NATURAL SCIENCE

GRADE 7

INSTRUCTIONS:

1. GR 7 Instructions: Read the content on physical properties of materials from pages 151-159. Answer activities on the following pages: 152; 157; 158-159.
   Memo will follow in due course.
2. Links
   a. https://m.youtube.com/watch?v=CIBXoYaM7Fw
   b. https://m.youtube.com/watch?v=C4UlCEMlo9k

3. Thanking You Mrs A. Dayal.

We can think of certain properties of materials in terms of advantages and disadvantages. Do you know what those are? Let's find out.

Advantages versus disadvantages

We have seen that strength and durability are desirable properties in some materials. We want things to be strong and to last long. Let's think of an example.

Why would plastic shopping bags need to be strong?

_____

_____

A black, plastic shopping bag.

Why would plastic shopping bags need to be durable?

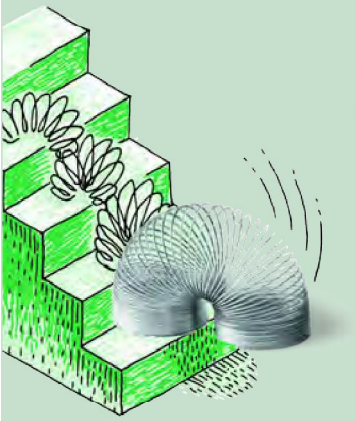
_____

We call the desirable properties of materials advantages. Disadvantages are unfavourable features, as can be seen in the images of plastic in the environment.

A goose about to eat a plastic bag in a river.

These plastic rings from soft drink packaging are very dangerous in the wild as they can entangle an animal's neck.

The following activity has another example of advantages versus disadvantages.



ACTIVITY: Advantages versus disadvantages

Can you imagine a car made of solid gold? A car like this would be very valuable!

INSTRUCTIONS:

1. Look at the image of a gold car then answer the questions that follow.
2. Discuss some of the questions with your classmates before writing down your answers.

QUESTIONS:

1. What are your feelings about the golden car in the picture?

2. What are the advantages of having a car made of gold?

3. Do you think a golden car would be very strong? Would it perhaps be safer in the event of an accident?

4. What are the disadvantages of a car made of gold?

We always have to weigh up the advantages against the disadvantages when we choose materials for a particular job.

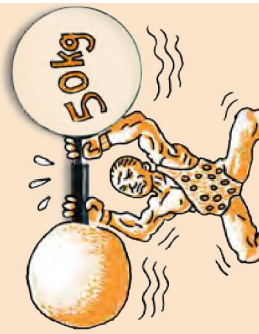
How would you test how strong a material is? Let's imagine you have different types of paper. How would you test which paper is the strongest? Discuss this as a class and write some notes on the lines provided.

The strength of paper is important because we use paper for many different things.

All these objects are made from different types of paper with different properties that suit the function of the object.

In the next activity we are going to investigate the tearing strength of different types of paper.

INVESTIGATION: Which type of paper is the strongest?



AIM: To compare the tearing strengths of different types of paper.

HYPOTHESIS:

When you write a hypothesis, you must state what you think will happen in your investigation.

MATERIALS AND APPARATUS:

- strips of different types of paper (20cm x 5cm)
- hole puncher
- strong paper clips
- yoghurt tub
- marbles
- string
- hand lens (optional)

METHOD:

1. Punch a hole at both ends of each paper strip. This is so that you can test the paper twice on each side. Make sure that the holes are in the middle, and also at the same distance from the end of each strip. This will make it a fair test.
2. Form the paper clip into an S-shape and hang it from the hole in the paper.
3. Make a handle for the yoghurt tub, using the string.
4. Hang the yoghurt tub from the paper clip and hold it in your hand.
5. Add marbles one-by-one to the yoghurt tub until the paper tears. Count the number of marbles in the tub. (Tip: Place the marbles very gently into the yoghurt tub or the shock of dropping them in might tear the paper).
6. Repeat steps 1 - 5 using the other end of the strip and count the marbles again. Take the average of the number of marbles.
7. Repeat this using the other strips of paper, doing each twice and taking the averages.
8. If each marble has a mass of 5 grams, work out the mass in grams that was needed to tear each strip of paper and write the number in the final column of your table.
9. If you have time, you can also test different kinds of materials, such as a plastic shopping bag, aluminium foil or plastic wrap.

Tip: To calculate the **average** of a set of numbers, you add all the numbers together and then divide by how many numbers there were in the set.

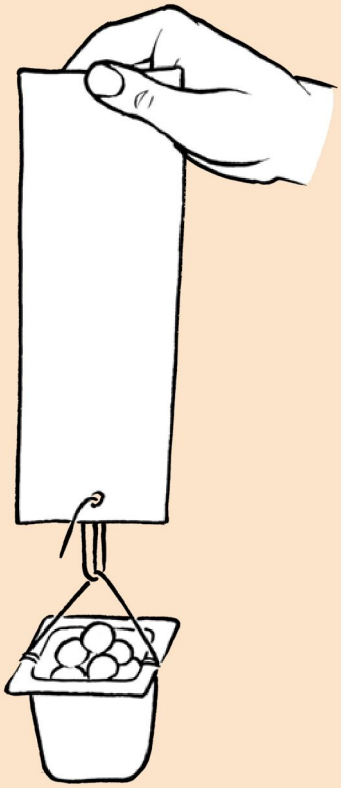
In this investigation, you will add the number of marbles together for each time you tested the paper strength (this was twice for each strip of paper) and then divide by 2 to calculate the average number of marbles that each piece of paper can hold before it tears.

For example, if you had 5 marbles in the first attempt, and 3 marbles in the second attempt, the average will be calculated as follows:

5 + 3 = 8 marbles

8 ÷ 2 = 4 marbles on average

Therefore, the paper type could hold an average of 4 marbles.



RESULTS AND OBSERVATIONS:

Record your results in the table.

Type of paper	Number of marbles (Trial 1)	Number of marbles (Trial 2)	Average number of marbles	Mass of the marbles

Now answer the following questions:

1. Look carefully at the surface of one of the paper strips. Now look carefully at the torn edge. Can you see anything special? Describe what you think the paper is made of.

2. Which paper is the strongest?

3. Which paper is the weakest?

4. Arrange the different types of paper *in order of increasing tearing strength*. (That means from weakest to strongest.)

ANALYSIS AND EVALUATION:

Let's now analyse and think about the results of the investigation.

1. What do you think causes one paper to be stronger than another?

2. How would you modify the investigation to test the strength of different types of plastic?

3. What did you do to ensure fair testing?

4. How would you modify the investigation to test the flexibility of different types of materials?

5. Why did you repeat the experiment for the same type of paper?

CONCLUSION:

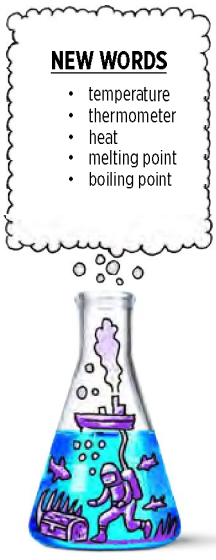
What can you conclude from this investigation?

Strength, **flexibility** (the ability to flex or bend), electrical conductivity and heat conductivity are important properties of materials that we learnt about in Gr. 5 and have revised again here.

Can you think of materials that are both strong and flexible? Most people will immediately think of plastics! Most plastics can easily be melted and **moulded** into different shapes for different purposes. Why do you think plastics can be 'melted and moulded' with ease?

All of these items are made of plastic in different shapes, sizes and colours.

We are going to learn about two new properties of materials, namely boiling point and melting point.



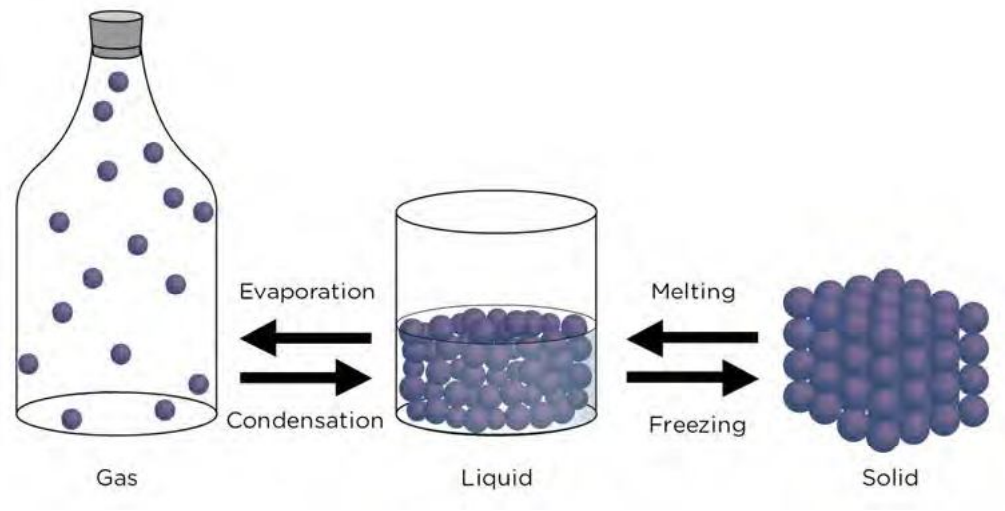
First, let's check if everyone knows that there is a difference between the words heat and temperature. The two words, heat and temperature, are connected but they do not mean the same thing:

- **Heat** is the transfer of energy from one object to another. This happens because of the difference in temperature between the two objects. The transfer of energy will be from the hotter object to the cooler object until they are the same temperature. You cannot measure heat directly, but you can detect its effect on a substance. Changes in heat can usually be detected as changes in temperature.
- **Temperature** is used to describe how hot or cold something is. Temperature can be measured directly with a thermometer.

Adding heat energy usually results in a temperature rise, so people often confuse heat and temperature. But they are not the same thing! We will look more at heating as a transfer of energy next term in Energy and Change.

Boiling and melting points

Do you remember learning about the state changes in previous grades? We will be focusing on boiling and melting in this section. Have a look at the following diagram to refresh your memories about the different changes of state between solids, liquids and gases.



1. Melting is when a solid changes into a liquid. Look at this photo of a candle burning. What is happening to the wax around the flame?

_____

2. Discuss with your partner why you think this is happening to the wax. Write your answer below.

_____

_____

_____

_____

A burning candle.

As you can see in the previous diagram, a liquid can change into a gas by evaporation. For example if you leave a saucer of water out in the sun, the water will evaporate. Evaporation can take place at any temperature. But, in boiling, the liquid needs to be heated to reach its **boiling point**. Bubbles of water vapour then form in the liquid and rise up.

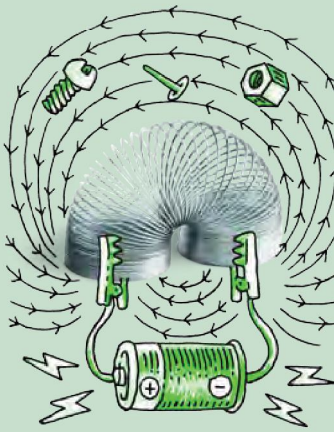
Can you think of at least three different ways to boil water? Discuss this with your class and write your answer down.

_____

_____

_____

What would happen if you tried to put the kettle into the microwave or on the stove? We will soon find out!



ACTIVITY: Boiling and melting

Look carefully at the picture. It looks as if something has gone wrong here!

QUESTIONS:

1. Write a short story to explain what you think happened to the kettle in the picture.

2. Why do you think the person made the mistake of heating the kettle on the stove?

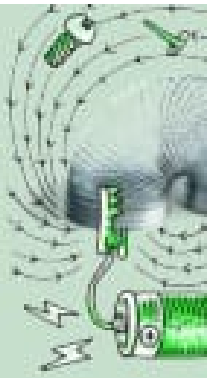
3. Do you think plastic is a good choice of material for making a whole cooking pot? Why do you say so?

4. Why does a plastic kettle not melt when we boil water in it?

5. Sometimes, just the handles of the cooking pot are made from plastic or wood. Why do you think this is so?

4. Why does a plastic kettle not melt when we boil water in it?
   The water boils at a temperature that is lower than the temperature needed to melt the plastic of the kettle.
5. Sometimes, just the handles of the cooking pot are made from plastic or wood. Why do you think this is so?
   This is because wood and plastic are not good conductors of heat, unlike metal, and so you can pick up the pot easily.

ACTIVITY: Boiling and melting



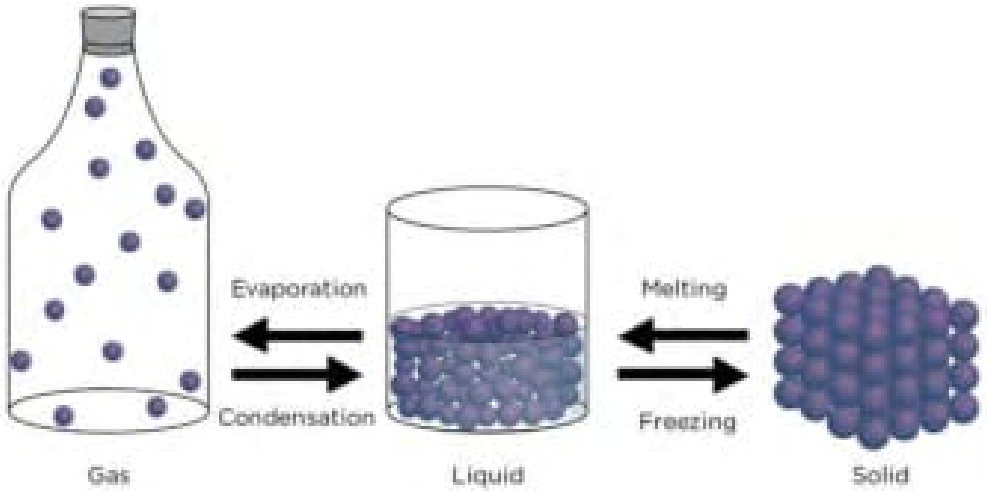
TEACHER'S NOTE

This is an optional activity.

Look carefully at the picture. It looks as if something has gone wrong here!

QUESTIONS:

1. Write a short story to explain what you think happened to the kettle in the picture.
   Just a few sentences are required here. The learners should note that someone placed the plastic kettle on the stove. When the person tried to heat the water, the kettle melted as a result of contact with the flame/heat. The kettle is meant to be plugged in to heat the water.
2. Why do you think the person made the mistake of heating the kettle on the stove?
   Learners can come up with their own reasons here. Perhaps the person was used to heating water on the stove in a metal kettle. Perhaps the person did not know that the plastic would melt. Perhaps the person was just absent-minded and made a mistake.
3. Do you think plastic is a good choice of material for making a whole cooking pot? Why do you say so?
   No. Plastic is not a good choice because it melts when it is heated above a certain temperature.



1. Melting is when a solid changes into a liquid. Look at this photo of a candle burning. What is happening to the wax around the flame?
   The wax is melting.

2. Discuss with your partner why you think this is happening to the wax. Write your answer below.

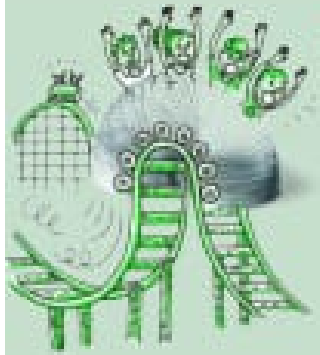
A burning candle.

*Discuss this with your class. The heat energy from the flame on the burning wick is transferred to the wax causing the temperature of the wax to rise. When the temperature gets to a certain point (called its **melting point**), the wax starts to melt as it changes state from a solid to a liquid.*

As you can see in the previous diagram, a liquid can change into a gas by

QUESTIONS:

1. What are your feelings about the golden car in the picture?
   Learner-dependent answer. Encourage learners to write what they think of the golden car, what their thoughts and feelings are. Do they think it looks great? Would they like to own one?
2. What are the advantages of having a car made of gold?
   A practical advantage is that gold doesn't rust. To some people, it may be important to display their wealth to everyone else.
3. Do you think a golden car would be very strong? Would it perhaps be safer in the event of an accident?
   Allow learners to debate this for a short while. You may want to point out that gold is actually quite a soft metal, and that driving a golden car would not offer more protection to the passengers than a car which has an exterior made mostly of steel would. Avoid the misconception that cars are made entirely out of steel. Cars have crumple zones to increase safety.
4. What are the disadvantages of a car made of gold?
   Gold is very expensive, and so the car would be unaffordable to most people. Gold is also very heavy (learners may need to be reminded of this), so the car would be heavy to move around. It would require lots of fuel to make it move and fuel is expensive. It would probably also scratch easily. Some learners may also say that because it is so valuable, it might get stolen. You could add that it could be insured against theft, but that insurance on a car this valuable would be very expensive. The conclusion is that although a gold car may seem like a nice idea, it is not practical or safe or fuel efficient.



ACTIVITY: Thinking about materials and their properties

INSTRUCTIONS:

1. Complete the following table by adding the names of different materials that have the properties listed.

Property	***Materials***
Strong	*Learner-dependent answer: metals, plastics, leather, concrete and wood are all examples of materials that learners could mention.*
Flexible	*Learner-dependent answer: some plastics, rubber, some metals (especially in thin sheets) are all examples that learners could mention.*
Conducts electricity	*Metals*
Conducts heat	*Metals*

QUESTIONS:

1. What does it mean when a material is flexible?
   Flexible means supple and bendy; able to flex and bend.
2. Suggest three possible uses of flexible materials?
   Flexible materials can be used to make clothing that needs to bend and fold; tubing or a pipe that needs to bend; coverings for electrical wiring that need to bend around corners; soles of shoes that need to flex when walking, etc.
3. Suggest three possible uses of a material that is a good conductor of electricity.
   Transmission cables for electricity, electrical wiring, electronic components for computers and other electronic equipment, electrical fencing (to protect property), etc.
4. Suggest three possible uses of a material that is a good conductor of heat.

   Good conductors of heat can be used for making pots and pans, heating elements, etc.