NATURAL SCIENCE AND TECHNOLOGY GRADE 4 TERM 2

Matter and Materials.

Materials around us.

Everything around us is made up of matter. All solids, liquids and gases in the world are matter. Matter takes up space and has mass, this means we can weigh matter. When we use matter to make something we usually call it a material.

There are three state of matter

- Solids
- Liquids and
- Gases.

These are substances that make up all the materials around us.

Solids

A solids has a fixed shape. They keep their shape. Particles cannot move past each other. The shape of a solid does not change easily. An apple and a brick are example of a solid. The only way they can change their shape is by force. For example, if you bite into the apple with your teeth or hit the brick with a big hammer, you will change the apple's and the brick's shape.

Liquids

A liquids does not have a fixed shape. Liquids flow and take the shape of the container. Particles can move past each other and liquid can be poured. A liquid take the shape of the container. Milk, water and juice are liquids. When you pour milk into a glass, it takes the shape of the glass. If you spill the milk on the floor, it will spread quickly as it takes the shape of the floor, so that liquids flow.

Gases

A gas has no shape but it takes up space. A gas spread out and have no shape, but can be contained. Particles can move past each other and move freely. It can move around freely and spreads out into open spaces. Gases will not stay in an open container or space. They can be contained in a closed space, such as air inside a balloon. You cannot see, feel, or smell some gases. The air we breathe is a gas. Air is made out of different gases.

Activity 1:

Copy the following table into your exercise book.

Make a list of at least five solids, liquids and gases which you can see.

Solid	Liquid	Gas

1. Give a definition for each of the states of matter:
   a) Gas -
   _____
   _____.
   b) Liquid -
   _____
   _____.
   c) solid -
   _____
   _____.

Change of state

When a material changes from a liquid to a solid, from a solid to a liquid, from a liquid to a gas, from a gas to a liquid, so that the material has a change of state.

Change of state is a substance that changes from one state of matter to another when it gains heat or loses heat. e.g. a liquid becomes a gas when it gains enough heat.

Melting –means changing from solid to liquid.

If solids are heated, they can change into a liquids. For example, if we add heat energy in a frying pan, it melts and becomes liquid.

Evaporating – means changing from liquid to gas.

When liquids are heated enough they can change to into gases. When this happens we say that liquid evaporates. Liquids evaporate when they gain heat. For example, when you heat liquid water it changes to a gas called water vapour.

Condensing- means changing from gas to liquid.

When a gas cools it forms a liquid again. When a gas changes back into a liquid we call that is condenses. Gases condense when they lose heat. For example, when you breathe out air on a cold day the water vapour in your breath cools down and condenses to form liquid water. The water in the wet washing evaporates into the air on warm days.

Solidifying—means changing from liquid to solid.

If liquids lose heat, they are cooled and they can change into solids. For example, when you put water into the freezer, it becomes a solid. When you take the ice out of the freezer a few hour later, it has become liquid. The water changes from a liquid into a solid when we cool it. We say that the water solidifies.

Activity: 1

1. What will happen to the wax when it allowed to cool down?
   _____.
2. What are the two differences between the wax at room temperature and the heated wax?
   _____.
3. Describe what happens when you eat an ice cream cone on a hot day?
   _____.
4. If you spread cold butter on toasted bread, it spreads more easily than if you spread it on untoasted bread.
   Why_____.

5. Someone gives you a chocolate bar. By the time you get home, it has been in your pocket all day and is completely melted.

a) Why has the chocolate bar melted ?

_____

b) What can you do to make it solid again?

_____

The water cycle.

If you pour a small amount of water into a shallow saucer or plate and put the plate on a sunny windowsill for a few hours. When you come back to the plate, you will see that there is no more water in it.

The same thing happens to areas of water, such as rivers, lakes and the ocean every day. You might wonder where all of that water goes, and why the ocean never seems to get empty. This is because water on earth is always recycled. This is called the water cycle.

Water cycle-means the movement of water from the land and the sea to the air and back again by the processes of evaporating, condensing, freezing and melting.

The Earth has a limited amount of water. That water keeps going around and around in what we call the water cycle. In the water cycle water moves from the land and sea to the air and back again. Water changes state in the water cycle. Water evaporates, condenses, freezes and melts in the water cycle.

- The sun's heat causes water to evaporate.
- As the water vapour rises, the air starts to cool. This causes the water vapour to condense and form clouds.
- When the clouds get too heavy with water droplets, it will rain, snow or hail.
- The rain water will flow back into the river, dams and oceans.

-When the water evaporates, it turns into water vapour (gas).

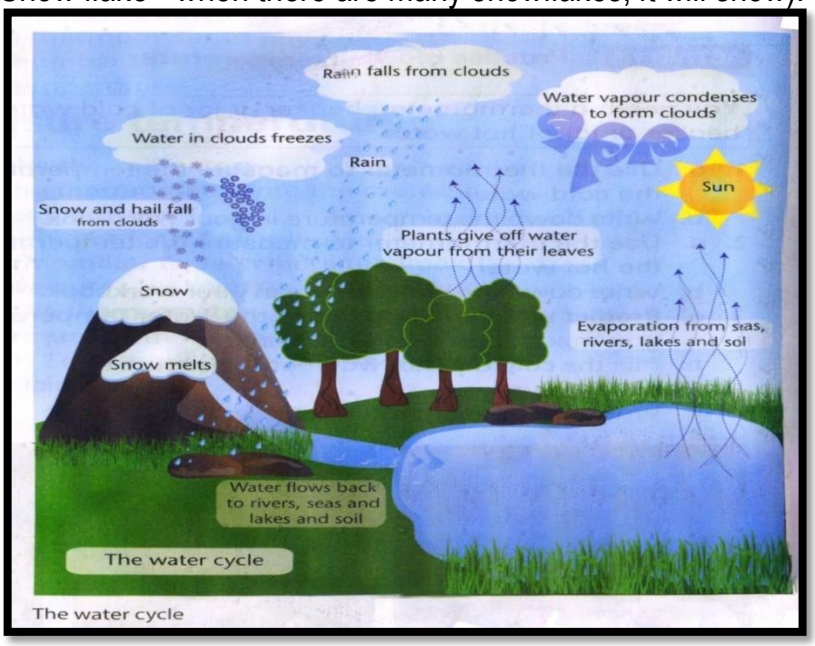
-When the water vapour condenses, it turns into water (liquid).

-Rain is liquid

-Hail is solid. (Hail is formed when water droplets in the cloud freeze together to form ice).

-Snow is solid. (Snow is formed when individual water droplets freeze to form a

Snow flake - when there are many snowflakes, it will snow).



The water cycle

Activity 1:

Question 1.

1.Where does the heat come from to make water evaporate from rivers, lakes and seas?

_____.

2.Where does the evaporated water go?

_____.

3.What happens to water vapour when it condenses

_____.

4.How does the water that evaporated get back to Earth in the water cycle?

_____.

Question 2.

Complete these sentences about water cycle. Use the words in the box to help you.

Water vapour | hail | condenses | evaporates | snow | clouds | rain.

a) Water on the Earth's surface _____ and moves up into the air as water _____.

b)The water vapour cools and _____ as it rises into the air.

c)Drops of water high in the air form_____.

d)Drops of water fall to the Earth as _____.

e) Water in the clouds freezes and falls to the Earth as _____ or _____.

f) Rain, snow and hail bring _____ back to the Earth's surface.

Activity 2:

Use the words to complete the sentences.

states | solids | cool | solidify | shape

space | melt | condense | evaporate

a. The _____ of substances are solid, liquid and gas.
b. _____ keep their shape.
c. Liquids take the _____ of the container they are in.
d. Gases have no _____, but they take up _____.
e. When we heat solids, they _____ and become liquid.
f. When liquids are heated they _____ to form gases.
g. When gases _____ they _____ to form liquids.
h. When liquids cool, they _____ and become solid.

Raw and Manufactured materials

Raw materials are materials that come from nature, and are in their natural states. An example of a raw material is wool from sheep. Sheep have a woolly covering that is allowed to grow quite long. When is it long enough, sheep farmers will shear (shave) the wool off the sheep.

Raw materials are used to create other useful materials. We call these manufactured which means 'made'. Once the wool has been shaved off the sheep, it is sold to manufactures, who use it to make useful products, such as the wool fabric that is used for jerseys, socks and other wool products.

Here are more examples of raw materials that used to make other useful materials:

- Wool
- Sand
- Clay
- Coal and oil




Sand is a raw material that can be used to make glass. Glass is useful for making many manufactured objects, for example:

- Window
- Plates
- Light bulbs



Clay is used to make ceramics. It can be shaped into bricks, pots mugs, and other crockery like plates and dishes.

Coal and oil are used to make plastic, paint and fabrics. Coal is a hard, black substance that comes from the earth. Coal is formed from the remains of trees and plants which grew millions of years ago.

Oil is a dark liquid that we find under the surface of the earth. Oil and coal are raw materials that can be used to make many new manufactured materials. Plastic is a very useful manufactured material that is made from oil and coal.

Activity 1:

Identify what materials the following objects have been made from.

Objects	Sand	Clay	Coal or oil
1. Plastic spoon			
2. Glass vase			
3. Nylon nightdress			
4. Ceramic tile			
5. Plastic ball			

Properties of materials

Key words

- **properties** what a material looks like and how it behaves
- **waterproof** does not allow water to pass through
- **dent** to make a hollow on a surface
- **flexible** material bends easily
- **stiff** material does not bend easily
- **examine** find out more about something
- **absorbent** to soak up a liquid

We make things out of different materials. To choose the right materials we need to know how they will behave if they are used in a certain way. In other words, we need to know what the **properties** of the material are. For example, if you need to make a container to store water, you would need to use a material that is **waterproof** and that is strong enough to hold the water but also light enough to carry it around.

Plastic is light and waterproof. It is also strong enough to hold the water.	Paper does not have suitable properties for making containers that store water.
	

Materials have different properties

Hard or soft:

Some materials are soft and others are very hard. We can test how hard a material is if we scratch, cut or **dent** it. Think of a candle. You can make a scratch on it with your fingernail. You would not be able to scratch a ceramic mug with your fingernail. You can dent an empty cool drink can with your fingers, but you would not be able to dent a piece of wood. If you cannot scratch, cut or dent a material, it is hard. To compare the hardness of materials, they must be tested in the same way.

Activity: Compare the hardness of different materials

1. You need: a nail or pin; a stone; mud, clay, clay brick, a plastic bottle top; a metal bottle top; a wooden cutting board; a ceramic clay tile.

Scratch each object with the nail or pin or try to dent it. Complete the table.

Materials scratched	Material that is easy to scratch her dent	Material that is more difficult to scratch or dent
Stone and clay		
Mud		
Clay brick		
Plastic bottle top		
Metal bottle top		
Wooden cutting board		
Ceramic clay tile		

2. Sort the materials into two groups – those that are raw materials and those that are manufactured materials. Write the key words in the correct blocks. **Clay pot, coin, stone, glass, plastic bottle, coal, wooden chair, woollen jersey** and draw the pictures to match.

Raw materials	Manufactured materials

3. Write down another property of each raw material and each manufactured material.

_____
_____
_____
_____
_____

Stiff or flexible

Sometimes we need materials that are flexible, because they can bend without breaking. A stiff material is needed if something should not bend, such as the handle of a spade.

Activity: Compare the flexibility and stiffness of different materials.
You need: a wooden ruler, and a plastic ruler, both the same length.

Bend both rulers with the same force.

Which ruler is more flexible?

_____

Which ruler is more stiff?

_____

Why do you think we must use rulers that are the same length for this test?

_____

Look at the toothbrush…

This toothbrush is stiff and has flexible bristles.

Strong or weak and light or heavy

How strong or how weak a material is can also help us to see if it is the right material to use when we make something. For example stone is a very strong material. It can however be difficult to work with as it is very heavy. It is often used to build with.

The lightness or heaviness of a material is also a property that needs to be considered to see if it is suitable to make something with. Plastic is light but can also be very strong.

The Castle of Good Hope in Cape Town is built of stone. It is the oldest surviving building in South Africa. It replaced an older fort that was build out of clay and wood.

Activity:

Examine the properties of raw and manufactured materials.

You need: plastic spoon; paper cup; wooden ruler; stone sculpture; cotton fabric; nylon fabric; glass bottle; ceramic pot.

1. Gather the objects in the list above. Examine each object to see if it is strong, weak light or heavy.
2. Complete the table below.

Object	What material is this made from?	Manufactured Or raw material?	Is it strong or weak?	Is it light or heavy?
Plastic spoon	Plastic	Manufactured	Weak	light
Paper cup				
Wooden ruler				
Stone sculpture				
Cotton fabric				
Nylon fabric				
Glass bottle				
Ceramic pot				

Waterproof or absorbent

Some materials can absorb or take in liquids like water. Many fabrics are absorbent. Other materials are waterproof which means they can keep water out.

- Cloths absorb water.
- A raincoat is waterproof.

Collect some materials. Feather, wooden spoon, plastic spoon, plastic bag, paper bag, clay brick, glass marble, rusk, newspaper, small towel, leather belt, nylon sock.
Complete the table below. Put an 'X' in the boxes.

Item	Hard	Soft	Strong	Weak	Stiff	Flexible	Light	Heavy	Waterproof	absorbent
Feather		x				x	x			

Activities:

Match the columns. Write the correct letter in column B.

A	B	C
Plastics	**C**	a. Threads in plant and animal products.
Absorbent		b. Made of clay and sand.
Brittle		**c. Made from oil and coal.**
Fibres		d. Breaks easily.
Ceramics		e. Soak up a liquid easily.

Look at the word box below and answer the questions.

Wool slippers	Wooden walking stick	Polyester pillow	Glass jug
Floor tile	Knitting wool	Plastic shopping bag	Plastic knitting needles

a. Name one object that is made of a hard material. _____
b. Give two examples that are made of soft materials.
_____
c. List two objects that are made of stiff materials.
_____
d. List two objects that are made of flexible materials.
_____