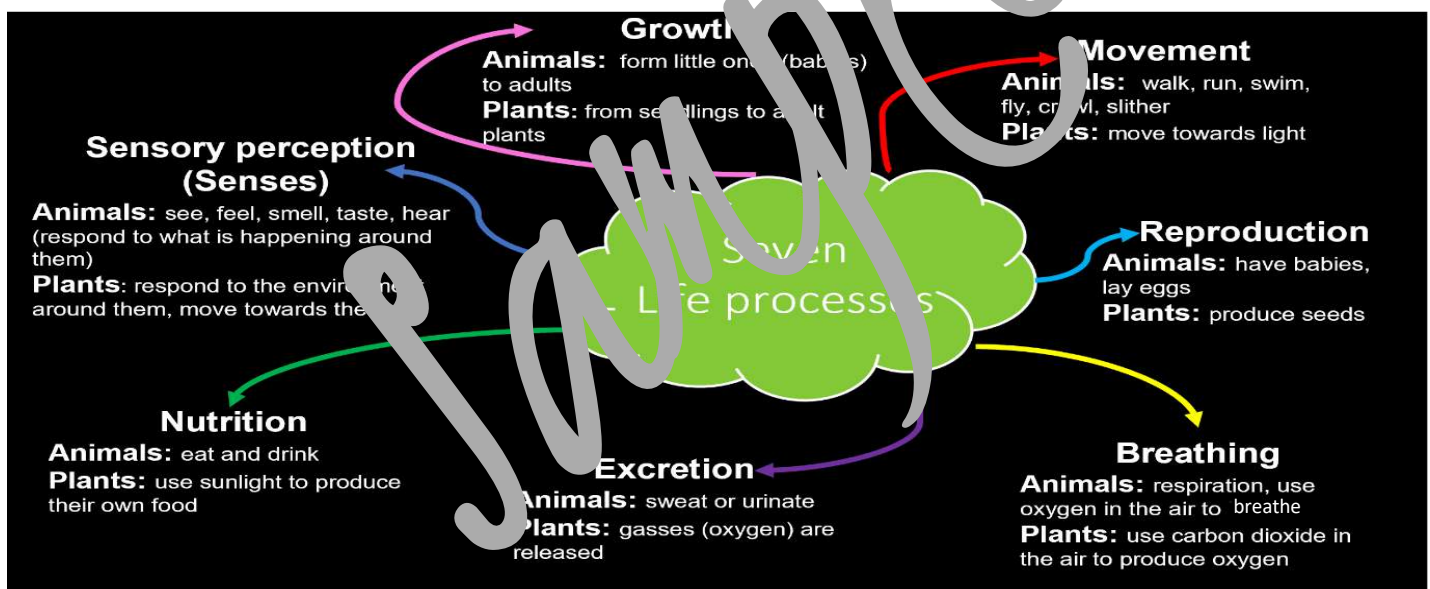


Figure 1. The seven life processes

Some organisms may appear to be not alive until exposing them to the right circumstances. Dry beans, a fertilized egg, seeds, and dry yeast are living organisms that are only temporarily dormant (apparently non-living). Once these organisms get exposed to the right amount of water (moisture) and heat, the life processes of these organisms will start.



Figure 2: Dry beans, a fertilized egg, dry yeast and sunflower seeds



LIFE AND LIVING THINGS

1.2 Non-living things

When an organism cannot perform all seven life processes, we say it is non-living. God created man to act as a steward over all living and non-living things. God also gave man wisdom and knowledge to discover and invent new things. Examples of things that are non-living are rocks, sand, an empty bird's nest, fire, water, the sun, moon and stars. There are also man-made things that are non-living, like the mug you use to drink your coffee, the shoes that you wear, your clothes, a rugby ball or the house you live in. God has given man a mind and the gift of understanding with it. God helps us use our minds to invent many new things to make life easier for man. There are also non-living things that were alive once but died. Examples of these are leaves that fall on the ground, animals that die or wood that burns in a fire. Therefore, an organism is only alive when it can perform all seven life processes.

Activity 1: Living and non-living things

1. Your teacher will give you a table. Copy it into your workbook.
2. Complete the table by making a tick or a cross in each block. Use a tick if the life process can be performed and a cross if the life process cannot be performed. Write your conclusion in the last column. Is it "living" or "non-living"?
3. Complete this sentence: Something is living when

Activity 2: Determining what yeast needs to grow

You are going to do an experiment. Answer the following questions before you do it.

1. What is the meaning of dormant? Give two examples of dormant organisms.
2. Your teacher will give you dry yeast. Is dry yeast living or non-living?
3. Read the steps you need to follow when doing the experiment. What will happen after five minutes?

Do the experiment with a friend. You will need: two empty containers (bottles or beakers), warm water, two teaspoons of dry yeast, and four teaspoons of sugar.

Experiment:

1. Put one teaspoon of yeast and two teaspoons of sugar in both containers.
2. Fill both the containers half full of warm water.
3. Stir the mixtures a few times and cover one container with cellophane.
Leave the mixtures for five minutes and observe what happens to the yeast.



LIFE AND LIVING THINGS

Activity 2: Determine what yeast needs to grow (continue)

Answer the following questions in your workbook:

1. What happened five minutes after adding the water?
2. Was the yeast alive after the water was added? Explain your answer.
3. What did the yeast need to grow?
4. Do you think the yeast reproduced? Explain your answer.
5. Do you think the yeast breathes? Explain your answer.
6. Research: Find out what exactly yeast is and what its uses are.

Activity 3: Germinate bean seeds

You will need: dry beans, newspaper, a saucer and a new water. Now, do the following:

1. Soak the dry beans in water for two to three hours.
2. Place the beans on a wet newspaper inside the saucer.
3. Cover the beans with damp newspaper.
4. Put the saucer in a sunny place like a window sill that gets a lot of sunlight.
5. Make sure that the newspaper stays moist.
6. Observe the beans for two weeks and see what happens.
7. Record your observation daily.

Answer the following questions in your workbook:

1. What does a seed need to grow?
2. Does the root or the shoot grow first?
3. Why does this part grow first?
4. After how many days did you see the first leaves?
5. Why does the plant need green leaves?
6. Draw a pencil sketch in your workbook of the germinated beans and label it.

TAKING CARE OF PLANTS:

Once your bean seed has germinated, you should plant it in fertile soil, preferably in a pot, so that you can take it to school later. You need to take care of this plant. Do research or find out from your nearest nursery how much water you should give your plant, how much sunlight your plant needs and where the best place is to put it. You can try this with other plants as well.



Activity 4: Research assignment

Give a definition for the following words:

1. Germinate
2. Living organisms
3. Non-living organisms
4. Classification
5. Dormant



Unit 2: Plants

Introduction



Figure 3: Baobab trees

On the third day, God created plants. There are many different types of plants on earth. Some plants have leaves, others have flowers, and some make fruits and seeds. Each plant is uniquely created to adapt to its environment and to be able to survive.

Plants found in the desert can survive very long periods without any water. These plants store water in their stems and leaves for the dry season. Some trees have a very long root system with roots that reach deep below to get water underground. Grasslands' roots hold the soil in place during major storms to prevent soil erosion.



Figure 4: Water lilies



Figure 5: Soil erosion



Term 2

Matter and materials





MATTER AND MATERIALS

Values



View of God:

(Who is God?)

God is the Creator and Sustainer of the universe.

View of man:

(Who am I?)

Crown of God's creation. Created in the image of God. Intellectual (able to reason).

View of creation:

(What must I do?)

Cultural mission – inhabit, cultivate and preserve. Stewardship. Develop and cultivate the earth.

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 of materials.

→ Technology and the environment: Strengthening of structures and the use of struts.



Skills

1. Safety during experiments:

Always ask an adult to help or assist you when you must do an experiment.

2. Scientific investigation:

- Observe and compare
- Follow steps to apply the technological process
- Making things: Build a strong frame structure

3. Scientific investigation:

Data analysis.





MATTER AND MATERIALS

Unit 1: Materials around us

Introduction

In Genesis 2, we read that God used the dust of the earth to create the human body. After that, God breathed life into man, and man became a living being. We also read in Genesis 2 that, at that time, it had not rained at all. God lifted mist from the earth, and this mist watered the ground. Matter is everything around us and everything you just read about. The water that bubbles from the earth is a liquid. The animals created are solids, and the breath that animals breathe out is an example of a gas. Matter is all around us. Every living and non-living organism on earth consists of matter. Matter and materials can exist in three different states: solid, liquid, and gas. These three phases are also known as the three states of matter.



1.1 Solids, Liquids and gases

Let's study the properties of the states of matter.

Solids

Solids occupy space. Solids can be as big as a giant rock or as small as a grain of sand. A solid has a specific shape and cannot easily be compressed or flattened. Therefore, a solid retains its shape, and its molecules do not move around.



Figure 1: Ice



MATTER AND MATERIALS

Liquids

Liquids are substances that take on the shape of the container it is poured into. A liquid can flow, and the molecules can move past each other. Therefore, a liquid has no form of its own. Examples of liquids are water, milk, coffee and raindrops.



Figure 2: Water

Gases



Figure 3: Gases

Gases also do not have a form of their own but do occupy space. Gases fill the entire container or space it is placed in. Humans cannot see most gases, nor can you touch it. The air around us consists of certain gases. Gases can be stored in containers. The gas molecules fill the entire container it is stored in. The molecules in gas move around quickly.

The three phases of matter

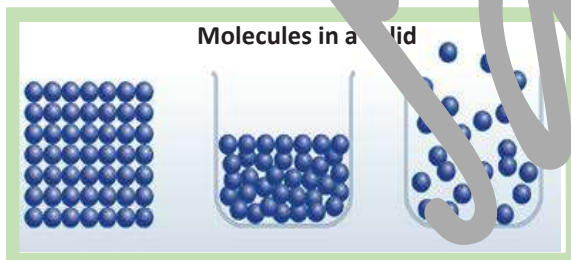


Figure 4: Representation of a solid, liquid and gas

All matter is made up of molecules. Molecules are tiny particles that consist of atoms. When the molecules are very close to each other and cannot move, it forms a solid. When the molecules are further apart and can move around, it forms a liquid. Molecules that move around freely form a gas.

Go outside with your teacher and then follow the teacher's instructions.

A FUN OUTING:

Stand very close to your friends and straighten your arms. Hold hands with the friend next to you but try not to bend your arms or body. You must stand as straight as possible. Now, try to jump around and move while standing upright between your friends.





MATTER AND MATERIALS

Molecules in a liquid

You must still hold hands but stand a little further apart, and you may bend your arms. Now, try to move and jump around.



Molecules in a gas

Now, let go of your friend's hand. Run and jump around.

Discuss the answers to the following questions in class:

1. Was it easy to jump around when you were standing so close to each other? Could you jump and move the way you wanted to?
2. Describe the movement of the molecules in a liquid.
3. What happened when you could move around like the molecules in a gas? Can the molecules in a gas move any way it wants to?

Activity 1: Matter and Materials

Copy the following table in your workbook:

Solid	Liquid	Gas

Decide whether the following pictures are examples of solids, liquids or gasses, and then write them in the correct column in the table.

Sunflower oil 	Shirt 	Fruit Juice 
Wood 	Plastic bag 	Helium 



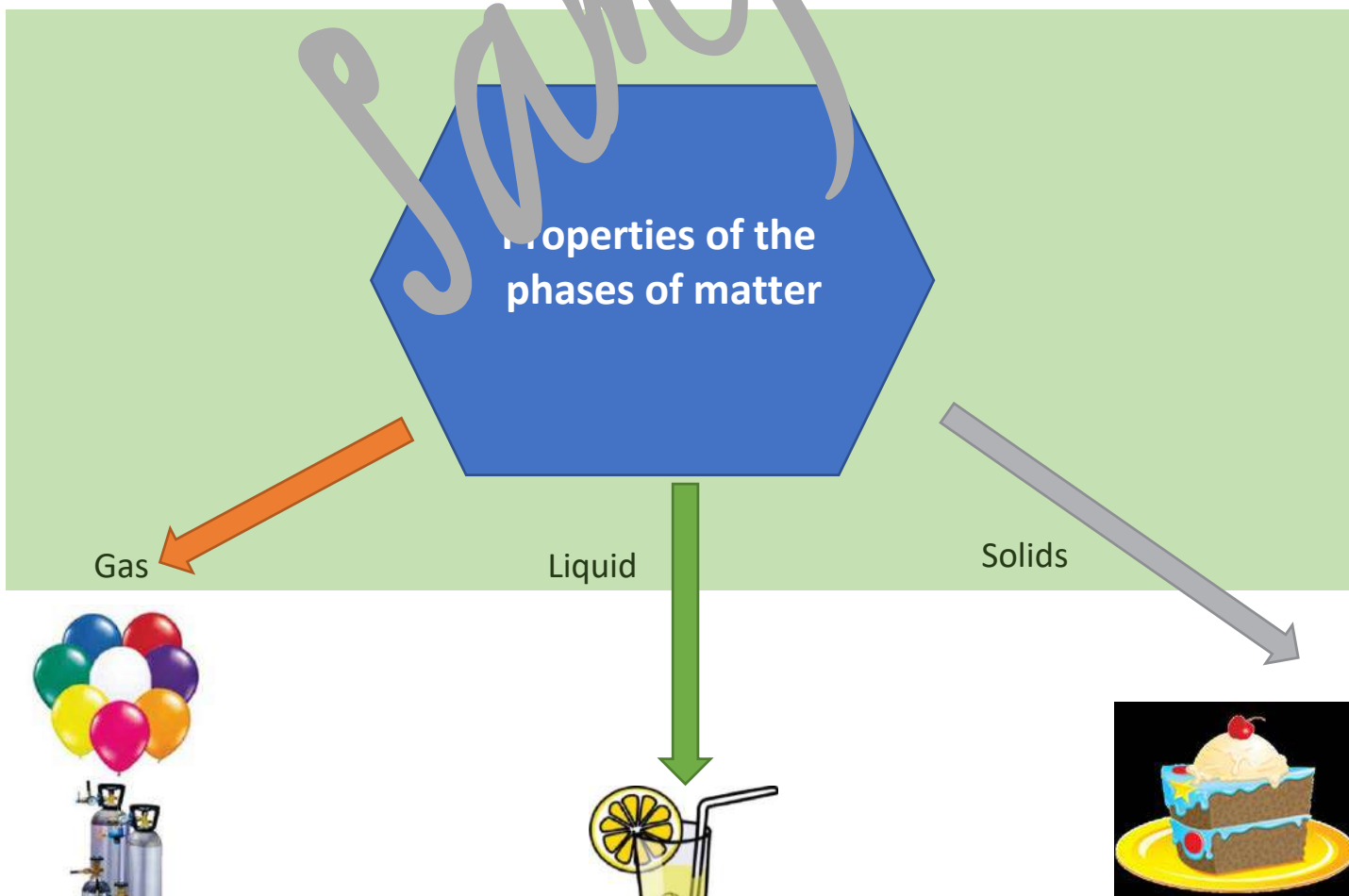
MATTER AND MATERIALS

Activity 1: Matter and Materials (continues)

Rock 	Steam 	Water 
Ice 	Rain 	Oxygen 
Carbon dioxide 	Milkshake 	Gas 

Activity 2: Properties of the phases of matter

Make a summary of the properties of the three phases of matter. Draw the mind map below in your workbook, and then complete the mind map by filling in the properties.





MATTER AND MATERIALS

Change of condition



Figure 5: Solid (ice cube)

Liquid (water)

Gas (steam)

Some materials can change from one phase to another. Certain solids can change into liquids. Think of your delicious soft-serve ice cream on a hot day. The ice cream can quickly melt and turn into a liquid. Certain liquids can change into gases or solids, and gases can change into liquids or solids. Materials can change shape when they are heated (heat is added) or when they are cooled (heat is removed).

Melt

When solids are heated, and it turns into a liquid.

Example: Ice that is taken out of the freezer. It is warmer outside than in the freezer, so we add heat to the ice turning it into water, which is a liquid.

Evaporate

When liquids are heated, they turn into gases.

Example: Water that is heated forms water vapour (steam).

Condense

When gas is cooled, it can turn into a liquid again.

Example: Keep your hand above boiling water. Be careful not to burn. Can you feel that your hand gets wet from the steam? The water vapour changed back into water.

Freeze / Solidify

It is when a liquid cools even further to form a solid again.

We take heat away until the water turns into ice again. This means the water has frozen or solidified. ("Solidify" is a term more commonly used in a kitchen, while "freeze" is a laboratory term.) Some substances can also crystallize.

DID YOU KNOW?

Water is one of the few substances found naturally in all three phase conditions on the earth's surface.





MATTER AND MATERIALS

Activity 3: Change of condition

1. Do the following experiment to investigate the states of matter.

Ask an adult to help you so that you do not get hurt.

Follow these steps:

- A. Put a few ice cubes in a small pot on the stove.
- B. Set the heat to high.
- C. Observe what happens.
- D. Keep heating the ice. It will melt, and then it will start to boil.
- E. Take a plate or the lid of a pot and hold it above the pot. What happens?
- F. Turn the stove off. Remove the pot from the stove and let the water cool. Pour the water into an ice tray and put it back into the freezer.
- G. Look what happens after a few hours.

Draw pencil sketches for steps A, D and G and label them.

2. Write the definitions of the following words:

- 2.1 Melt
- 2.2 Evaporate
- 2.3 Condensation
- 2.4 Solidify
- 2.5 Water vapour
- 2.6 Molecules



1.3 The water cycle

Everything God created is good. He sustains and cares for creation. One of the methods God uses to do so is through the water cycle.

1. The sun heats the water in rivers, dams, lakes and oceans. The water vapour then changes to steam that rises into the air. **(Evaporation)**
2. Plants also help to form water vapour in the air. During photosynthesis, the plant releases water vapour. **(Transpiration)**
3. It is colder high in the air than on earth. This causes the air to cool down and the water vapour to turn into water droplets again. **(Condensation)**
4. The water droplets pack together to form clouds. As the water droplets get bigger, they fall back to the earth in the form of rain, hail, sleet or snow. **(Precipitation)**



MATTER AND MATERIALS

5. The water is taken up again by rivers, lakes, dams and oceans. Water also sinks into the soil, where plants can absorb it. **(Runoff)**

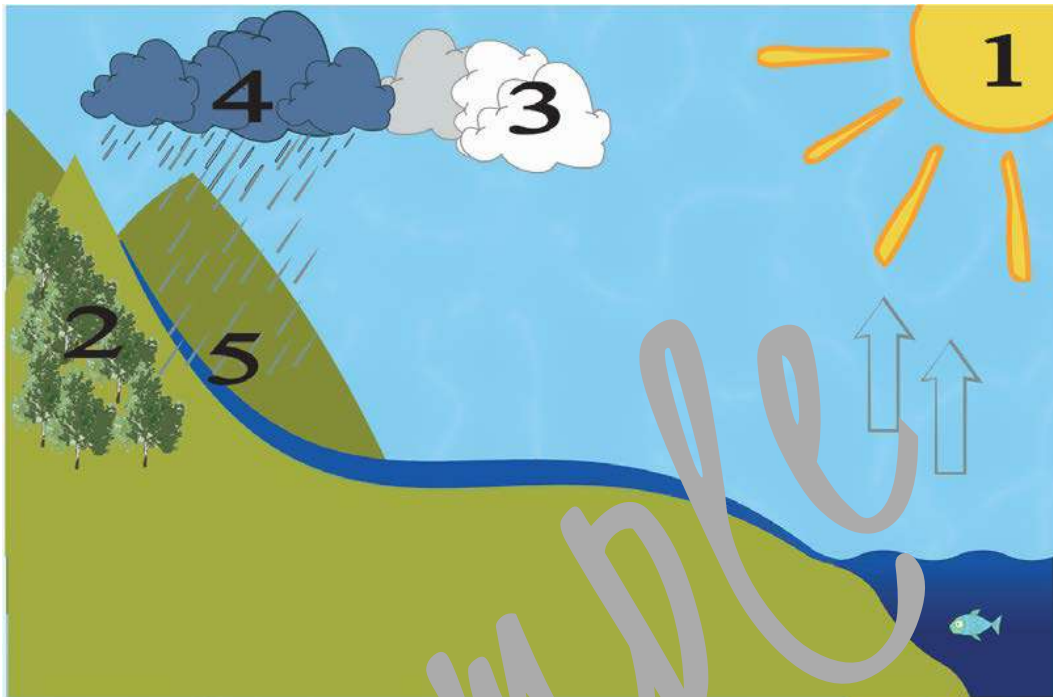


Figure 6: The water cycle

Activity 4: The water cycle

1. Draw the water cycle and label it.
2. Write the water cycle steps and explain each of them in one sentence (a definition).
The first step is done for you:

Evaporation – The sun heats the water (rivers, dams, lakes and ocean).

Unit 2: Solids

Introduction

God has given us the knowledge and skills to use different materials to make objects that we use every day. Like natural and man-made structures, materials can also be natural or man-made. Just think of your beautiful wooden dining room table at home. Wood comes from trees that grow in nature.

The wood is processed to form furniture. The furniture is a man-made product.



Figure 7: Processed wood products



Term 3

Energy and change



ENERGY AND CHANGE



Values



View of God: (Who is God?)	God is the Creator of the universe. Never-ending. Provider. Almighty.
View of man: (Who am I?)	Crown of God's creation. Created in the image of God. Unique and wonderful. Dependent on God.
View of creation: (What must I do?)	Cultural mission – inhabit, cultivate and preserve to the glory of God and for the salvation of my neighbors.

Knowledge

→ New words:

- Use a dictionary, the internet or any other source to look up and write down the definition of the new words.

→ Scientific knowledge:

- Different types of energy.

→ Technology and environment:

- Observe, measure and compare.
- Music instruments and sound.



Skills

1. Scientific investigation:

- Do research.

2. Construction and scientific knowledge:

- Draw a food chain.

3. Scientific investigation:

- Follow steps to apply the technological process.
- Analyse and understand systems.
- Data management.

4. Scientific knowledge:

- Distinguish between wind, string, percussion and picking instruments.





Unit 1: Energy and energy transfer

Introduction

As humans, we can quickly get tired and weary. We use energy when we learn, run, breathe or even sleep. All living organisms use energy. Fortunately, we serve a God who never gets tired or weary. In Isaiah 40, the author says that God never gets tired. He gives us the strength to keep going by providing us with what is needed to provide energy to our bodies. Energy gives living organisms the ability to do something. We obtain energy from the food we eat. Energy comes from the sun that God created. The sun is a very large star that consists of burning gases. These burning gases release energy in the form of light and heat. We say that the sun is the source of all energy on earth, and its energy is inexhaustible.

1.1 Energy for life

Energy chain

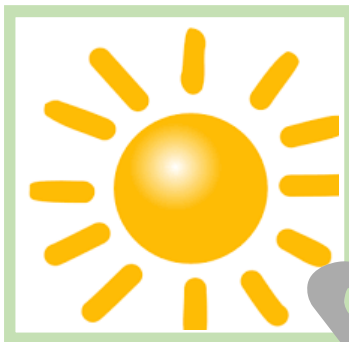


Figure 1.1 Sun

Energy is the ability to work. We need energy to be able to perform all seven life processes. We use energy when we grow, move and even chew our food. When we chew our food, we get energy from the food, which is part of the food chain. For example, when we eat meat, we get energy from the meat. The animal got the energy from the plant he ate, and the plant got the energy from the sun. The sun is the source of all energy on earth. The sun gives us heat and light energy.



Figure 1.2 Plants



Figure 1.3 Animals



Figure 1.4 Humans

Activity 1: Energy for life

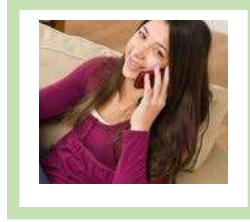
Look at the pictures below and then answer the questions:



A.



B.



C.



D.



Activity 1: Energy for life (continue)

- 1.1 What do the people in the pictures need for energy?
- 1.2 For which of these activities does one need the most energy?
- 1.3 Why do you burn energy even when you sleep?
- 1.4 Is there anything you do that you do not need energy for?
- 1.5 Give five more examples of how you use energy every day.
2. Draw the table in your workbook. Complete it by filling in what part of the meal comes from plants and what part comes from animals:

Food	Energy from plants	Energy from animals
T-bone and salad		
Fish and chips		
Macaroni and cheese		

3. Explain what a carnivore, herbivore and omnivore are.



1.2 Energy from the sun

All energy comes from the sun. Without the sun, nothing on earth will be able to survive.

Plants - When a plant absorbs light from the sun, the plant produces sugar (glucose) using water and carbon dioxide. This process is called photosynthesis. Plants use energy to grow and to produce seeds, fruits and flowers.

Animals - Herbivores and omnivores eat grass and other plants, so these animals get energy from plants. Carnivores eat the herbivores and omnivores and get their energy from the animals that ate the plants.

Humans - Humans eat fruits and vegetables that come from plants and meat that comes from animals to give us the energy we need to live.



An Energy chain:

An energy chain shows us the energy transfer from one organism to another. In the picture below, you can see that the grasshopper eats the grass, the frog eats the grasshopper, the snake eats the frog, the eagle (bird of prey) eats the snake. When the eagle dies, it places nutrients back into the ground. In return, this helps plants grow again, and photosynthesis takes place when the sun shines on the plants.

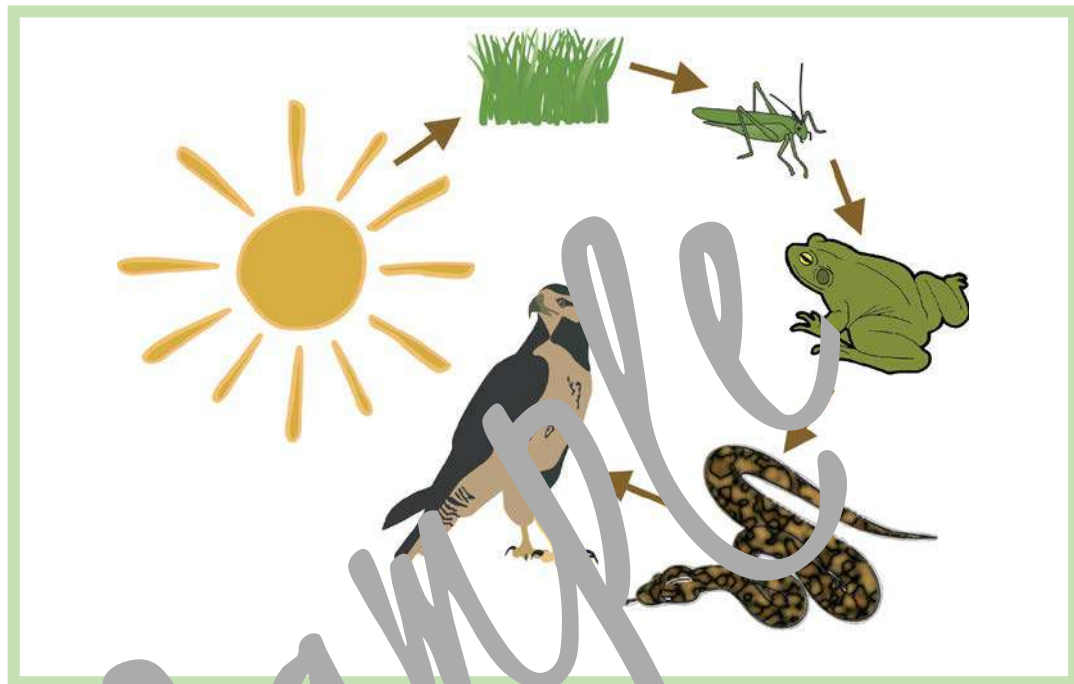
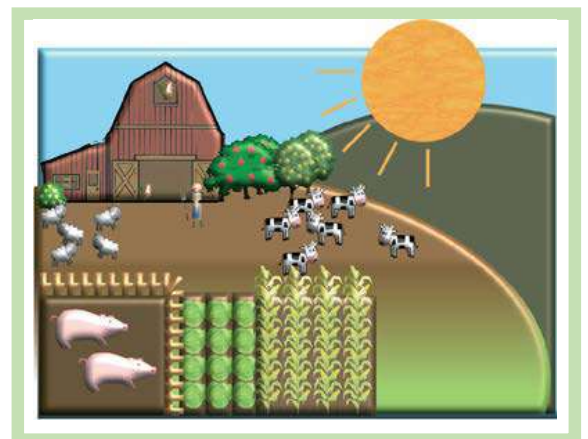


Figure 1 Energy chain: Sun -> Grass -> Insect -> Frog -> Snake -> Eagle

Activity 2: Energy for life

Look at the picture below and then answer the questions:

1. Make a list of all the plants in the picture?
2. Which of these plants are only eaten by humans?
3. Which of these plants are only eaten by animals?
4. Which of these plants are eaten by both humans and animals?
5. For what do plants use light energy?
6. What does a cow eat to get energy?
7. Where does the energy in the plants and grass come from?





Activity 3: Energy chain

1. Draw a simple energy chain that includes at least five living organisms.
2. Rearrange the following energy chains:
 - a) Grass → lion → buck
 - b) Fish eagle → fish → seaweed
 - c) Chameleon → flower → bird of prey → butterfly
 - d) Mouse → snake → owl → grasshopper → grass
 - e) Human → insect → plant → fish

Unit 2: Energy around us

Introduction

Energy is all around us, but where does all the energy come from, and what are the forms of energy? These questions will be answered in this unit.

2.1 Sources of energy

A source is where something begins. A source of energy is where energy is stored, and the source can give us energy. We get our energy from plants and animals that get their energy from the sun. The sun is the source of energy for plants and plants and animals are our energy sources.

There are two different types of energy sources:

- **Renewable energy sources:**
God created renewable energy sources as constant sources of energy. It exists forever. Sun, wind, water and wood are renewable energy sources.
- **Non-renewable energy sources:**
Energy sources that can run out of energy are called non-renewable sources of energy. Examples are coal, oil and gas. These sources consist of dead plants and animals that died long ago and now lie deep beneath the earth's crust, waiting to be mined. In South Africa, coal is such a source and is mainly used to generate electricity. This means that coal is the source of energy for electricity.

2.2 Forms of energy

There are many different forms of energy. All the different forms of energy have the same characteristic: it can do work or it can do something.

Energy cannot be seen or touched. We can see the effect of energy around us in various ways. We can feel heat caused by energy. We can hear sounds, and we can see movement.



Term 4

The earth and space



THE EARTH AND SPACE



Values



View of God:

(Who is God?)

Creator. Maintainer. Provider. Perfectly wise.

View of man:

(Who am I?)

Created in the image of God. Has fallen into sin, but Jesus Christ restored it.

View of creation:

(What must I do?)

Preserve. Stewardship. Discover. Name.

Knowledge



→ Scientific knowledge:

- Know the planets in order from the sun.

→ Scientific investigation:

- The sun is our nearest star. The earth and planets revolve around the sun. The sun is the centre of our solar system. The moon reflects the sun's light.

Skills



1. Scientific investigation:

- Do research.
- Make a rocket.

2. Construction and scientific knowledge:

- Recall knowledge by means of a mind map.
- Categorize knowledge.
- Draw the phases of the moon.



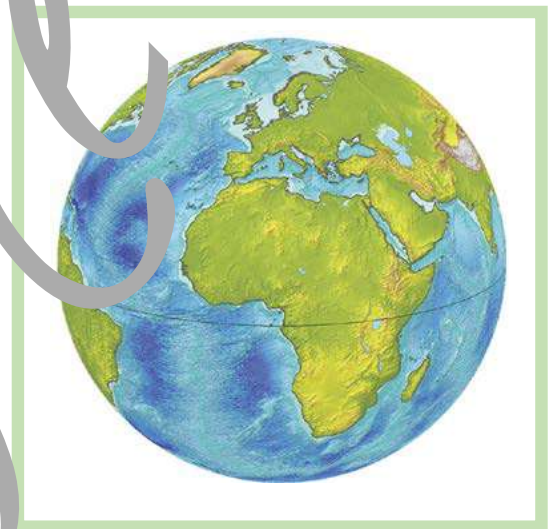
Unit 1: The earth

Introduction

God created the earth so that the climate is exactly right for humans, animals and plants to live on the earth. If the earth were a little closer to the sun, everything would scorch. If the earth were a little further away from the sun, everything would have frozen. The earth rotates around the sun. This revolution causes seasons. After winter comes spring, and then everything looks new again. The earth also rotates around its own imaginary axis, which causes day and night. Each morning is a new beginning. God meticulously planned and made everything.

1.1 Characteristics of the earth

The earth is the third planet orbiting the sun, and is the only planet where humans, animals and plants can survive. It has three things essential for the survival of living organisms: an atmosphere rich in oxygen and other gases, a large amount of running water, and sunlight. The biggest surface of the earth is covered with water (29 % land and 71 % water). The atmosphere is a layer of air surrounding the earth. It is almost like a



blanket that protects us. It protects us against radiation from space and keeps the earth's temperature stable. Beautiful photos of the earth can be taken from space.

The earth has the form of a sphere. But then, why do we not fall off? God created gravity. With gravity, we become like magnets attracted to the earth. The layer of air around the earth is also held in place by gravity.

1.2 Continents and islands

The earth is covered with a layer of solid rock called the earth's crust. The lowest areas on earth are covered with water and form the bottom of seas and oceans. The high areas on earth form continents and islands. A continent is a large landmass separated from other continents by water or other natural features, like mountain ranges. There are seven continents. Each continent has a wide variety of habitats and plant and animal life. Islands are continents that are surrounded by water from all sides. An island is much smaller than a continent that is completely surrounded by water, like Australia. Madagascar and Mauritius are African countries that are islands.

THE EARTH AND SPACE



The earth has three oceans. An ocean is a large body of water. A sea is much smaller than an ocean and is more surrounded by land than an ocean is.

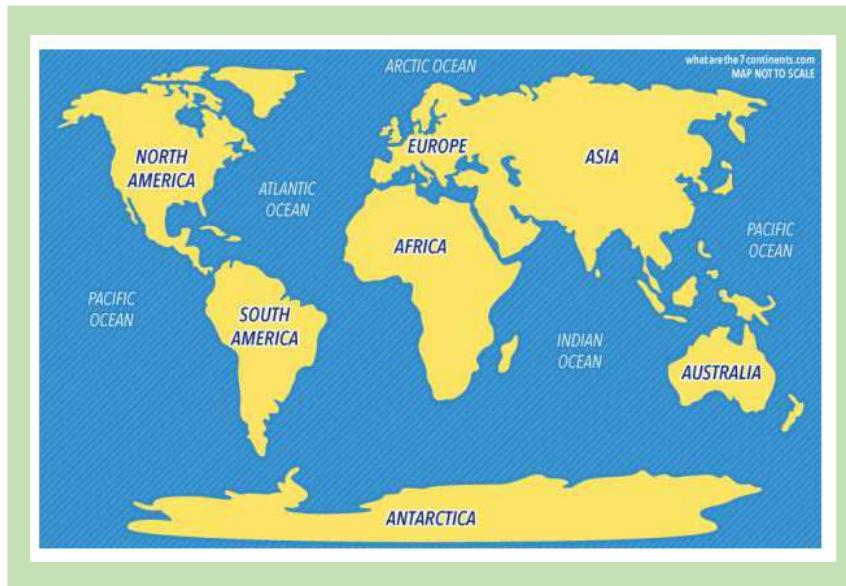


Figure 2: The 7 Continents and the 3 oceans

Activity 1: Characteristics of the earth

1. Name three things that make up the earth's surface.
2. Write the definition for the following words:

Habitat

Ocean

Island

Continent

Sea

Gravity

Sphere

Earth's crust

3. In which habitat are these animals found and why?



Elephant



Ant



Cheetah



Bee



Dolphin

THE EARTH AND SPACE



3.1 The earth and space

The sun is at the centre of our solar system, which also has eight planets, moons, space debris, stars, satellites, asteroids, comets, rock and dust orbits around the moon.

Planets are spheres made of stones, metal or a mixture of gases. The planets orbit around the sun. The gravity of the sun holds the planets in orbit around the sun.

The first four smaller planets (Mercury, Venus, Earth and Mars) consist of rock. The four outer, larger planets (Jupiter, Saturn, Uranus and Neptune) consist mainly of gases. The dwarf planet, Pluto, also consist of rock.

The sun, moon and stars can be seen from earth with the naked eye, but we can also see Mercury, Venus, Mars, Jupiter and Saturn.

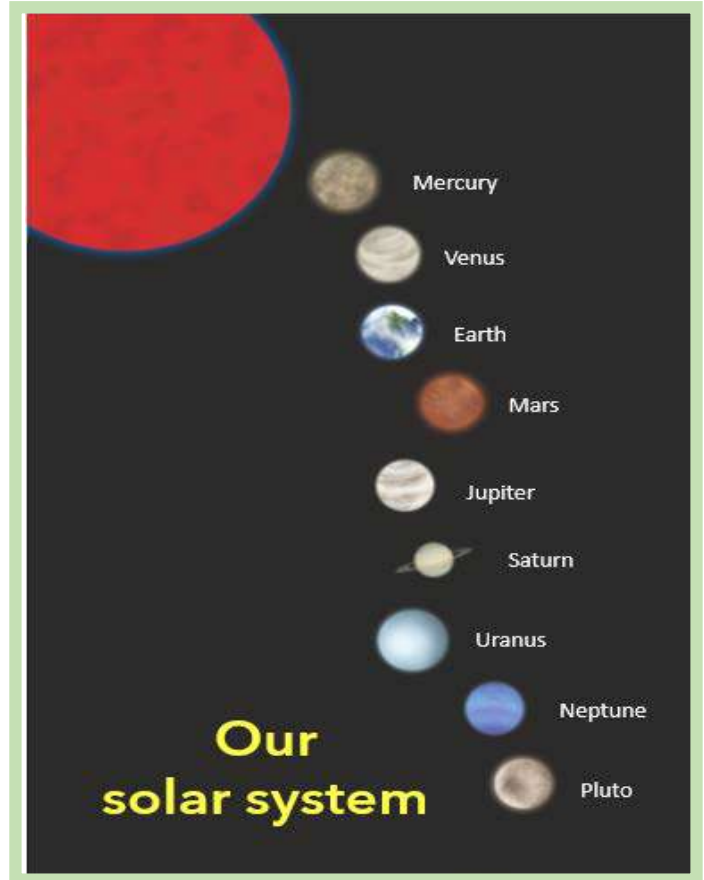


Figure 3: Solar system

This sketch is not drawn to scale and shows only the planets in order from the sun.

A star like the sun is a sphere of burning gases that radiate light and heat. Stars are much larger than planets and have fixed positions in space.

REMEMBER THE SEQUENCE OF THE PLANETS AS FOLLOWS:

My Very Efficient Memory Just Summed Up Nine Planets.

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune

(Pluto is now considered a dwarf planet)



THE EARTH AND SPACE



Figure 4 Pluto the dwarf planet

Pluto was classified as a dwarf planet in the year 2006. Every day, new research is being done on space. This research frequently changes because the galaxy is so big. People are building telescopes that can see much further than we could a few years ago.

In 2021, NASA sent a new telescope into space.

This telescope's name is the James Webb telescope. You can read more about the latest research at www.jwst.nasa.gov. Look how impressive the James Webb telescope looks.

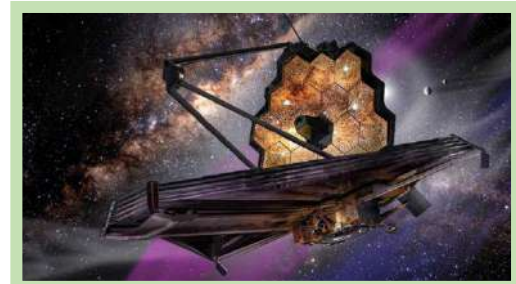
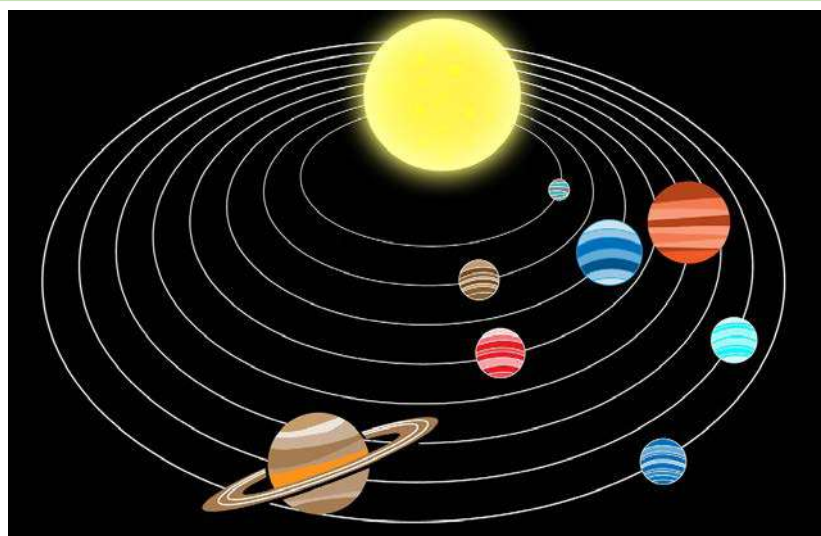


Figure 5: James Webb Telescope

Activity 2: The earth and space

Planet project:

1. Draw the sun and each of the planets. Colour them and cut them out.
2. Take an A4 sheet of black cardboard. Splash white paint on it with an old toothbrush (galaxies).
3. Cut the sun in half and paste it to the side of the cardboard.
4. Draw lines with a grey pencil to indicate the orbits.
5. Paste each planet into its correct orbit.



Grade 4
Learners Guide