

GCSE Combined Science: Trilogy

Worksheet: Chemical bonds

TIME 30 min	TOTAL 29 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Chemical bonds

NAME	CLASS	DATE
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- 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
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There are three types of strong chemical bond: ionic, covalent and metallic.

0	1	.	1
---	---	---	---

Give the type of bonding in each substance.

sodium chloride

water

copper

.....

.....

.....

.....

.....

.....

[3 marks]

0 1 . 2

Complete the sentence.

Tick (✓) **one** box.

Ionic bonding occurs in compounds formed from

metals combined with non-metals

☐

non-metals only

☐

metals only

☐

noble gases

☐

[1 mark]

0 1 . 3

Which describes the particles in covalent bonding?

Tick (✓) **one** box.

Atoms that share pairs of electrons

☐

Oppositely charged ions

☐

Positive ions and delocalised electrons

☐

Molecules that share protons

☐

[1 mark]

0 2

There are three types of strong chemical bond: ionic, covalent and metallic.

0 2 . 1

Give the type of bonding in each substance.

magnesium oxide

ammonia, NH_3

zinc

.....

.....

.....

.....

.....

.....

[3 marks]

0 2 . 2

Which type of bonding involves delocalised electrons?

.....

.....

.....

.....

[1 mark]

0 3

A student says:

‘Covalent bonds must be weak, because substances like water, which has covalent bonds, have low melting points.’

0 3 . 1

Evaluate the student’s statement.

.....

.....

.....

.....

[2 marks]

0 4

Here is a list of substances.

- magnesium oxide, MgO
- carbon dioxide, CO₂
- brass
- chlorine, Cl₂
- potassium fluoride, KF
- iron, Fe

0 4 . 1

Which **two** substances have ionic bonding?

Tick (✓) **two** boxes.

Magnesium oxide

☐

Carbon dioxide

☐

Brass

☐

Chlorine

☐

Potassium fluoride

☐

Iron

☐

[2 marks]

0 4 . 2

Explain why carbon dioxide has covalent bonding.

.....

.....

.....

.....

[2 marks]

0 4 . 3

Brass is an alloy of copper and zinc.

Name the type of bonding in brass.

.....

.....

.....

.....
[1 mark]

0 4 . 4

Describe the forces that hold the particles together in ionic bonding.

.....

.....

.....

.....

[2 marks]

0 5

Table 1 describes the particles in three substances, **A**, **B** and **C**.

Table 1

Substance	Description of the particles
A	positive ions arranged in a regular pattern, with electrons that are free to move through the whole structure
B	atoms joined in pairs by a shared pair of electrons
C	positive ions and negative ions arranged in a regular pattern

0 5 . 1

Name the type of bonding in each substance.

.....

.....

.....

.....

.....

.....

[3 marks]

0 5 . 2

Potassium bromide has the same type of bonding as substance **C**.
Describe how this bonding forms, in terms of electrons.

.....

.....

.....

.....

[2 marks]

0 5 . 3

Explain why two non-metal atoms form a covalent bond rather than an ionic bond.

.....

.....

[1 mark]

0 6

A student tests three solids, **A**, **B** and **C**, to see whether they conduct electricity when solid and when molten.

Table 2 shows the results.

Table 2

Solid	Conducts when solid?	Conducts when molten?
A	no	yes
B	no	no
C	yes	yes

0 6 . 1

Identify the type of bonding in each solid.

.....

.....

.....

.....

.....

.....

[3 marks]

0 6 . 2

Explain how the results for solid **A** show that it has ionic bonding.

.....

.....

.....

.....

[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 Combined Science: Trilogy · Worksheet: Chemical bonds · 29 marks

Question 1 (5 marks)

01.1 [3 marks]

Answer: sodium chloride: ionic; water: covalent; copper: metallic

- sodium chloride: ionic (1)
 - water: covalent (1)
 - copper: metallic (1)
-

01.2 [1 mark]

Correct: metals combined with non-metals

01.3 [1 mark]

Correct: Atoms that share pairs of electrons

Question 2 (4 marks)

02.1 [3 marks]

Answer: magnesium oxide: ionic; ammonia: covalent; zinc: metallic

- magnesium oxide: ionic (1)
 - ammonia: covalent (1)
 - zinc: metallic (1)
-

02.2 [1 mark]

Answer: metallic

- metallic (1)
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: The student is wrong: covalent bonds are strong. Water melts at a low temperature because only the weak intermolecular forces between the molecules are overcome; the covalent bonds within the molecules do not break.

- covalent bonds themselves are strong, so the student is wrong (1)
 - water's low melting point is due to the weak intermolecular forces between molecules, which are overcome when it melts; the covalent bonds within the molecules do not break (1)
-

Question 4 (7 marks)

04.1 [2 marks]

Correct: Magnesium oxide; Potassium fluoride

04.2 [2 marks]

Answer: Carbon and oxygen are both non-metals, so their atoms share pairs of electrons.

- carbon and oxygen are (both) non-metals (1)
 - (so their atoms) share pairs of electrons (1)
-

04.3 [1 mark]

Answer: metallic

- metallic (1)
-

04.4 [2 marks]

Answer: Strong electrostatic forces of attraction between oppositely charged ions.

- (strong) electrostatic forces of attraction (1)
- between oppositely charged ions (1)

Notes: Do not accept 'between atoms' or 'between molecules'.

Question 5 (6 marks)

05.1 [3 marks]

Answer: A: metallic; B: covalent; C: ionic

- A: metallic (1)
 - B: covalent (1)
 - C: ionic (1)
-

05.2 [2 marks]

Answer: Each potassium atom transfers one electron to a bromine atom, forming K^+ and Br^- ions, which attract each other.

- potassium atoms lose / transfer one electron to bromine atoms (1)
 - forming oppositely charged ions (K^+ and Br^-) which attract each other (1)
-

05.3 [1 mark]

Answer: Both atoms need to gain electrons to fill their outer shells, so they share pairs of electrons instead of transferring them.

- both atoms need to gain electrons (to get a full outer shell), so they share electrons (neither loses electrons to form a positive ion) (1)
-

Question 6 (5 marks)

06.1 [3 marks]

Answer: A: ionic; B: covalent; C: metallic

- A: ionic (1)
- B: covalent (1)
- C: metallic (1)

Notes: For B, allow small molecules or giant covalent.

06.2 [2 marks]

Answer: In the solid the ions are in fixed positions so they cannot carry charge; when molten the ions are free to move and carry charge.

- in the solid, the ions are in fixed positions, so they cannot move to carry charge (1)
 - when molten, the ions are free to move (and carry charge), so it conducts (1)
-