



NATURAL SCIENCES : NATS4

LESSON 6

UNIT STANDARD: 7509

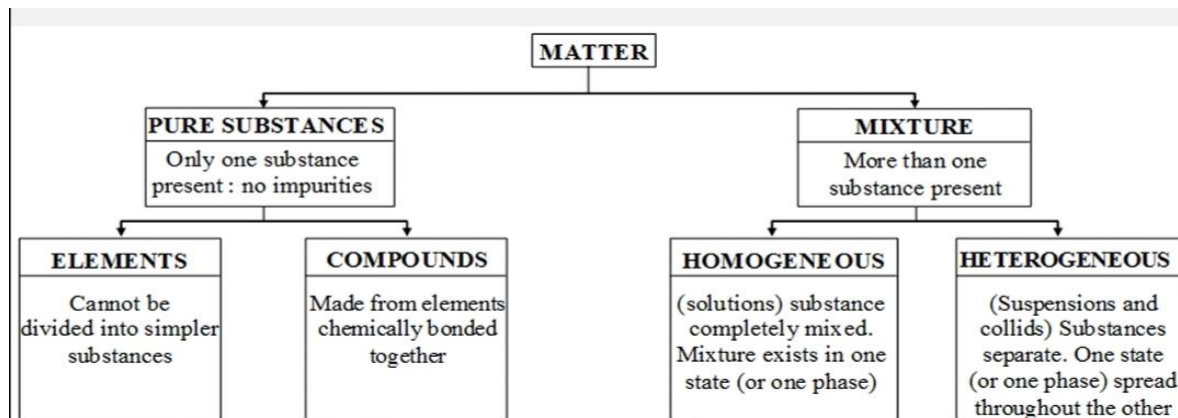
NOTES AND ACTIVITY

THEME: Matter and Materials

TOPIC: Pure Substances and Mixtures

At the end of this unit, you should be able to:

1. Define and describe pure substances and mixtures
2. Distinguish types of pure substances and mixtures.
3. Understand the properties of mixtures and how they combine.



A. PURE SUBSTANCES

1. A **pure substance** is a form of matter that has a constant composition and properties throughout the sample. It has no impurities in its state.
2. There are TWO types of pure substances, namely, **Elements and Compounds**

2.1 An **Element** is a substance that cannot be broken down into simpler substances by any ordinary chemical means. The smallest unit of an element is the **atom**.



Table 1: First 10 Elements in a Periodic Table

ATOMIC NUMBER	ELEMENT NAME	ELEMENT SYMBOL
1	Hydrogen	H
2	Helium	He
3	Lithium	Li
4	Beryllium	Be
5	Boron	B
6	Carbon	C
7	Nitrogen	N
8	Oxygen	O
9	Fluorine	F
10	Neon	Ne

2.2 A **Compound** is a chemical substance made up of two or more different elements that are joined together in a fixed ratio.

Table 2: Examples of compounds

COMPOUND NAME	CHEMICAL FORMULA	FIXED RATIO	COMBINATION OF ELEMENTS
Water	H ₂ O	2:1	2 hydrogen atoms for every 1 oxygen atom
Sodium Chloride	NaCl	1:1	1 sodium atom for every chlorine atom
Iron oxide	Fe ₃ O ₂	3:2	3 iron atoms for every 2 oxygen atoms

B. MIXTURES

1. A **mixture** is a physical combination of two or more substances (i.e. liquid, solid or gas).
2. These substances are not bonded (or joined) to each other and no chemical reaction occurs between them.

Table 3: Properties of a mixture

PROPERTIES	EXAMPLES
Mixing ratio is not fixed	Whether you add 20g, 40g, 100g of sand to any volume of water, it will still be called a mixture of sand and water.



They keep their physical properties	Neither sand nor water changed in any way when they are mixed together. The sand is still sand, and water still water.
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3. Mixtures can be classified as **homogeneous** or **heterogeneous**.

3.1 A **homogeneous** mixture has a definite composition and specific properties throughout. This means different parts cannot be seen.

3.1.1 They are also called **solution** because they exist in one state or phase.

3.3.2 A solution is made up of a **solute** and **solvent**.

(i.e. Solute + Solvent → Solution)

- A **solute** is a substance that is dissolved in another substance, usually a lesser amount.
- A **solvent** is a substance that dissolves another substance, usually a larger amount.

For example

Salt water (also known as Brine) is made by dissolving salt (solid) to water (liquid).

- Salt is a solute and water is a solvent.
- When salt dissolves, it spreads evenly through the water so that all parts of the solution are the same, and you can no longer see the salt as being separate from the water

3.2 A **heterogeneous** mixture consists of two or more substances that are non-uniform and the different components can be seen.

Table 4: Types of Heterogeneous mixtures

Phases of matter	Name of mixture	Example
Liquid to liquid	Emulsion	Oil in water
Solid to liquid	Suspension	Muddy water
Gas to liquid	Aerosol	Fizzy drinks
Gas to solid	Smoke	Smog
Solid to solid	Money	Coins and notes



ACTIVITY

1. Is a mixture made by pure substances? Explain.
2. Differentiate between heterogeneous and homogeneous mixtures.
3. What is meant by fixed ratio in a compound? Give an example to support your answer.
4. Aluminum oxide has the following chemical formula: Al_2O_3
 - 4.1 Write down the fixed ratio of aluminum oxide
 - 4.2 Explain the combination of elements.
5. Copy the table into your workbook and complete.

Substances	Mixture or non-mixture	Heterogeneous mixture	Homogeneous mixture
Tap water			
Brass (an alloy of copper and zinc)			
Concrete			
Aluminum foil (tin foil)			
Coca cola			
Soapy water			
Black tea			
Sugar water			

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