NATURAL SCIENCES

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 1

<table>
<tr><td colspan="3">TOPIC: ATOMS</td></tr>
<tr><td colspan="2">Sub-topic: Atoms – building blocks of matter</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p40)
KEY CONCEPTS
1. Matter
2. Atoms</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills: Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
1. Learners will be able to demonstrate understanding atoms as the smallest building blocks of matter.
2. Learners will be to display understanding that different elements are made of different atoms.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Periodic Table Poster
• Examples of various elements
• Textbooks: e.g. Siyavula Explore Gr. 8A
Web links:
• The Periodic Table (Live) - http://www.chemeddl.org/resources/ptl/index.html
Video links:
• The Periodic Table (Explained) - https://youtu.be/72vwtrJxUTY</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:

Revision of concept matter from previous grades using a flow diagram(refer to teachers guide).
Introduction of an atom.
Activities:
1. Teacher presents content of an atom as the building block of matter e.g Siyavula Gr 8A p.120-125.
2. Learners complete an exercise based on the concept of matter and atoms</td></tr>
<tr><td colspan="3">TEXTBOOK REFERENCES: (Indicate textbook used and reference page numbers)</td></tr>
<tr><td colspan="3">ASSESSMENT:
Informal</td></tr>
</table>

NATURAL SCIENCES

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 2

<table>
<tr><td colspan="3">TOPIC: ATOMS</td></tr>
<tr><td colspan="2">Sub-topic: Sub atomic particles</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p40)
KEY CONCEPTS
1. Protons
2. Neutrons
3. Electrons
4. Nucleus
5. Charged particle</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills: Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Explain concepts protons, neutrons, electrons, nucleus and charged particles
2. To draw and label a model of an atom.
3. Explain why atom can be the positively, negatively and neutrally charged</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Periodic Table Poster
• Model/poster/diagram of an atom
• Textbooks: e.g. Siyavula Explore Gr. 8A
Web links:
• The Periodic Table (Live) - http://www.chemeddl.org/resources/ptl/index.html
Video links:
• The Periodic Table (Explained) - https://youtu.be/72vwtrJxUTY</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher will make use of model/poster to explain subatomic particles that make up an atom, their charges as well as indicate their position and movement. Hint on their comparative masses (Siyavula p.125, CAPS p.40)
2. Learners draw and label an example of neutral atom</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">ASSESSMENT:
Assess correctness of the drawing indicating subatomic particles (with positions) and nucleus.</td></tr>
</table>

NATURAL SCIENCES

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 3

<table>
<tr><td colspan="3">TOPIC: ATOMS</td></tr>
<tr><td colspan="2">Sub-topic: Sub atomic particles:</td><td>Duration: 60min</td></tr>
<tr><td colspan="3">Building an atomic model (CAPS p40)
KEY CONCEPTS</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td>X</td></tr>
<tr><td colspan="3">Process Skills: Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Make a model of an atom using resources listed resources.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Paper plates
• glue
• beads/beans etc
• Pencil</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. Learners make a 2D model of atom as per instruction and complete a worksheet provided.</td></tr>
<tr><td colspan="3">ASSESSMENT:
Class activity: make a model of an atom
Siyavula p.126-127</td></tr>
<tr><td colspan="3"></td></tr>
</table>

ACTIVITY: Make your own model of an atom

Do you remember Dalton's 3 postulates from the beginning of the chapter? They are:

1. **Each element consists of indivisible, minute particles called atoms.**
2. **All atoms of a given element are identical.**
3. **Atoms of different elements have different masses.**

So, each element on the Periodic Table has its own type of atom. The atoms of different elements are different as they have different numbers of protons. Do you remember that we said the **atomic number** of an element is the number of protons in an atom of that element?

1. So, if we wanted to make a model of a nitrogen atom, how many protons would we need?

_____

2. If we wanted to make a model of a sulfur atom, how many protons would we need?

_____

In most atoms of an element, the number of neutrons in the nucleus is the same as the number of protons. The number of electrons can change, but for now we are going to make models of neutral atoms. So, there must be the same number of electrons as protons.

MATERIALS :

- glue
- paper plate
- playdough, beads, dried lentils or peas, etc

INSTRUCTIONS:

1. After reading the information about atoms, your teacher will give you an element of which you have to build a model. What is the name of your element?

_____

2. What is the atomic number of your element?

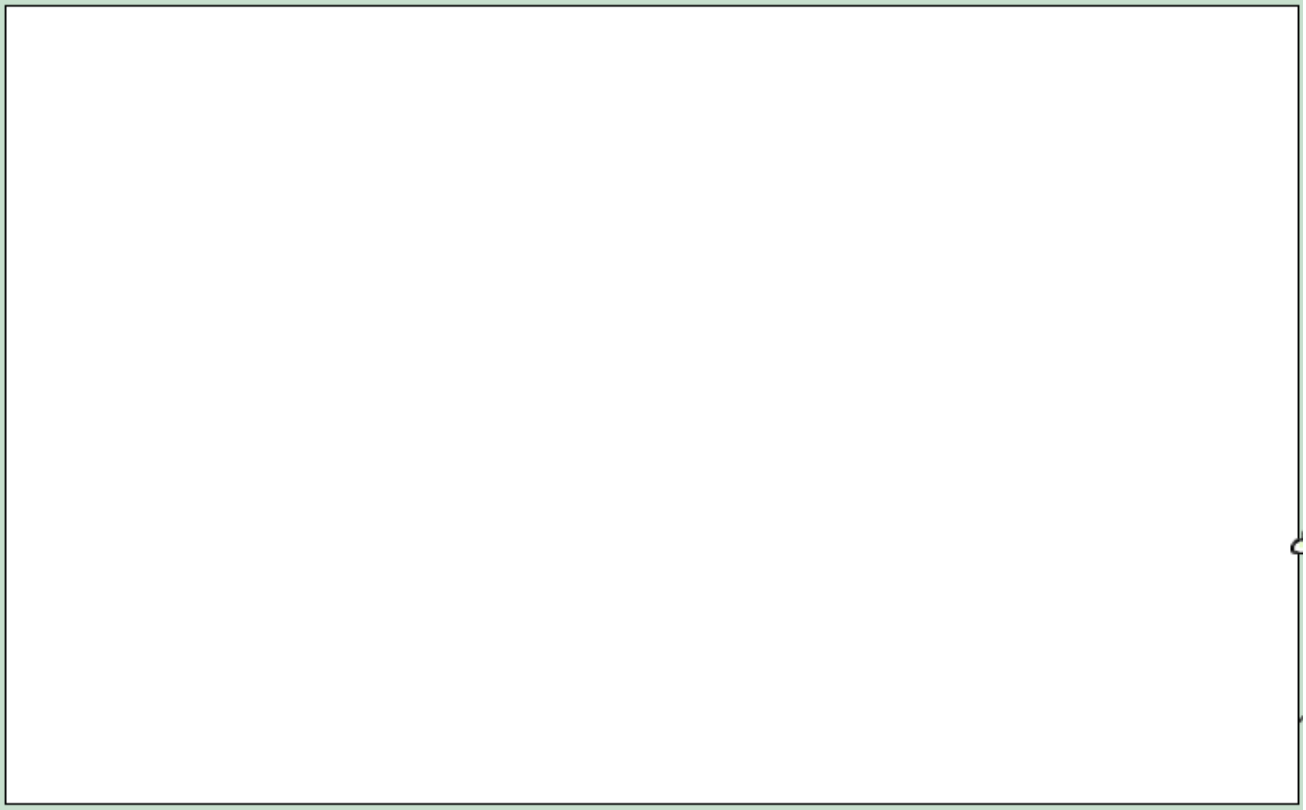
_____

3. How many protons will you need to make for your atom?

_____

4. Now decide what objects you will use to create the subatomic particles in your model.

5. Stick these onto the paper plate and provide labels.
6. After you have built your model, draw a model of your atom below. Provide labels. These are both models of your atom!



NATURAL SCIENCES

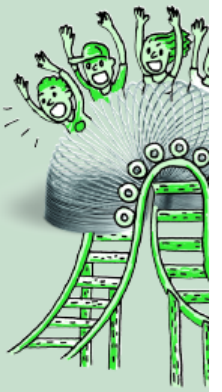
TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 4

<table>
<tr><td colspan="3">TOPIC: ATOMS</td></tr>
<tr><td colspan="2">Sub-topic: Elements</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p41)
KEY CONCEPTS
1. Pure substance
2. Element
3. Diatomic molecules
4. Molecules</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills: Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Describe pure substances : elements and compounds in terms of the atoms making them
2. Define element, molecules and diatomic molecules giving examples.
3. Identify elements in a Periodic Table
4. Make models showing atoms making up molecules.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Periodic Table Poster
• Plastic beads or modelling clay or playdough or any other relevant materials
• Textbooks: e.g. Siyavula Explore Gr. 8A
• Science/English dictionary
Web links:
• The Periodic Table (Live) - http://www.chemeddl.org/resources/ptl/index.html
Video links:
• The Periodic Table (Explained) - https://youtu.be/72vwtrJxUTY</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher will ask learners to look for the meaning of key concepts: pure substance, elements, molecule, diatomic molecule from dictionary.
2. Learners will give oral responses
3. The teacher will wrap up
4. The teacher uses models to demonstrate molecules of elements(diatomic molecules) and molecules of compounds to further explain the concepts
5. Learners are then given available resources (polystyrene balls; play dough etc) to make models of H_2, N_2, CO_2 to demonstrate their understanding</td></tr>
<tr><td colspan="3">ASSESSMENT:
Class Activity
Siyavula p.131-132</td></tr>
</table>

ACTIVITY: Atoms and molecules



Let's make sure we understand the difference between atoms and molecules.

QUESTIONS:

1. Look at the following diagrams. Decide whether each represents an atom or a molecule. If it is a molecule, state how many atoms make up the molecule.

Diagram	Atom or molecule?
	
	
	
	
	

2. Look at the following complex molecule.

a) How many atoms make up this molecule?

_____

b) How many different types of atoms make up this molecule?

_____

c) What holds the atoms together in this molecule?

_____

NATURAL SCIENCES

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 5

TOPIC: ATOMS		
Sub-topic: Compounds	**Duration**: 30min	
CONTENT & CONCEPTS (CAPS p41) **KEY CONCEPTS** 5. Compound 6. Chemical formulae 7. Chemical bond 8. Ratio of atoms in a compound		
Specific Aims:	Specific Aim 1: 'Doing Science'	
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	
Process Skills: Accessing and recalling information		
LESSON OBJECTIVES: Learners will able to: 5. Describe the formation of a compound. 6. Explain the meaning of a compound, chemical bond and chemical formula. 7. Write down the names and chemical formula of the compounds such as water, carbon dioxide, salt, copper(II) chloride 8. Determine and explain the chemical ratio of the compounds such as water, carbon dioxide, salt, copper(II) chloride 9. Make models and draw models of compounds such as water, carbon dioxide, table salt.		
RESOURCES REQUIRED: • Periodic Table Poster • Plastic beads or modelling clay or playdough or any other relevant materials(like ball and stick apparatus) and tooth picks or match stick and or glue • Textbooks: e.g. Siyavula Explore Gr. 8A •		
TEACHING & LEARNING ACTIVITIES: 6. Teacher will explain the formation of compounds, chemical bonds using models. 7. Teacher will now explain the meaning of the terms such as compound, chemical bond and chemical formulae. 8. The teacher uses models to demonstrate molecules of elements(diatomic molecules) and molecules of compounds to further explain the concepts 9. Learners are then given available resources (polystyrene balls; play dough etc) to make models of H_2, N_2, CO_2 to demonstrate their understanding		
ASSESSMENT: **Class Activity** Siyavula p.131-132		

NATURAL SCIENCES

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 6

<table>
<tr><td colspan="3">TOPIC: ATOMS</td></tr>
<tr><td colspan="2">Sub-topic: Compounds</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p41)
KEY CONCEPTS
9. Decomposition reactions
10. electrolysis
11. Thermal decomposition</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td>X</td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills: Accessing and recalling information, Observing</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Understand that compounds can be broken down back into their elements by chemical means (decomposition reactions)- refer to practical task.
2. Explain terms like decomposition reactions, electrolysis and thermal decomposition.
3. Explain the process of electrolysis of water into hydrogen gas and oxygen gas .
4. Explain and demonstrate understanding of how oxygen gas is produced from decomposing potassium permanganate and also recall that oxygen in not the only product of this reaction.
5. Write down the test for oxygen gas.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Potassium permanganate.
• Bunsen burner.
• Test tube
• Wooden splint
• Matches
• Tongs or retort stand
• Spatula

Web links:
Video links:
• https://www.youtube.com/watch?v=9YLU4B1FMZU</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
10. Teacher will explain the how compounds can be broken down by chemical means.
11. Teacher will now explain the meaning of the terms such as decomposition reactions giving examples.
12. The teacher will describe each method of decomposition e.g electrolysis and thermal heating.</td></tr>
</table>

13. The teacher will further discuss using a demonstration of thermal decomposition of potassium permanganate.
14. Learners will observe the demonstration carefully and then complete a worksheet (class activity) given by the teacher.

ASSESSMENT:
Practical Activity

Practical activity: decomposing potassium permanganate

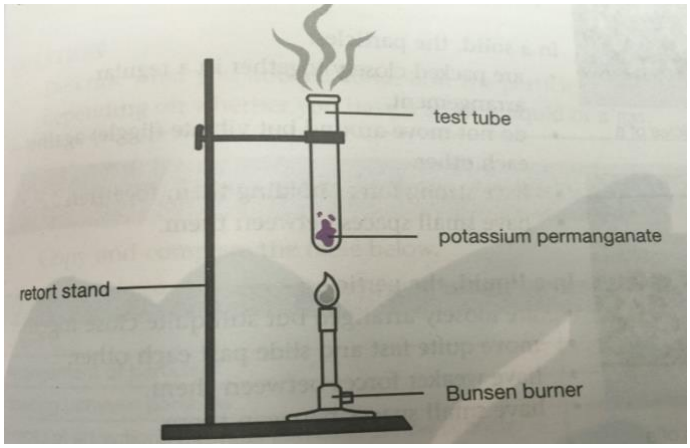
AIM: to decompose potassium permanganate.

Apparatus needed:

- Potassium permanganate
- Bunsen burner
- Test tube
- Wooden splint
- Matches
- Tongs or retort stand
- Spatula

METHOD:

1. Place a spatula of potassium permanganate into the test tube.
2. Hold the test tube with the tongs or retort stand and heat over a Bunsen burner as shown in the diagram below.
3. Place the glowing splint into the mouth of the test tube.
4. Record your observations.



QUESTIONS

1. When potassium permanganate is heated, what colour change do you observe?
2. What happens to the glowing splint when it is placed into the mouth of the test tube?
3. What does the observation in question 2 indicate about the gas given off in the decomposition reaction?

NATURAL SCIENCES

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 7

<table>
<tr><td colspan="3">TOPIC: ATOMS</td></tr>
<tr><td colspan="2">Sub-topic: Compounds</td><td>Duration: 60min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p41)
KEY CONCEPTS
1. Decomposition reaction
2. Electrolysis
3. Electrode</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td>X</td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Observing
▪ Recording
▪ Interpreting
▪ Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Carry out the decomposition of a compound ($CuCl_2$) by electrolysis.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Beakers
• Cardboard discs to cover top of the beakers
• Two conducting wires
• Copper chloride solution
• 9 volt battery or battery made of 3 torch cells
• Textbooks: e.g. Siyavula Explore Gr. 8A, p139 - 142</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher…Teacher will explain the formation of compounds, chemical bonds using models.
2. The learners carry out the activity: Siyavula p139 – 140
3. At the end the teacher reinforces the key concepts (electrical energy converted to chemical energy; compound breaking down to its original elements)
4. The teacher assesses the learner responses on the practical activity</td></tr>
</table>

ASSESSMENT: Practical activity Siyavula p.139-141

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 8

TOPIC: ATOMS		
Sub-topic: Mixtures of elements and compounds	**Duration**: 30min	
CONTENT & CONCEPTS (CAPS p41) **KEY CONCEPTS** 1. Mixtures 2. Separation of mixtures.		
Specific Aims:	Specific Aim 1: 'Doing Science'	
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	**X**
Process Skills: ▪ Accessing and recalling information		
LESSON OBJECTIVES: Learners will able to: 1. Demonstrate understanding of the concept mixture and various kinds of mixtures. 2. Describe different methods of separating mixtures. 3. Know the difference between physical process of separating mixtures and chemical process of separating compounds.		
RESOURCES REQUIRED: • Beans • Sand • Water • Sugar and salt • Oil • Textbooks: e.g. Siyavula Explore Gr. 8A, p139 - 142		
TEACHING & LEARNING ACTIVITIES: 1. The teacher challenges learners to name the compounds that they know in nature 2. The teacher describes the concept: mixture and give examples such as air(mixture of gases), sea water(mixture of salt and water), rock(mixture of minerals). Also name different elements and compounds that make up these mixtures. 3. The teacher makes use of various resources provided to make mixtures. 4. The teacher briefly revises the methods of separating mixtures done in Gr 7 (CAPS: p P22-23) through oral		

questioning e.g name and explain different methods of separating mixtures. What would you consider to choose a method of separating a mixture?

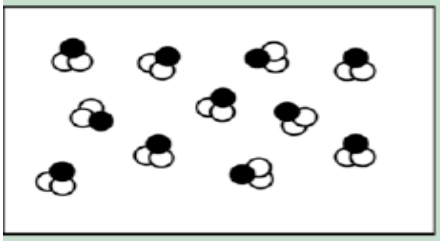
5. The teacher explains that mixtures are separated by physical process and that compounds are separated by chemical process.
6. The teacher makes use diagrams of an element, molecules of an element, molecules of a compound and mixtures of elements and compounds to show the difference between elements, compounds and mixtures.(e.g. Siyavula Gr 8A: p142)

ASSESSMENT:
Class activity
Siyavula p.143-144

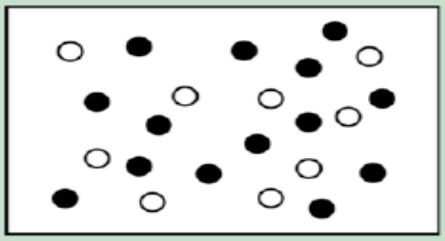
ACTIVITY: Distinguishing between elements, compounds and mixtures

INSTRUCTIONS:

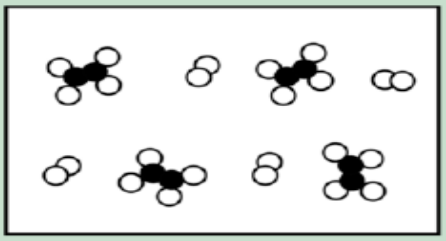
1. Each of the 15 blocks contains a diagram representing atoms and molecules of matter.
2. You must classify the matter in each block using only the letters A to E to identify the categories:
   - A = element
   - B = compound
   - C = mixture of elements
   - D = mixture of compounds
   - E = mixture of elements and compounds



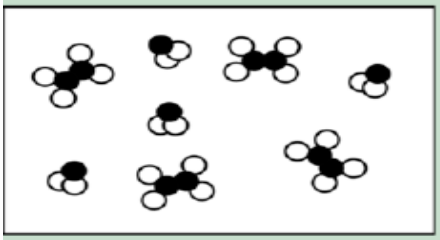
1)_____



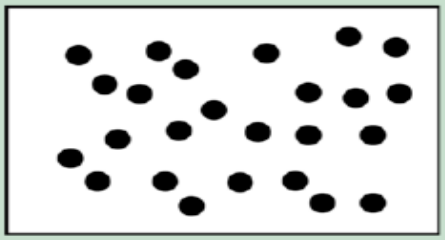
2)_____



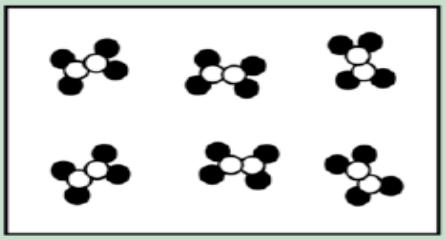
3)_____



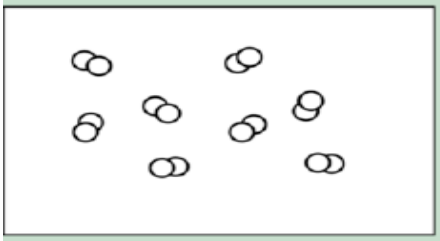
4)_____



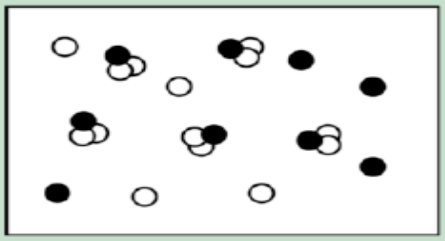
5)_____



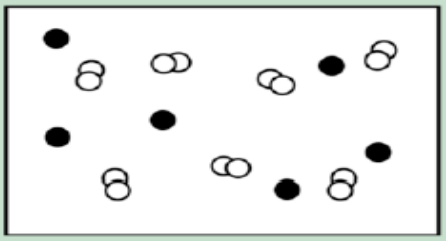
6)_____



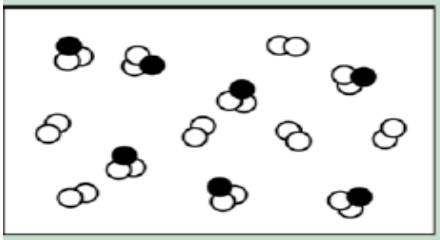
7)_____



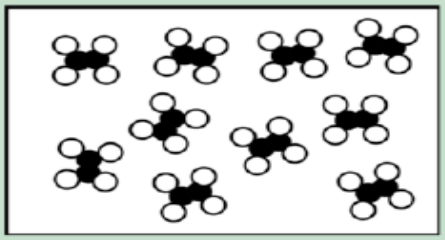
8)_____



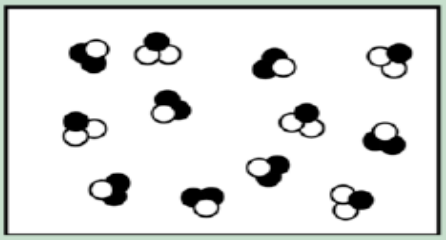
9)_____



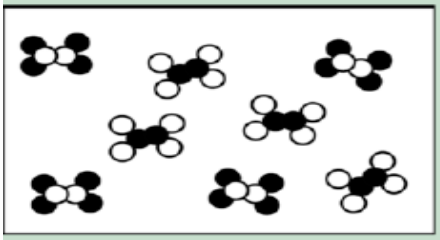
10)_____



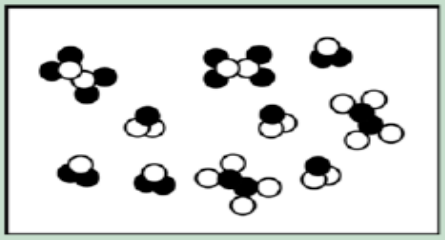
11)_____



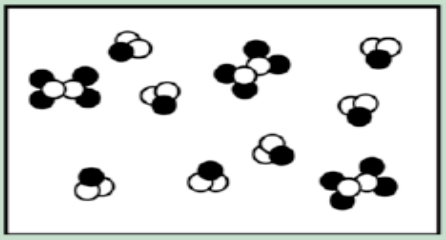
12)_____



13)_____



14)_____



15)_____

2. For each of the mixtures appearing on the table, choose a separation technique from the following list. You want to keep all the substances in the mixture. Also provide the properties of the substances in the mixture which make the separation technique suitable.

Hand sorting; Magnetism; Evaporation; Filtration; Fractional distillation; Separating funnel method; Distillation; Chromatography;

MIXTURE	**SEPARATION METHOD**	**PROPERTIES**
Water and oil		
Steel nails and copper nails (same size, painted the same colour)		
Water and alcohol		
Red, pink and green Smarties		
The different colours in the dye of a red Smartie		

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 9

<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL O MATTER</td></tr>
<tr><td colspan="2">Sub-topic: The concept of the particle model of matter</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p42)
KEY CONCEPTS
1. Particle model</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Know the particle model of matter.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A, p153-154
• Video links: https://youtu.be/i0sOq7EbQWI</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher explains what a scientific theory is.
2. The teacher discusses what the particle model of matter considers in describing some aspects of matter:
• Particles as constituents of matter
• Forces between the particles of matter
• Movement of the particles of matter
• Spaces between the particles of matter
3. The teacher further discusses the importance of the particle model of matter.(understanding of the three states of matter)</td></tr>
<tr><td colspan="3">ASSESSMENT:
Class activity
Siyavula p.143-144</td></tr>
</table>

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 10

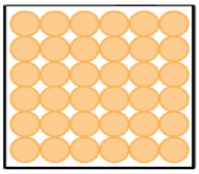
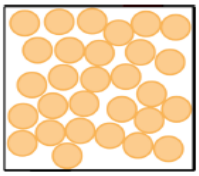
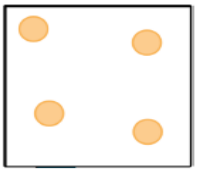
<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: The concept of the particle model of matter (SOLIDS, LIQUIDS AND GASES)</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p41)
KEY CONCEPTS
1. Solids
2. Liquids
3. gases</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Apply the knowledge of particle model of matter theory to explain the three states of matter.
2. Draw and identify diagrams showing different states of matter.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Ice water
• burner
• Textbooks: e.g. Siyavula Explore Gr. 8A, p156- 158</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher challenges learner to identify all the three states of matter during heating process of ice water.
2. The teacher draw diagrams/poster showing three different states of matter and explain them using scientific theory according:
• Arrangement of particles
• Forces between the particles
• Movement of the particles
• Spaces between the particles</td></tr>
<tr><td colspan="3">ASSESSMENT:
Class activity
Siyavula p.159-160</td></tr>
</table>

ACTIVITY: Comparing solids, liquids and gases

Let's summarise what we have learnt about what the particle model of matter tells us about solids, liquids and gases.

INSTRUCTIONS:

1. Use the images of the different states to help you, and go back over the text in your workbook.

	Solid	Liquid	Gas
			
Arrangement of particles			
Movement of particles			
Forces between particles			
Spaces between particles			

QUESTIONS:

1. Use the particle model of matter to explain why solids have a fixed shape, but gases fill the shape of the container they are in.

2. Use the particle model of matter to explain why you can compress a gas easily, but you cannot compress a liquid very easily.

3. Think of a bag of cake flour. You can pour the cake flour out of the bag and into a mixing bowl. Does this mean the flour is a liquid? Explain whether you think the cake flour (and all powders) are solids or liquids.

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 11

<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: Diffusion</td><td>Duration: 60min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p41)
KEY CONCEPTS
1. diffusion</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td>X</td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills: 1.
▪ Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Explore and explain the concept of diffusion through observation of spraying/sprinkling of perfume or ether etc in the classroom and dissolving of potassium permanganate in water.
2. To compare the rate of diffusion in liquid and gases
3. Applying particle model of matter in explaining diffusion.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Spray/ sprinkle (airoma; perfume; ether; ethanol; petrol)
• Potassium Permanganate
• Water</td></tr>
</table>

- Glass beaker/ test tube (or any transparent container)
- Textbooks: e.g. Siyavula Explore Gr. 8

TEACHING & LEARNING ACTIVITIES:

1. Explain concept of Diffusion using demonstration:
   a. Spray/sprinkle airoma (or perfumume etc)
   b. Learners at different points in a classroom tell when they feel the smell
   c. The teacher add a spatula of potassium permanganate($KMnO_4$) in water
   d. Learners communicate their observation.
2. Learners now will come up with explanation or definition of the term diffusion.
3. Learners compare the rate of diffusion in gases and in liquids.
4. Learners apply particle model of matter in explaining diffusion.

ASSESSMENT:

Practical investigation on diffusion
Siyavula p.161-163

INVESTIGATION: Comparing the diffusion of particles in a gas and in a liquid

INVESTIGATIVE QUESTIONS:

1. Do particles diffuse (mix) faster when they are in the liquid state or in the gaseous state? Which particles will mix more quickly: gases or liquids?
2. Do particles diffuse faster with or without mixing?

HYPOTHESIS:

What are your predictions? Do you expect liquids to mix more quickly than gases, or the other way around? Will stirring influence the speed at which gases mix? Write down your hypothesis below.

_____

_____

IDENTIFY VARIABLES:

This is not a **controlled experiment** as we are not measuring the rates of mixing of the liquids and gases under exactly the same conditions. We will make a simple comparison of the mixing rates, by seeing how long it takes each to mix under two different sets of conditions.

MATERIALS AND APPARATUS:

- large glass beaker or other large clear glass container
- dropper
- food colouring or ink
- tap water
- vanilla essence
- shallow dish or saucer

METHOD:

Part 1: How fast do liquids mix?

1. Fill a large, clear container with tap water and place it where everyone can see it.
2. Use a dropper to place one or two drops of the food colouring in the water.
3. Record the time at which the colouring is added to the water.
4. Look carefully at the two liquids mixing, and write your observations below. Allow the liquids to mix without any stirring.
5. Record the time when the liquids are fully mixed, in other words, when the colour is uniformly spread throughout the water.

Part 2: How fast do gases mix?

This experiment should be performed with the windows closed.

1. Raise your hand as soon as you can smell vanilla essence.
2. Pour some vanilla essence into the saucer.
3. Record the time when the vanilla essence is poured out.
4. Record the time when the first learner puts up his/her hand to indicate that they can smell the vanilla essence.
5. Record the time when roughly half of the learners in the class have their hands up, to indicate that they can smell the vanilla essence.
6. Record the time when the learners at the back of the class first smell the vanilla essence.
7. If there is enough time during your next Natural Sciences lesson, repeat steps 1-5. You should do everything exactly the same, but this time, you should move your arms and try to 'wave' the air towards the back of the class.

RESULTS AND OBSERVATIONS:

1. What did you observe in the container immediately after the liquids were mixed?

_____

_____

2. How long did it take for the liquids to be fully mixed, until the colour was uniformly spread throughout the water?

_____

_____

3. When you did NOT wave your arms during the experiment:
   a) How long did it take until the first learners smelled the vanilla essence molecules?

_____

   b) How long did it take until the last learners smelled the vanilla essence?

_____

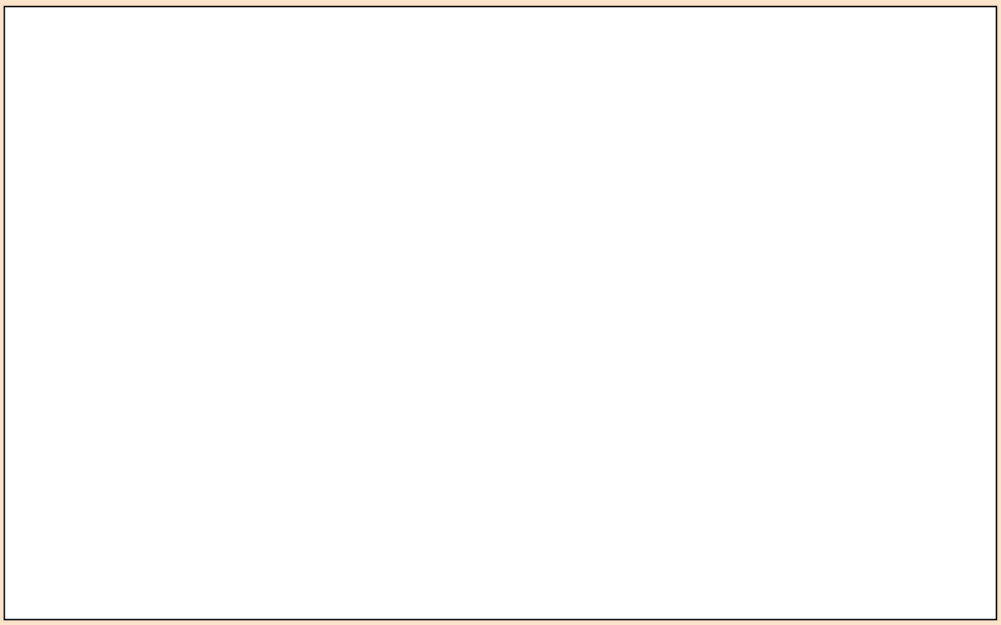
4. When you DID wave your arms during the experiment:
   a) How long did it take until the first learners smelled the vanilla essence molecules?

_____

   b) How long did it take until the last learners smelled the vanilla essence?

_____

5. Draw a table with your results for the vanilla essence experiment. You can



ANALYSIS AND EVALUATION:

1. Did anything go wrong during the experiment?

2. Can you think of anything that could have improved this experiment?

CONCLUSIONS:

What are your conclusions? (What are your answers to the investigative questions?)

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 12

TOPIC: PARTICLE MODEL OF MATTER	
Sub-topic: Change of state of matter(part 1)	**Duration**: 30min

CONTENT & CONCEPTS (CAPS p43)

KEY CONCEPTS

1. Melting
2. Evaporating
3. Boiling
4. Freezing
5. solidifying
6. Sublimation
7. Deposition
8. Liquidifying
9. condensation

Specific Aims:	Specific Aim 1: 'Doing Science'	
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	

Process Skills:

- Accessing and recalling information

LESSON OBJECTIVES:

Learners will able to:

1. Demonstrate understanding of processes of changes of state of matter.
2. Understand the relationship between the processes of change of states of matter in different diagrams, graphs, flow diagrams etc.

RESOURCES REQUIRED:

- Textbooks: e.g. Siyavula Explore Gr. 8A, p154- 155

TEACHING & LEARNING ACTIVITIES:

1. Learners find meaning of the key concepts from different resources (eg. Dictionary , textbook)
2. The teacher uses flow diagram e.g Siyavula p. 154 and class activity p.155 to do revision.
3. The teacher reinforces the key concepts on change of state of matter using the flow diagram.

ASSESSMENT:

Class activity

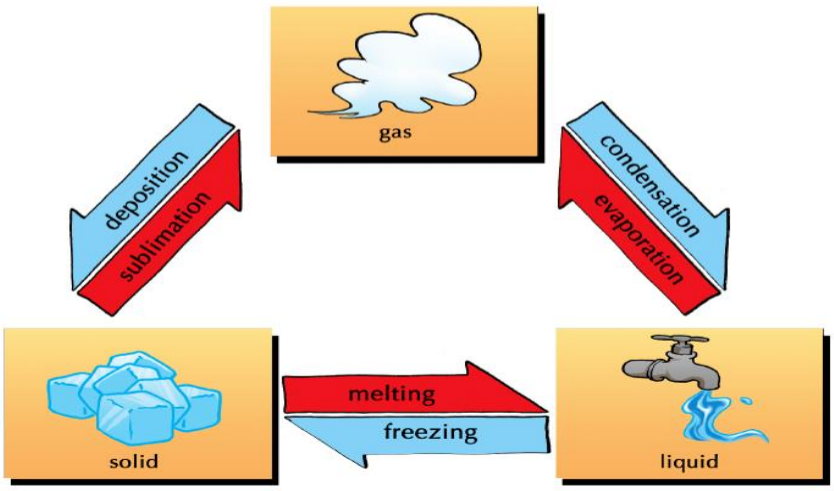
Siyavula p.155

Why is the particle model of matter so useful?

The particle model of matter is one of the most useful scientific models because it describes matter in all three states. Understanding how the particles of matter behave is vital if we hope to understand science!

The model also helps us to understand what happens to the particles when matter changes from one state to another.

The following diagram shows different changes of state, as well as which processes are the **reverse** of each other. Melting and freezing are the reverse processes of each other and so are evaporation (boiling) and condensation.



The change of states

ACTIVITY: Changes of state revision

INSTRUCTIONS:

1. Refer to the previous diagram.
2. Check that you remember some of the concepts you learnt about in previous grades by going through these quick questions.

QUESTIONS:

1. What is the name of the process when a solid turns into a liquid?

---

2. What is the reverse process to melting?

---

3. What can we do to make ice melt quickly?

---

4. Explain the steps that a solid must go through to become a gas.

---

5. What is the reverse process of evaporation?

---

6. When we heat something, are we adding energy to it, or taking energy away?

---

7. How do you think the particles in a substance behave when we give them more energy?

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 13

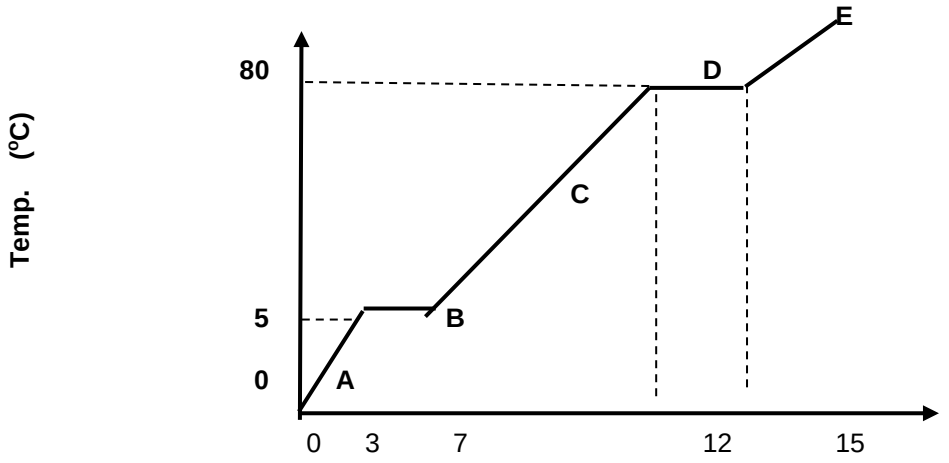
<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: change of state of matter (part 2)</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p43)
KEY CONCEPTS
1. Change of state by heating</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Apply the particle model of matter to explain the change of state through heating.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A, p156- 158
• Graph showing change of state of matter.</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher explains change of state of matter through heating using a graph.
2. The teacher applies the particle model theory to explain the changes of state from solid to liquid and from liquid to gas throughout the graph.
To be attached</td></tr>
<tr><td colspan="3">ASSESSMENT:
Siyavula p.167- 168</td></tr>
</table>

Class activity

1. Study the table below. Compare and complete the table below about the different states of matter

State	(ice)Solid	(water)Liquid	(steam)Gas
Diagram	1.1	1.2	O O O O O O
Spaces between the particles	Very small	1.3	Big
Forces between particles	1.4	Weaker	Extremely Weak forces
Arrangement of particles	1.5	Loosely arranged	No arrangement

2. Study the heating curve for a pure substance:



2.1 What is the melting point of this substance?

2.2 What is the boiling point of this substance?

2.3 Define boiling point. Which point will represent the boiling point on the graph?

2.4 Which point on the curve (A,B,C,D,E) is the energy between particles the highest?

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 14

TOPIC: PARTICLE MODEL OF MATTER		
Sub-topic: change of state of matter (part 2)	**Duration**: 30min	

CONTENT & CONCEPTS (CAPS p43)

KEY CONCEPTS

2. Change of state by cooling

Specific Aims:	Specific Aim 1: 'Doing Science'	
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	

Process Skills:

- Accessing and recalling information

LESSON OBJECTIVES:

Learners will able to:

2. Apply the particle model of matter to explain the change of state through heating.

RESOURCES REQUIRED:

- Textbooks: e.g. Siyavula Explore Gr. 8A, p156- 158
- Graph showing change of state of matter.

TEACHING & LEARNING ACTIVITIES:

3. The teacher explains change of state of matter through heating using a graph.
4. The teacher applies the particle model theory to explain the changes of state from gas to liquid and from liquid to solid throughout the graph.
   To be attached

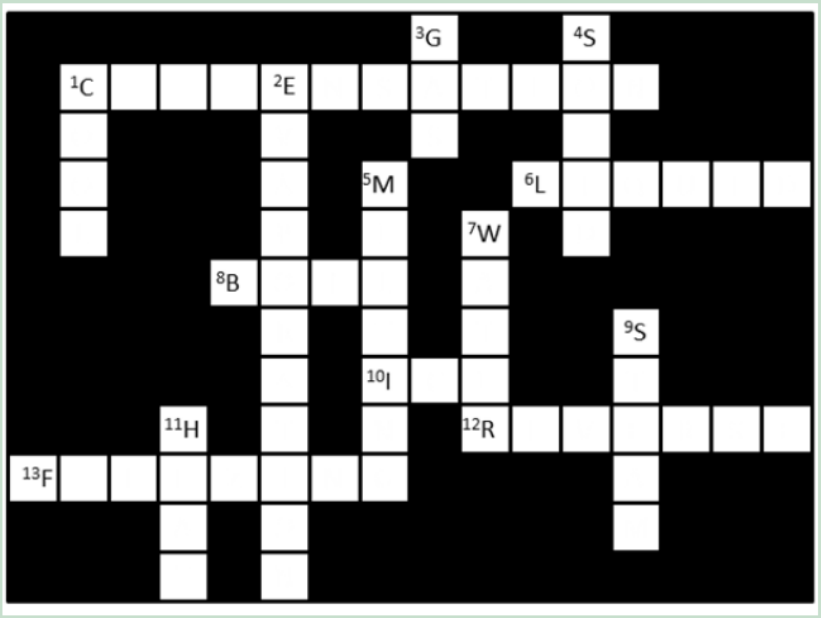
ASSESSMENT:

Class activity

ACTIVITY: Changes of state

INSTRUCTIONS:

1. The crossword puzzle below can be completed by following the clues given below.
2. The 'Down' clues are for the vertical words in the puzzle and the 'Across' clues are for the horizontal words in the puzzle.
3. All the clues have to do with changes of state of materials, and the first letter of every word has been filled in to help you.



Here are the clues:

Down:

1. If we want to turn steam into water we have to _____ it. (4 letters)

2. The process of turning a liquid into a gas is called _____. (11 letters)

3. The particles of a _____ have large spaces between them. (3 letters)

4. The particles of a _____ are locked in position by strong forces. (5 letters)

5. A solid will change into the liquid state at its _____ point. (7 letters)

7. The liquid state of ice is called _____. (5 letters)

9. The gaseous state of ice is called _____. (5 letters)

11. If we want to turn water into steam we have to _____ it. (4 letters)

Across:

1. The process of turning a gas into a liquid is called _____. (12 letters)

6. The particles of a _____ are close together but they can flow and slide over each other. (6 letters)

8. The boiling point of a liquid is the temperature at which that liquid will start to _____. (4 letters)

10. The solid state of water is called _____. (3 letters)

12. Freezing and melting are the _____ of each other. (7 letters)

13. _____ water turns it into ice. (8 letters)

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 15

TOPIC: PARTICLE MODEL OF MATTER		
Sub-topic: Density, mass and volume	**Duration**: 30min	
CONTENT & CONCEPTS (CAPS p43) **KEY CONCEPTS** 1. Density 2. Mass 3. Volume		
Specific Aims:	Specific Aim 1: 'Doing Science'	
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	
Process Skills: ▪ Accessing and recalling information, measuring, comparing, predicting		
LESSON OBJECTIVES: Learners will able to: 1. Understand the relationship between density, mass and volume using an equation. 2. Define density.		
RESOURCES REQUIRED: • Textbooks: e.g. Siyavula Explore Gr. 8A, p156- 158 • Sponge block • Polystyrene block • Wood block • Metal block		
TEACHING & LEARNING ACTIVITIES: 1. Before the lesson the teacher prepares blocks of different materials provided. 2. Learners will determine the volume and mass of different blocks by calculation.(use: V= l x b x h) 3. Learners will determine the relationship between ratio of mass and volume of different blocks and then compare the answers. 4. The teacher then defines density as mass per unit volume of an object. 5. Teacher represents relationship between density, mass and volume using an equation: Density= $\frac{mass}{volume}$		
ASSESSMENT: Class activity		

Class activity

1. List the blocks that you have used from the heaviest to the lightest.
2. Arrange the blocks according to the densities you calculated from highest to lowest.
3. How does the mass of the block (object) affect it's density?
4. How will the volume of the block (object) affect it's density?

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 16

<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: Density and states of matter</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p43)
KEY CONCEPTS
1. Density of solids
2. Density of liquids
3. Density of gases</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information, comparing,observation</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Conduct a practical task and identify densities of different solids, liquids and gases
2. Use particle model theory to explain why different solids, liquids and gases have different densities for a fixed volume.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A, p178-180
• Marker
• 4 polystyrene cups
• Water
• Sand
• Flour</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The learners conduct a practical task where they compare densities of different solids, liquids and gases.
2. Learners will use the particle model to explain why gases have the lower density than liquids and liquids have lower density than solids for a fixed volume.</td></tr>
<tr><td colspan="3">ASSESSMENT:
Practical task</td></tr>
</table>

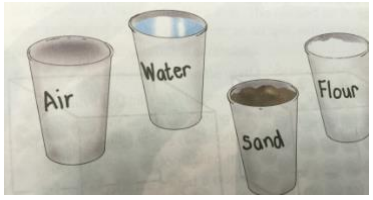
Practical task: densities of different solids, liquids and gases.

Resources required:

- Marker
- 4 polystyrene cups
- Water
- Sand
- Flour

Method

1. Label the cups Air, Flour, Sand and Water.
2. Leave the cup labelled Air empty.
3. Fill each of the other cups according to their labels.
4. Hold each of the cups in your hand and assess it's mass.
5. Place the cups in a row on the table, from heavy to light.



Questions

1. Which cup was the heaviest?
2. Which cup was the lightest?
3. Rank the materials from highest to lowest density.
4. What can you conclude about the densities of solids, liquids and gase?

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 17

<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: Density of different materials</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p43)
KEY CONCEPTS
1. Density of different materials</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td>X</td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Doing investigation</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Understand that in nature some materials are more dense and some are less dense
2. Use particle model theory to explain why different solids, liquids and gases have different densities for a fixed volume.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A, p178-180
• Marker
• 4 polystyrene cups
• Water
• Sand
• Flour
• Mass balance or scale</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The learners conduct an investigation to determine which of the given materials has the highest density.
2. Learners will use the particle model theory to explain why the material determined in the investigation has the highest density.</td></tr>
<tr><td colspan="3">ASSESSMENT:
Investigation
Siyavula p. 180-183</td></tr>
</table>

INVESTIGATION: Comparing the densities of sand, flour, water and air

INVESTIGATIVE QUESTION:

Which material has the highest density: sand, flour, water or air?

HYPOTHESIS:

What do you predict: Which material has the highest density: sand, flour, water or air?

RESULTS AND OBSERVATIONS:

What were the results of your investigation? Summarise them below. You can draw a table. If you were able to measure the mass of each cup, show your calculations for the density of each material.

ANALYSIS AND EVALUATION:

1. Did anything go wrong during the experiment? If so, what?

_____

_____

2. Can you think of anything that could have improved this experiment?

IDENTIFY VARIABLES:

1. Which variables must be kept constant to make this a fair test?

_____

_____

2. What is the independent variable? (what is it that you have control over to change in this investigation?)

_____

3. What are the dependent variables? (Which variables will you be measuring?)

_____

_____

MATERIALS AND APPARATUS:

- four identical cups (paper or plastic)
- sand
- flour
- tap water
- triple beam balance or scale

METHOD:

You will be designing this investigation yourself. If you are working in groups, you need to first discuss how you are going to conduct (carry out) this investigation. This is the planning. Write down your proposed method in your notebook or on scrap paper. Discuss this with your teacher. Remember to also think about how you are going to record your results. After you have conducted the investigation, write down your method on the lines provided here. Summarise each step in sequence and number the steps.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

3. What steps did you include to ensure fair testing?

CONCLUSION:

What is your conclusion? (What is your answer to the investigative question?)

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 18

<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: Density of different materials</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p43)
KEY CONCEPTS
1.Floating and sinking of materials</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td>X</td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information, observe, compare, predicting</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Use concept of density to determine which material would sink or float in a given liquid.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A, p178-180
• Two glass beaakers
• Cooking oil
• Teaspoon
• Water</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The learners conduct a practical task of densities of different liquids.
2. Learners will use the concept to determine which material would sink or float between cooking oil and water.
3. The teacher will then wrap up by explaining the concept of density in determining which material would sink or float in a given liquid.
4. The teacher will give learners a research on pollution of water by oil</td></tr>
<tr><td colspan="3">ASSESSMENT:
Practical task
Research: do a research on how oil has affected the oceans and shorelines around South Africa.</td></tr>
</table>

Practical task

Material needed:

- Two glass beaakers
- Cooking oil
- Teaspoon
- Water

Method:

1. Half fill a beaker with water
2. Pour some oil into water. Describe what happens.
3. Use a teaspoon to stir the oil and water mixture. Let it settle. Describe what happens.

Questions

1. Which liquid has the lower density? Give a reason for your answer.
2. Which liquid has the highest density? Give a reason for your answer.
3. Suggest three reasons why oil and water have different densities.

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 19

<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: expansion and contraction of materials</td><td>Duration: 60min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p44)
KEY CONCEPTS
1. Expansion
2. Contraction</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information, observe, compare, predicting</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. To define the concepts expansion and contraction.
2. Use particle model to draw and explain the concept of expansion and contraction in solids, liquids and gases.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A, p178-180
• Thermometer
• Ball and stick apparatus</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher will explain the concept expansion and contraction of solids, liquids and gases using ball and stick apparatus or thermometer, or any other available resource.
2. Learners watch a video clip on the theory of expansion and contraction of solids, liquids and gases.
3. The learners then use particle model theory to explain the concept of expansion and contraction of materials.</td></tr>
<tr><td colspan="3">ASSESSMENT:
Class activity</td></tr>
</table>

ACTIVITY: How much longer?

In this activity we will compare the expansion of different solid materials by drawing a graph. You will need the following information for your graph:

Material	**How far a 100 metre length of the material will expand when the temperature increases by 10°C**
Brass	19 mm
Iron	12 mm
Steel	11 mm
Platinum alloy	10 mm
Concrete	11 mm
Ordinary glass	11 mm
Ovenproof glass	3,5 mm

Draw a bar graph with 'Expansion' on the y-axis and 'Materials' as categories on the x-axis. Choose an appropriate title for you graph.

QUESTIONS:

1. Which material expands the most upon heating?

_____

2. Which material expands the least?

_____

3. Which solid would be the best material to **reinforce** concrete? (Hint: the reinforcing material should expand as much as the concrete, otherwise it will damage the concrete during expansion.)

_____

4. A man builds a house with large windows set in beautiful frames made of brass. The house is in a region where it gets very hot during summer. Imagine that the owner of the house has a problem: the windows of the house look beautiful in their shiny brass frames but they keep falling out during the summer months. As a scientist, how would you explain this and what would your advice to the owner of the house be? Should the frames be replaced? If so, with which material? What other solutions can you suggest?

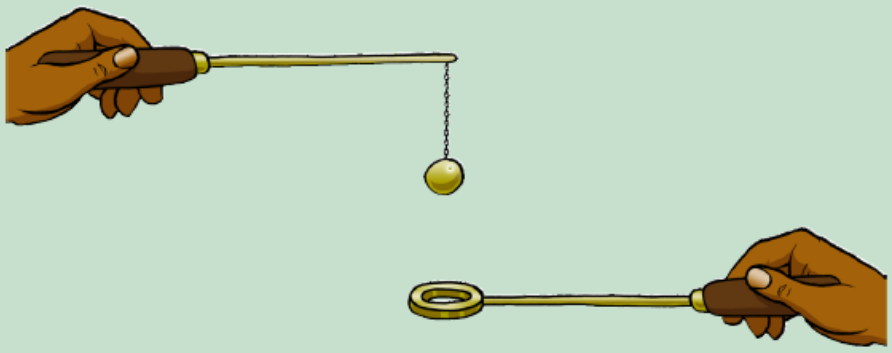
_____

_____

_____

_____

5. The following diagram shows a metal ball and ring apparatus. The ring and ball are both made of brass. At room temperature, the ball is just the right size to pass through the ring.



Do you think the ball will still fit through the ring when the ball has been heated?

_____

6. Do you think the brass ball will have more mass when it has expanded? Explain your answer.

7. What will happen to the brass ball when its temperature drops back to room temperature? Will it be larger than, smaller than, or the same size as before it was heated? Explain your answer.

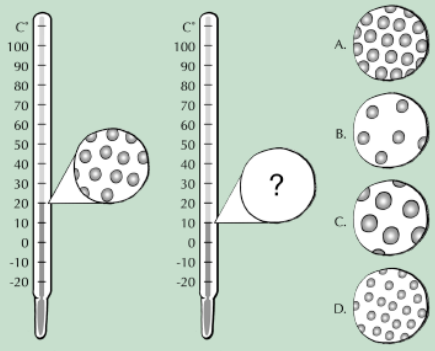
Now that we have seen that materials can expand, how can we explain expansion of a material in terms of the behaviour of the particles in that material?

We have learnt that when matter is heated, the particles of that matter will move faster and push further apart from each other. What happens to the particles in matter when it is cooled?

ACTIVITY: How does a thermometer work?

The common glass thermometer is called a bulb thermometer. All bulb thermometers have a fairly large bulb that is connected to a long, thin tube. The thermometer has a brightly coloured liquid on the inside. Some thermometers contain mercury as it expands and contracts quite a lot when heated or cooled.

Look carefully at the following set of diagrams. They represent the same thermometer at two different temperatures.



QUESTIONS:

1. The drawings represent the particles in the liquid inside a thermometer. What is the temperature measured on the thermometer on the left?

_____

2. The drawing on the right is of the same thermometer, but slightly different. Can you tell the difference?

_____

3. Which of the circles (A, B, C, or D) is the best representation of the liquid in the thermometer on the right? Why did you choose this one?

_____

_____

_____

4. Does a material have less mass when it has contracted? Explain.

_____

_____

5. If the temperature was raised and the thermometer read 30°C, which circle would now best represent the particles in the liquid of the thermometer? Why?

_____

_____

6. How does the volume change when a material is heated? Why?

_____

_____

YOU KNOW?

:ury is the only
that is a liquid at
n temperature.

7. How does the density change when a material is heated? Why?

_____

_____

_____

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 20

TOPIC: PARTICLE MODEL OF MATTER		
Sub-topic: pressure part 1	**Duration**: 60min	
CONTENT & CONCEPTS (CAPS p44) **KEY CONCEPTS** 1. Gas pressure		
Specific Aims:	Specific Aim 1: 'Doing Science'	
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	
Process Skills: ▪ Accessing and recalling information, observe, compare, predicting		
LESSON OBJECTIVES: Learners will able to: 1. Understand the concept of gas presuure		
RESOURCES REQUIRED: • Textbooks: e.g. Siyavula Explore Gr. 8A, p178-180 • Paper bag medium size • Balloon • Empty plastic cold drink or water bottles(2 litre bottlea are preferably) • Bicycle pump and tyre		
TEACHING & LEARNING ACTIVITIES: 1. The learners will complete the worksheet given. 2. The teacher consolidate the lesson by using the particle model theory to explain the concept of gas pressure.		
ASSESSMENT: Class activity Siyavula p. 197- 200		

ACTIVITY: Understanding gas pressure

MATERIALS:

- brown paper bags (medium size)
- balloons
- empty plastic cold drink or water bottles (2-litre bottles are preferable)
- bicycle pump and tyre

INSTRUCTIONS:

1. This step requires a brown paper bag.
   a) Blow up a brown paper bag until it is fully inflated.
   b) Try blowing it up even more. See if you can make it pop by blowing into it.

c) Write two or three sentences to describe what it feels like to blow into the bag when it is 'empty', compared to when it is 'full' of air. Does it feel different? Is it more difficult to blow into the bag when it is already full?

2. This step requires a balloon.
   a) Blow up the balloon until it is the size of an orange. Pinch it closed but do not tie a knot in the top.
   b) Now blow up the balloon as large as you can.
   c) Try blowing it up even more. See if you can make it pop by blowing into it.
   d) Write two or three sentences to describe what it feels like to blow into the balloon when it is 'empty', compared to when it is 'full' of air. Does it feel different? Is it more difficult to blow into the balloon when it is already full?
   e) Tie a knot in the top of an inflated balloon. Leave the balloon in the classroom and examine it again after one week. Does it look the same as when you inflated it a week ago? Perhaps it looks a bit like this balloon in the following photo:

A deflated birthday balloon.

   f) Remember to write your observations below.

3. This step requires a balloon and an empty plastic bottle.
   a) Stretch the balloon over the top of the bottle, with the balloon hanging down into the bottle.
   b) Blow into the balloon. What do you observe? Can you blow up the balloon?

   c) Now make a small hole in the bottom of the bottle. Blow into the balloon again. What do you observe now?

4. This step requires a bicycle tyre and pump.
   a) Use the pump to pump air into the tyre. Continue to pump until it becomes too difficult to pump any more air into the tyre.
   b) Write 1 or 2 sentences about your observations.

_____

_____

QUESTIONS:

Try to answer the following questions by explaining what is happening to the air particles in each case. Use the words 'particles', 'collisions' and 'pressure' in your answers.

1. What happens when you blow up a paper bag or a balloon, or when you pump air into a tyre?

_____

_____

_____

2. When you blow into a paper bag, why does the bag pop or start to leak air after a while?

_____

_____

_____

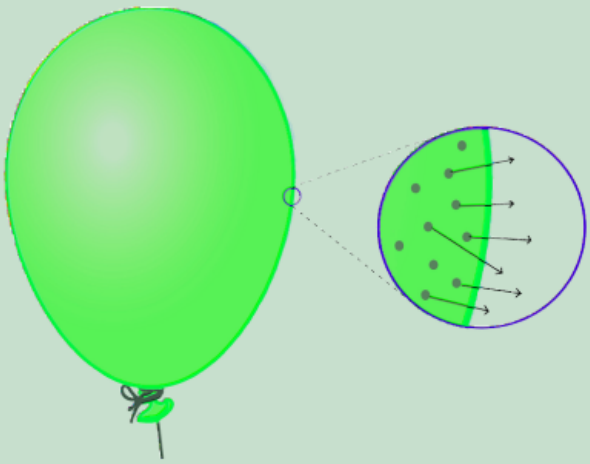
3. When you blow into a balloon that is fully inflated, why does the balloon pop?

_____

_____

_____

4. Why do you think the balloon became smaller when it was left for a week? The following diagram should provide a hint:



5. Explain why you think it was impossible to blow up the balloon inside the bottle? Why was it possible to blow up the balloon when there was a hole in the bottle?

6. Why does it become more and more difficult to pump air into the bicycle tyre?

TERM 2: MATTER & MATERIALS

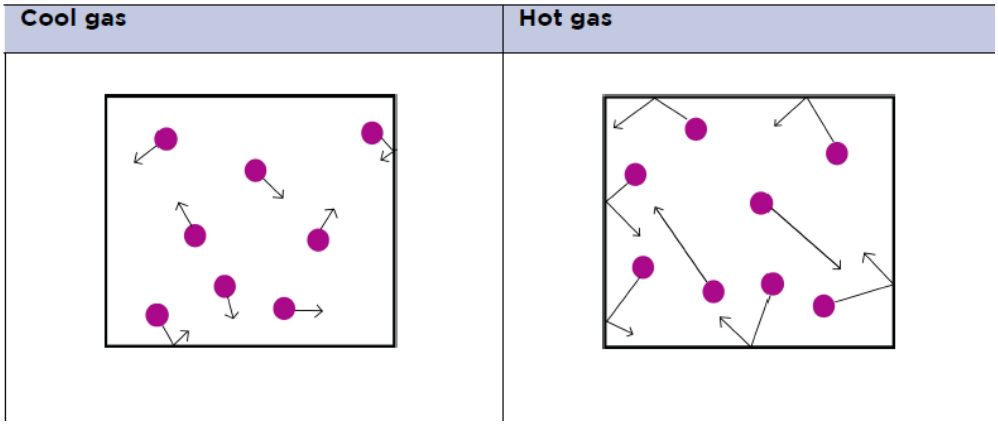
GRADE 8

Lesson plan 21

<table>
<tr><td colspan="3">TOPIC: PARTICLE MODEL OF MATTER</td></tr>
<tr><td colspan="2">Sub-topic: pressure part 2</td><td>Duration: 30min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p44)
KEY CONCEPTS
1. Gas pressure</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information, observe, compare, predicting</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Understand how heating or cooling a gas changes it’s pressure.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A, p200</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. Learners complete the activity given.
2. Teacher guides the learners to conclude that heating the gas increases it’s pressure whereas cooling the gas decreases it’s pressure.</td></tr>
<tr><td colspan="3">ASSESSMENT:
Class activity</td></tr>
</table>

Class activity

Refer to the diagram to answer the following question:



Describe what is happening in the diagram with reference to :

a)collisions of particles with the walls of the container,

b)energy of the particles and

c)pressure in the container

TERM 2: MATTER & MATERIALS

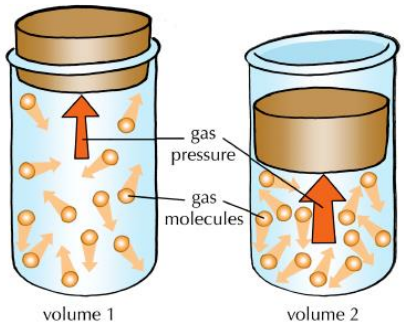
GRADE 8

Lesson plan 22

TOPIC: PARTICLE MODEL OF MATTER		
Sub-topic: pressure part 3	**Duration**: 30min	
CONTENT & CONCEPTS (CAPS p44) **KEY CONCEPTS** Gas pressure and volume		
Specific Aims:	Specific Aim 1: 'Doing Science'	
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	
Process Skills: ▪ Accessing and recalling information, observe, compare, predicting		
LESSON OBJECTIVES: Learners will able to: 1. Understand the relationship between the pressure and volume of a gas(how does volume of a gas affect the pressure of a gas) 2. Explain using particle model theory the effect of changing volume of a gas on pressure of a gas.		
RESOURCES REQUIRED: • Textbooks: e.g. Siyavula Explore Gr. 8A, p201		
TEACHING & LEARNING ACTIVITIES: 1. Learners complete the activity given. 2. Teacher guides the learners to conclude that increasing the volume decreases the pressure and decreasing the volume increases the pressure.		
ASSESSMENT: Class activity		

Class activity

Refer to the diagram to answer the following question:



Describe what is happening in the diagram with reference to :

a) Volume of the container

b) Collisions of particles with the walls of the container,

c) Pressure in the container

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 23

TOPIC: CHEMICAL REACTIONS		
Sub-topic: reactants and products part 1	**Duration**: 60min	

CONTENT & CONCEPTS (CAPS p45)

KEY CONCEPTS

1. Chemical reaction
2. Chemical bond

Specific Aims:	Specific Aim 1: 'Doing Science'	**X**
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	

Process Skills:

- Accessing and recalling information, investigation skills

LESSON OBJECTIVES:

Learners will able to:

1. Understand the concepts chemical reaction, chemical bond.
2. Carry out a practical task to identify whether a reaction has taken place or not.

RESOURCES REQUIRED:

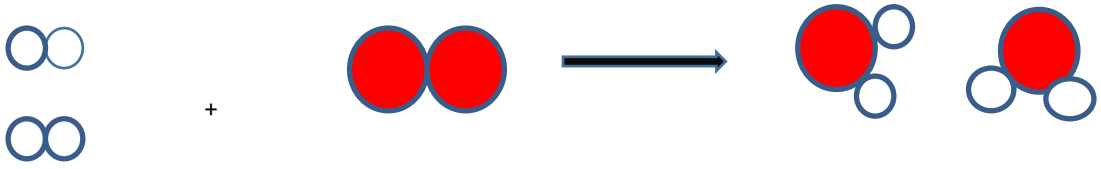
- Textbooks: e.g. Siyavula Explore Gr. 8A,p. 208-211
- Eggs
- Glass
- White vinegar

TEACHING & LEARNING ACTIVITIES:

1. The teacher conducts a brief revision of: Atoms; Molecules; Elements and Compounds.
2. The teacher explains the concept of a chemical reaction as the breaking and formation of new bonds.
3. The teacher explains a chemical bond as a force that holds atoms together.
4. The teacher makes use of diagrams to describe chemical reactions.
5. The teacher gives examples to illustrate the concept of a chemical reaction e.g. reaction of hydrogen and oxygen to form water.
6. The teacher represents a chemical reaction using :
   6.1 words
   6.2 symbols
   6.3 diagrams

Hydrogen + Oxygen → Water

$2\ H_2 + O_2 \rightarrow 2\ H_2O$



ASSESSMENT:

Practical task

Siyavula p. 210-211

ACTIVITY: Can we use a chemical reaction to see inside an egg?

MATERIALS:

- eggs
- a glass
- white vinegar

INSTRUCTIONS:

1. Carefully place the egg in the glass. Be careful not to crack the shell.
2. Cover the egg with vinegar. Wait a few minutes. Can you see anything happening on the surface of the eggshell?
   a) Write your observations below.

_____

   b) What is this observation a sign of?

_____

3. Leave the egg in the vinegar for 4 - 5 days. You should complete the rest of the activity after this.
4. After 4 to 5 days, look at the egg in the vinegar and write down your observations.

_____

_____

5. Carefully scoop the egg out of the vinegar with a large spoon. Touch the surface of the egg. Write your observations below. What has happened to the shell?

_____

_____

6. Rub the powdery coating off the egg and place it in some clean water. What does it look like now?

_____

_____

7. Draw and label pictures of what the contents of the glass looked like before and after the reaction took place.

QUESTIONS:

1. What signs did you see that told you a chemical reaction had taken place?

_____

_____

_____

2. Write a short paragraph to explain what happened to the eggshell.

_____

_____

_____

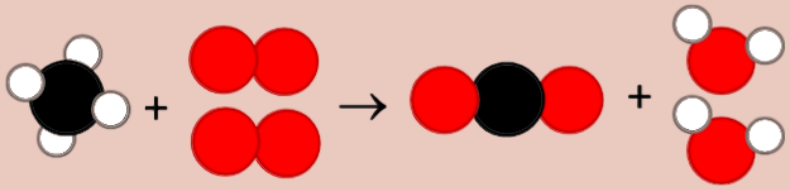
TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 24

<table>
<tr><td colspan="3">TOPIC: CHEMICAL REACTIONS</td></tr>
<tr><td colspan="2">Sub-topic: reactants and products part 2</td><td>Duration: 60min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p45)
KEY CONCEPTS
1. Reactants
2. Products</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td></td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Understand the concepts reactant and product.
2. Identify reactants and products in a chemical reaction.
3. Make and Draw models showing chemical reactions.</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A,p. 211-213
• Plastic beads or modelling clay or playdough or any other relevant materials</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher gives examples to illustrate the concept of reactants and products e.g. The teacher provides examples e.g.
Carbon reacts with oxygen to form carbon dioxide
 
Carbon + Oxygen → carbon dioxide
C + O_2 → CO_2
2. The teacher then explains a reactants as substances that react with one another during a chemical reaction and products as substances that are produced during a chemical reaction.
3. The teacher will write different chemical reactions in symbols and learners will make and draw models of the following reactions:
3.1 $2Na + Cl_2 \rightarrow 2NaCl$
3.2 $H_2 + Cl_2 \rightarrow 2HCl$
3.3 $2Mg + O_2 \rightarrow 2MgO$</td></tr>
</table>

5. Methane gas (CH_4) is a natural fuel gas that burns in oxygen gas to produce carbon dioxide and water. The reaction can be represented by the following diagram:



Key:
Carbon atoms (C): black
Oxygen atoms (O): red
Hydrogen atoms (H): white

a) Use the diagram and the 'key' below it to write formulae for each of the substances in the reaction. [4 marks]

Name of compound	**Formula**
Methane	
Oxygen gas	
Carbon dioxide	
Water	

b) What are the reactants of the above reaction? [2 marks]

_____

c) What are the products of the above reaction? [2 marks]

_____

ASSESSMENT:
Class activity
Siyavula p. 212

ACTIVITY: Analysing the eggshell experiment

In the eggshell activity the calcium carbonate in the eggshell reacted with acetic acid and formed calcium acetate, carbon dioxide and water.

We can write this **chemical equation** as follows:

eggshell + vinegar → calcium acetate + carbon dioxide + water

QUESTIONS:

1. There are two starting substances **before** this chemical reaction takes place. What are they?

---

2. There are three substances present **after** the reaction. What are these?

---

3. What are the chemical formulae for the compounds water and carbon dioxide?

---

4. We call the substances that are present before the chemical reaction has taken place, the **reactants**. What are the reactants of the eggshell experiment?

---

5. What do you think happened to the reactants during the chemical reactions?

---

6. We call the substances that are produced during the chemical reaction, the **products**. What are the products of the eggshell experiment?

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 25

<table>
<tr><td colspan="3">TOPIC: CHEMICAL REACTIONS</td></tr>
<tr><td colspan="2">Sub-topic: reactants and products part 3</td><td>Duration: 60min</td></tr>
<tr><td colspan="3">CONTENT & CONCEPTS (CAPS p45)
KEY CONCEPTS
1. Indigenous knowledge
2. Fermentation</td></tr>
<tr><td rowspan="3">Specific Aims:</td><td>Specific Aim 1: ‘Doing Science’</td><td></td></tr>
<tr><td>Specific Aim 2: ‘Knowing the subject content and making connections’</td><td>X</td></tr>
<tr><td>Specific Aim 3: ‘Understanding the uses of Science ’</td><td>X</td></tr>
<tr><td colspan="3">Process Skills:
▪ Accessing and recalling information, observe</td></tr>
<tr><td colspan="3">LESSON OBJECTIVES:
Learners will able to:
1. Explain reactants and products through indigenous knowledge of fermentation process (sorghum beer)</td></tr>
<tr><td colspan="3">RESOURCES REQUIRED:
• Textbooks: e.g. Siyavula Explore Gr. 8A,p. 211-213
• Sugar
• Sorghum
• Transparent container
• lid</td></tr>
<tr><td colspan="3">TEACHING & LEARNING ACTIVITIES:
1. The teacher discusses the brewing of sorghum beer in relation to reactants and products during fermentation product.
2. The learners brewing sorghum beer using resources identified.
3. Learners carry out a class activity.</td></tr>
<tr><td colspan="3">ASSESSMENT:
Class activity
Siyavula p. 212</td></tr>
</table>

ACTIVITY: Studying the fermentation reaction

The basic reaction in the fermentation process can be summarised as follows:

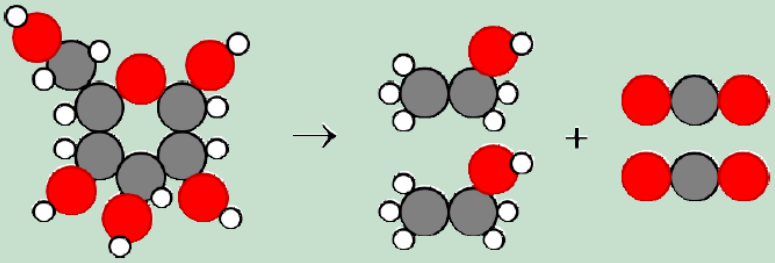
glucose → alcohol + carbon dioxide

What are the reactants and products in this reaction?

_____

_____

We can draw pictures of the molecules to show how the atoms are rearranged during the reaction:



In the diagram above, the grey atoms are carbon (C), the red atoms are oxygen (O) and the small, white ones are hydrogen (H). Write in the names of the compounds in this reaction.

Glucose does not change into alcohol and carbon dioxide by itself! Microorganisms like yeast and bacteria actively ferment glucose.

In South Africa, a popular drink is ginger or pineapple beer! The fizzy bubbles in the ginger beer or pineapple beer are bubbles of carbon dioxide produced by the yeast during fermentation. Let's make some ginger beer!

INSTRUCTIONS:

1. You need to research how to make traditional South African ginger beer.
2. Identify the different ingredients you will need.
3. Once you have done so, you can decide as a class about the best recipe you will use. You can then make ginger beer in class with your teacher.
4. Answer the questions that follow.

QUESTIONS:

1. What are the reactants in the reaction to make ginger beer?

_____

2. What is the product in the reaction taking place in the ginger beer?

_____

3. Why are there fizzy bubbles in the ginger beer?

4. Where do you think the gas came from?

5. Another example of where we see a chemical reaction taking place is when we burn wood in a fire, either in our homes or to cook food. The wood burns and produces carbon dioxide gas and water vapour. What are the products and reactants in this reactions?

TERM 2: MATTER & MATERIALS

GRADE 8

Lesson plan 26

TOPIC: CHEMICAL REACTIONS		
Sub-topic: reactants and products part 4	**Duration**: 60min	
CONTENT & CONCEPTS (CAPS p45) **KEY CONCEPTS** 1. Lime water 2. Reactants and products		
Specific Aims:	Specific Aim 1: 'Doing Science'	**X**
	Specific Aim 2: 'Knowing the subject content and making connections'	**X**
	Specific Aim 3: 'Understanding the uses of Science '	**X**
Process Skills: ▪ Accessing and recalling information, ▪ Investigative skills		
LESSON OBJECTIVES: Learners will able to: 2 Explain reactants and products through indigenous knowledge of fermentation process. (sorghum beer)		

RESOURCES REQUIRED:

- Textbooks: e.g. Siyavula Explore Gr. 8A,p.
- Drinking straw
- beaker
- clear lime water

TEACHING & LEARNING ACTIVITIES:

4. Learners carry out a practical activity of blowing CO_2 through clear lime water.
5. The teacher will lead the discussion of the practical task in terms of:
   5.1 Observations before blowing and after blowing carbon dioxide.
   5.2 Concept of chemical reaction.
   5.3 Concept of reactants and products.
6. The teacher further discusses other chemical reactions from Life and Living (photosynthesis, respiration) showing reactants and products

ASSESSMENT:

Class activity
Siyavula p. 217

ACTIVITY: Some chemical reactions from Life and Living

1. Do you remember we used clear lime water to detect carbon dioxide in our breath in Chapter 1 in Life and Living? What colour did the clear lime water turn when we blew bubbles through it?

_____

2. Limewater is a solution of calcium hydroxide in water. A reaction occurs between the lime water and the carbon dioxide to produce a white substance in the water called calcium carbonate. What are the reactants and products in this reaction?

_____

_____

3. We say that we used the colour change of the lime water to detect the carbon dioxide in our breath. Carbon dioxide is the by-product of the chemical reaction that takes place during respiration in all organisms. Write a word equation for respiration.

_____

4. In Life and Living we spoke about the ingredients of respiration as we had not yet learned the terms reactant and product. What are the reactants and what are the products in respiration?

_____

_____

5. What are the reactants and products in photosynthesis?

_____

_____