

2.1 Elements, compounds and mixtures

Name: _____ Class: _____ Date: _____

Total: 21 marks

KEY WORDS compound 化合物 • mixture 混合物 • element 元素 • atom 原子 • ion 离子

Objective

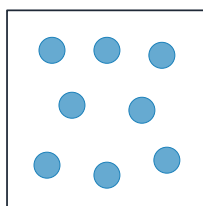
Build the skills to answer exam questions on **elements, compounds and mixtures** 元素、化合物与混合物 — telling them apart and explaining the key difference.

You must be able to:

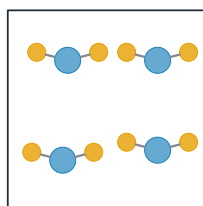
- define element, compound and mixture
- recognise each from a particle diagram
- explain that a compound is bonded (chemical separation) but a mixture is not

1 Worked examples

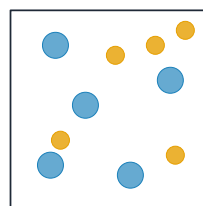
■ Three types of substance



element
only one type of atom

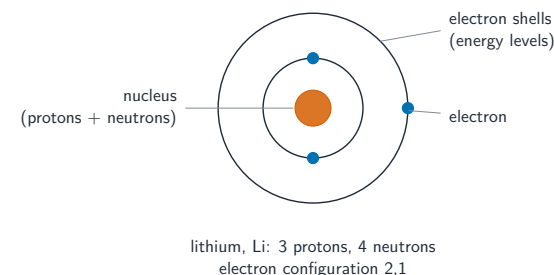


compound
different atoms bonded
in a fixed ratio



mixture
not bonded,
easy to separate

*Element = one type of atom; compound = different atoms bonded in a fixed ratio;
mixture = not bonded*



Atoms are the building blocks of elements and compounds

- **element:** one type of atom (e.g. copper).
- **compound:** elements chemically bonded in a fixed ratio (e.g. water); different properties from its elements.
- **mixture:** not bonded; separated by physical methods (e.g. air).

2 Practice

2.1 Define a compound. [1]

2.2 State how a mixture can be separated. [1]

3 Exam-style questions

3.1 Which is a compound? [1]

- A oxygen, O₂
- B water, H₂O
- C air
- D copper

3.2 A particle diagram shows two different atoms always joined together in pairs.

(a) State whether this represents an element, a compound or a mixture. [1]

(b) Explain your answer. [2]

3.3 State the main difference between a compound and a mixture of the same elements.[2]

3.4 Four substances are examined: **W** is made of one kind of atom only; **X** contains two kinds of atom chemically joined in a fixed ratio; **Y** contains two kinds of atom that can be separated by filtering; **Z** is a shiny grey solid that conducts electricity and cannot be broken down.

(a) Classify **W**, **X**, **Y** and **Z** as element, compound or mixture, giving a reason for each.[4]

(b) Explain the difference between a compound and a mixture in terms of how the substances are joined and how they can be separated. [4]

(c) Iron filings and sulfur powder are mixed, then heated strongly to form iron sulfide. Describe how you could show that a chemical change has taken place. [3]

(d) Name a method that would separate the iron from the **mixture** but not from the **compound**, and explain why. [2]

Solutions

2.1 two or more elements chemically joined (bonded) together in a fixed ratio.

2.2 by physical methods (e.g. filtering, distillation).

3.1 B. Water is two elements chemically bonded — a compound.

3.2 (a) a compound.

(b) two different atoms are present, chemically bonded together in a fixed ratio.

3.3 in a compound the elements are chemically bonded and need a chemical reaction to separate; in a mixture they are not bonded and are easily separated by physical means.

3.4 (a) **W** element — only one type of atom. **X** compound — different atoms chemically bonded in a fixed ratio. **Y** mixture — the parts are not chemically joined, so a physical method separates them. **Z** element — it cannot be broken down into anything simpler.

(b) In a compound the atoms are held by **chemical bonds** and are present in a fixed ratio; in a mixture the substances are simply mixed and can be in any proportion. A compound can only be separated by a chemical reaction; a mixture can be separated by physical means such as filtering, distilling or using a magnet.

(c) The mixture is grey with yellow specks and the product is a single black solid, so the appearance changes; heat is given out once the reaction starts and it continues without further heating; the product has different properties from both starting materials, and the change cannot be reversed easily.

(d) A **magnet**. In the mixture the iron is still iron, so it is still attracted; in iron sulfide the iron atoms are chemically bonded to sulfur, so the compound has its own properties and is not magnetic.