

GCSE Chemistry

Worksheet: Atoms, elements and compounds

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Atoms, elements and compounds

NAME _____ **CLASS** _____ **DATE** _____

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Table 1 shows the formulae of four substances, **A**, **B**, **C** and **D**.

Table 1

Substance	Formula
A	N ₂
B	NH ₃
C	Ne
D	KBr

0 1 . 1

Which **two** substances are elements?

Tick (✓) **two** boxes.

A

☐

B

☐

C

☐

D

☐

[2 marks]

0 1 . 2

Name substance **D**.

.....

.....

.....

.....

[1 mark]

0 1 . 3

Substance **B** is a compound.
Explain why.

.....

.....

.....

.....

[2 marks]

0 1 . 4

How many atoms are there in one molecule of substance **B**?

.....

.....

.....

.....

[1 mark]

0 2

Calcium phosphate has the formula $\text{Ca}_3(\text{PO}_4)_2$.

0 2 . 1

Show that one formula unit of calcium phosphate contains 8 oxygen atoms.

.....

.....

[1 mark]

0 2 . 2

Give the ratio of calcium atoms to phosphorus atoms in calcium phosphate.

.....

.....

.....

.....

[1 mark]

0 2 . 3

Which element is **not** present in calcium phosphate?

Tick (✓) **one** box.

Calcium

☐

Oxygen

☐

Phosphorus

☐

Sulfur

☐

[1 mark]

0 3

Chalk is mainly calcium carbonate. The formula of calcium carbonate is CaCO_3 .

0 3 . 1

Which of these substances is an element?

Tick (✓) **one** box.

Carbon dioxide

☐

Magnesium

☐

Sodium chloride

☐

Water

☐

[1 mark]

0 3 . 2

Give the chemical symbol for calcium.

.....

.....

[1 mark]

0 3 . 3

Name the **three** elements in calcium carbonate.

.....

.....

[1 mark]

0 3 . 4

How many atoms are shown in the formula CaCO_3 ?

.....

.....

.....

[1 mark]

0 3 . 5

Which statement describes an atom?

Tick (✓) **one** box.

A particle that always has an overall positive charge

☐

The smallest part of an element that can exist

☐

Two or more elements chemically combined

☐

A substance that contains more than one type of particle

☐

[1 mark]

0 4

A student mixed iron filings with sulfur powder and held a magnet close to the mixture.

A teacher then heated some of the mixture strongly in a fume cupboard until it glowed red. A black solid formed.

0 4 . 1

The iron filings in the mixture were attracted to the magnet.

Explain why.

.....

.....

[1 mark]

0 4 . 2

The black solid formed after heating was **not** attracted to a magnet.
Explain why.

.....

.....

.....

.....

[2 marks]

0 4 . 3

Write a word equation for the reaction.

.....

.....

[1 mark]

0 4 . 4

Give **one** other difference between the mixture and the compound, apart from magnetism.

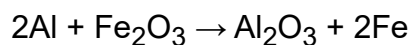
.....

.....

[1 mark]

0 5

When a mixture of aluminium powder and iron(III) oxide is ignited, it glows white hot and molten iron is formed.



0 5 . 1

Name the compound Al_2O_3 .

.....

.....

.....

.....
[1 mark]

0 5 . 2

Write a word equation for this reaction.

.....

.....

[1 mark]

0 5 . 3

Show that the equation is balanced.

.....

.....

.....

.....

[2 marks]

0 5 . 4

Give **two** pieces of evidence from the description that a chemical reaction takes place.

.....

.....

.....

.....

[2 marks]

0 6

Epsom salts is hydrated magnesium sulfate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$.

The $\cdot 7\text{H}_2\text{O}$ in the formula shows that there are seven water molecules for every MgSO_4 unit.

0 6 . 1

Give the number of oxygen atoms in one formula unit of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$.

.....

.....

.....

Number of oxygen atoms =

[1 mark]

0 6 . 2

Show that the ratio of hydrogen atoms to magnesium atoms in $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ is 14 : 1.

.....

.....

.....

.....

[2 marks]

0 6 . 3

Calculate the total number of atoms in one formula unit of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$.

.....

.....

.....

.....

Total number of atoms =

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Chemistry · Worksheet: Atoms, elements and compounds · 30 marks

Question 1 (6 marks)

01.1 [2 marks]

Correct: A; C

01.2 [1 mark]

Answer: potassium bromide

- potassium bromide (1)

Notes: Do not accept potassium bromine.

01.3 [2 marks]

Answer: It contains two different elements (nitrogen and hydrogen) that are chemically combined.

- (contains) two (or more) different elements / different types of atom (1)
- chemically combined / (chemically) bonded (together) (1)

Notes: Allow 'nitrogen and hydrogen' for 'two different elements'. 'Mixed' does not score the second mark.

01.4 [1 mark]

Answer: 4

- 4 (1)
-

Question 2 (3 marks)

02.1 [1 mark]

Answer: $(\text{PO}_4)_2$ contains $2 \times 4 = 8$ oxygen atoms.

- $2 \times 4 = 8$ (oxygen atoms) (1)
-

02.2 [1 mark]

Answer: 3 : 2

- 3 : 2 (1)

Notes: Do not accept 2 : 3.

02.3 [1 mark]

Correct: Sulfur

Question 3 (5 marks)

03.1 [1 mark]

Correct: Magnesium

03.2 [1 mark]

Answer: Ca

- Ca (1)

Notes: The symbol must have a capital C and a lower-case a. Do not accept CA or ca.

03.3 [1 mark]

Answer: calcium, carbon and oxygen

- calcium, carbon and oxygen (1)

Notes: All three are needed for the mark. Allow Ca, C and O.

03.4 [1 mark]

Answer: 5

- 5 (1)
-

03.5 [1 mark]

Correct: The smallest part of an element that can exist

Question 4 (5 marks)

04.1 [1 mark]

Answer: The iron and sulfur are not chemically combined, so the iron keeps its magnetic property.

- the iron and sulfur are not chemically combined / it is a mixture, so the iron keeps its (magnetic) properties (1)

04.2 [2 marks]

Answer: The iron reacted with the sulfur to form a new compound, iron sulfide, which has different properties from iron.

- the iron has reacted (chemically) with the sulfur to form a new substance / compound, iron sulfide (1)
- iron sulfide has different properties from iron / is not magnetic (1)

04.3 [1 mark]

Answer: iron + sulfur $\rightarrow$ iron sulfide

- iron + sulfur $\rightarrow$ iron sulfide (1)

04.4 [1 mark]

Answer: The mixture can be separated by a physical method, but the compound can only be separated into its elements by a chemical reaction.

- the (elements in the) mixture can be separated by a physical method, but the compound can only be separated into its elements by a chemical reaction (1)

Notes: Allow a difference in appearance: the mixture shows grey and yellow specks; the compound is a black solid. Allow: the proportions of iron and sulfur in a mixture can vary, but in the compound they are fixed.

Question 5 (6 marks)

05.1 [1 mark]

Answer: aluminium oxide

- aluminium oxide (1)

05.2 [1 mark]

Answer: aluminium + iron(III) oxide $\rightarrow$ aluminium oxide + iron

- aluminium + iron(III) oxide $\rightarrow$ aluminium oxide + iron (1)

Notes: Allow iron oxide for iron(III) oxide. Ignore state symbols.

05.3 [2 marks]

Answer: Left: 2 Al, 2 Fe, 3 O. Right: 2 Al, 2 Fe, 3 O.

- 2 aluminium atoms and 2 iron atoms on each side (1)
- 3 oxygen atoms on each side (1)

05.4 [2 marks]

Answer: A new substance (iron) is formed; energy is released (the mixture glows white hot).

- a new substance is formed (molten iron / aluminium oxide) (1)
- there is an energy change: energy is given out, making the mixture glow white hot (1)

Question 6 (5 marks)

06.1 [1 mark]

Answer: 11

- 11 (4 in MgSO_4 + 7 in the water molecules) (1)

06.2 [2 marks]

Answer: 7 water molecules contain $7 \times 2 = 14$ hydrogen atoms, and there is 1 magnesium atom.

- $7 \times 2 = 14$ hydrogen atoms (from the water molecules) (1)
- there is only 1 magnesium atom, so the ratio is 14 : 1 (1)

06.3 [2 marks]

Answer: 27

- 1 (Mg) + 1 (S) + 4 (O) + 7×3 (atoms in $7\text{H}_2\text{O}$) (1)
 - 27 (1)
-