

Core Concepts: An **atom** is the smallest particle of an element that can exist. An **element** is a substance consisting of only one type of atom. A **compound** is a substance formed when two or more elements are chemically bonded together. A **mixture** consists of two or more substances (elements or compounds) that are not chemically bonded together.

Section A: Key Terms & Basic Concepts

A1. Match the following keywords to their correct definitions by drawing lines.

Keyword	Definition
Atom	A substance made of two or more elements chemically bonded together.
Element	The central part of an atom, containing protons and neutrons.
Compound	A substance consisting of only one type of atom.
Mixture	The smallest particle of an element that can exist.
Nucleus	Two or more substances not chemically bonded together.

Model Answer:

Atom → The smallest particle of an element that can exist.

Element → A substance consisting of only one type of atom.

Compound → A substance made of two or more elements chemically bonded together.

Mixture → Two or more substances not chemically bonded together.

Nucleus → The central part of an atom, containing protons and neutrons.

A2. Complete the following sentences using the most appropriate scientific terms.

- (i) Atoms are made of a central nucleus containing protons and neutrons, with electrons orbiting around it.
- (ii) The particles in the nucleus that have a positive charge are protons, while those with no charge are neutrons.
- (iii) In a compound, the elements are chemically bonded together, whereas in a mixture, they are not chemically bonded.

Model Answer:

(i) nucleus, protons, neutrons, electrons

(ii) protons, neutrons

(iii) chemically bonded, not chemically bonded

Section B: Core Concepts & Explanations

B1. Distinguish between an atom and an element.

Model Answer:

An atom is the smallest particle of an element that can exist.

An element is a substance made up of only one type of atom.

B2. Explain how a compound is different from a mixture.

Model Answer:

In a compound, two or more elements are chemically bonded together in a fixed ratio, forming a new substance with different properties.

In a mixture, two or more substances (elements or compounds) are not chemically bonded, they retain their individual properties, and can be separated more easily.

B3. Describe the structure of an atom, including the relative charges and masses of its subatomic particles.

Model Answer:

An atom consists of a central nucleus containing protons and neutrons.

Protons have a relative charge of +1 and a relative mass of 1. Neutrons have no charge (0) and a relative mass of 1.

Electrons orbit the nucleus, have a relative charge of -1, and a negligible relative mass (approximately 1/1836 of a proton).

B4. Draw a simple diagram to represent a molecule of water (H_2O) and explain why it is classified as a compound.

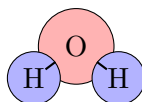


Figure 1: A simple representation of a water molecule.

Model Answer:

(Diagram as above)

Water (H_2O) is classified as a compound because it is formed from two different elements, hydrogen (H) and oxygen (O).

These elements are chemically bonded together in a fixed ratio (two hydrogen atoms to one oxygen atom).

This chemical bonding results in a new substance with properties distinct from hydrogen gas and oxygen gas.

Section C: Exam Application & Extended Writing

C1. The diagrams below show different arrangements of particles. Identify whether each diagram represents an element, a compound, or a mixture.

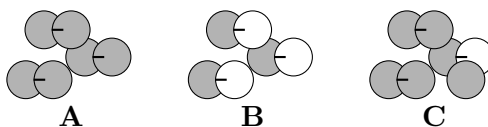


Figure 2: Particle arrangements.

(i) Diagram A:

Model Answer:

Element

(ii) Diagram B:

Model Answer:

Compound

(iii) Diagram C:

Model Answer:

Mixture

C2. (6 marks) Explain how the properties of a compound are typically different from the properties of the elements from which it is formed. Use an example to illustrate your answer.

Model Answer:

When a compound is formed from its constituent elements, a chemical reaction occurs where new chemical bonds are formed between the atoms of the different elements.

This process results in the creation of an entirely new substance with its own unique set of physical and chemical properties, which are often vastly different from those of the original elements.

The original elements lose their individual identities and characteristics as they are chemically transformed into the compound.

For example, sodium (Na) is a highly reactive, soft, silvery metal that reacts violently with water and air.

Chlorine (Cl₂) is a poisonous, green-yellow gas.

When sodium and chlorine react, they form sodium chloride (NaCl), which is common table salt.

Sodium chloride is a stable, white crystalline solid that is essential for life and has completely different properties from both sodium metal and chlorine gas. It does not react violently with water and is not a poisonous gas.