

SESSION 2: MATTER

KEY CONCEPTS:

- Properties of Matter
- Classification of Matter
- Names and Formulae of Substances
- States of Matter

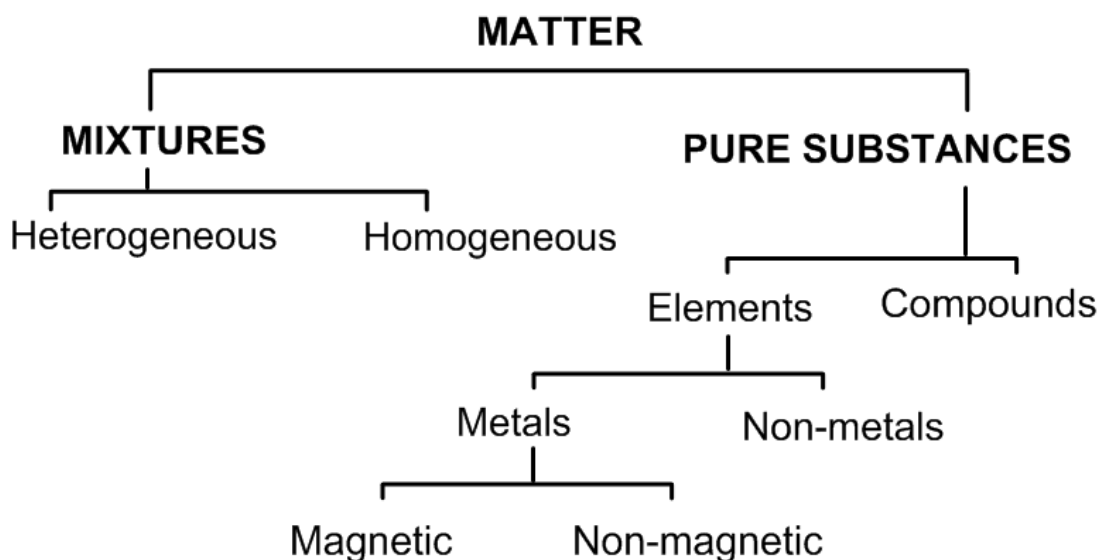
Terminology

Thermal Conductors	Substances that conduct heat
Thermal Insulators	Substances that do not allow heat to flow through it
Electrical Conductors	Substances that allow charge to pass through it.
Electrical insulators	Non-conducting materials that do not carry any charge.
Brittle	Substance that break when force is applied to them
Malleable	Substances that can be rolled into thin sheets
Ductile	Substances that can be draw into strands of wire
Melting Point:	The temperature at which a <i>solid</i> changes its phase or state to become a <i>liquid</i> .
Freezing Point	The temperature at which a <i>liquid</i> changes its phase to become a <i>solid</i>
Boiling Point	The temperature at which a <i>liquid</i> changes its phase to become a <i>gas</i> .
Mixture	A combination of two or more substances, where these substances are not bonded (or joined) to each other and no chemical reaction occurs between the substances.
Homogeneous mixture	A mixture that is uniform, and where the different components of the mixture cannot be seen.
Heterogeneous mixture	A mixture that is not uniform, and where the different components of the mixture can be seen.
Element	A substance that cannot be broken down into other substances through chemical means.

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

X-PLANATION

Classification of Matter



Properties of Mixtures:

- Are not in a fixed ratio.
- Keep their physical properties.
- Can be separated by mechanical means.

Types of Mixtures

Phases of matter	Name of mixture	Example
liquid-liquid	emulsion	oil in water
solid-liquid	suspension	muddy water
gas-liquid	aerosol	fizzy drinks
gas-solid	smoke	smog

Table of Cations

Compound ion	Formula	Compound ion	Formula	Compound ion	Formula
Hydrogen	H ⁺	Lithium	Li ⁺	Sodium	Na ⁺
Potassium	K ⁺	Silver	Ag ⁺	Mercury (I)	Hg ⁺
Copper (I)	Cu ⁺	Ammonium	NH ₄ ⁺	Beryllium	Be ²⁺
Magnesium	Mg ²⁺	Calcium	Ca ²⁺	Barium	Ba ²⁺
Tin (II)	Sn ²⁺	Lead (II)	Pb ²⁺	Chromium (II)	Cr ²⁺
Manganese (II)	Mn ²⁺	Iron (II)	Fe ²⁺	Cobalt (II)	Co ²⁺
Nickel	Ni ²⁺	Copper (II)	Cu ²⁺	Zinc	Zn ²⁺
Aluminium	Al ³⁺	Chromium (III)	Cr ³⁺	Iron (III)	Fe ³⁺
Cobalt (III)	Co ³⁺	Chromium (VI)	Cr ⁶⁺	Manganese (VII)	Mn ⁷⁺

Table of Anions

Compound ion	Formula	Compound ion	Formula
Fluoride	F^{-}	Oxide	O^{2-}
Chloride	Cl^{-}	Peroxide	O_2^{2-}
Bromide	Br^{-}	Carbonate	CO_3^{2-}
Iodide	I^{-}	Sulphide	S^{2-}
Hydroxide	OH^{-}	Sulphite	SO_3^{2-}
Nitrite	NO_2^{-}	Sulphate	SO_4^{2-}
Nitrate	NO_3^{-}	Thiosulphate	$S_2O_3^{2-}$
Hydrogen carbonate	HCO_3^{-}	Chromate	CrO_4^{2-}
Hydrogen sulphite	HSO_3^{-}	Dichromate	$Cr_2O_7^{2-}$
Hydrogen sulphate	HSO_4^{-}	Manganate	MnO_4^{2-}
Dihydrogen phosphate	$H_2PO_4^{-}$	Oxalate	$(COO)_2^{2-} / C_2O_4^{2-}$
Hypochlorite	ClO^{-}	Hydrogen phosphate	HPO_4^{2-}
Chlorate	ClO_3^{-}	Nitride	N^{3-}
Permanganate	MnO_4^{-}	Phosphate	PO_4^{3-}
Acetate (ethanoate)	CH_3COO^{-}	Phosphide	P^{3-}

X-AMPLE QUESTIONS:

Question 1:

Look at the table below. In the first column (A) is a list of substances. In the second column (B) is a description of the group that each of these substances belongs in. Match up the *substance* in Column A with the *description* in Column B.

Column A	Column B
1. iron	A. a compound containing 2 elements
2. H ₂ S	B. a heterogeneous mixture
3. sugar solution	C. a metal alloy
4. sand and stones	D. an element
5. steel	E. a homogeneous mixture

Question 2:

Give the name of each of the following substances:

- KBr
- HCl
- Kmno₄
- NO₂
- NH₄OH
- Na₂SO₄
- Fe(NO₃)₃
- PbSO₃
- Cu(HCO₃)₂

Question 3:

Give the chemical formula for each of the following compounds:

- a) potassium nitrate
- b) sodium oxide
- c) barium sulphate
- d) aluminium chloride
- e) magnesium phosphate
- f) tin(II) bromide
- g) manganese(II) phosphide

Question 4:

For each of the following materials, say what properties of the material make it important in carrying out its particular function:

- a) **tar** on roads
- b) **iron** burglar bars
- c) **plastic** furniture
- d) **metal** jewellery
- e) **clay** for building
- f) **cotton** clothing

Question 5:

Refer to the table below which gives the melting and boiling point of a number of elements and then answer the questions that follow:

Element	Melting point (°C)	Boiling point (°C)
copper	1083	2567
magnesium	650	1107
oxygen	-218,4	-183
carbon	3500	4827
helium	-272	-268,6
sulphur	112,8	444,6

a)

What state of matter (i.e. solid, liquid or gas) will each of these elements be in at room temperature (25°C)?

b)

Which of these elements has the strongest forces between its atoms? Give a reason for your answer.

c)

Which of these elements has the weakest forces between its atoms? Give a reason for your answer.

X-exercises

1. Give the names of each of the following compounds:
 - a) NaBr
 - b) $\text{Ba}(\text{NO}_2)_2$
 - c) SO_2
 - d) H_2SO_4
2. Give the formula for each of the following compounds:
 - a) iron (II) sulphate
 - b) boron trifluoride
 - c) potassium permanganate
 - d) zinc chloride

Solutions to X-exercises

1.
 - a) NaBr sodium bromide
 - b) $\text{Ba}(\text{NO}_2)_2$ barium nitrite
 - c) SO_2 sulphur dioxide or sulphur (IV)oxide
 - d) H_2SO_4 hydrogen sulphate or sulphuric acid
2. Give the formula for each of the following compounds:
 - a) iron (II) sulphate FeSO_4
 - b) boron trifluoride BF_3
 - c) potassium permanganate KMnO_4
 - d) zinc chloride ZnCl_2