AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.2.1.1

Chemical bonds

Past-paper questions

Tier	**Foundation**
Question groups	**2**
Available paper years	**2018–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

5.2.1.1 Chemical bonds

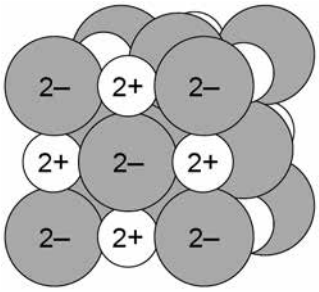
Question 01

June 2018 | 8464/C/1F | Original Q1

0 1 This question is about structure and bonding.

0 1 . 1 **Figure 1** shows part of the structure of calcium oxide (CaO).

Figure 1



What type of bonding is present in calcium oxide?

[1 mark]

Tick **one** box.

Covalent ☐

Ionic ☐

Macromolecular ☐

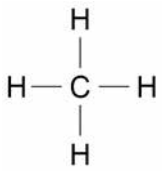
Metallic ☐

5.2.1.1 Chemical bonds

Question 01 · continued

0 1 . 2 **Figure 2** shows a particle of methane (CH_4).

Figure 2



What type of particle is present in **Figure 2**?

[1 mark]

Tick **one** box.

An ion ☐

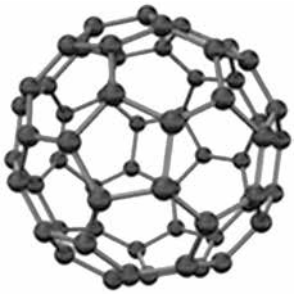
A lattice ☐

A molecule ☐

A polymer ☐

0 1 . 3 **Figure 3** shows the structure of C_{60}

Figure 3



Complete the sentence.

Choose the answer from the box.

[1 mark]

diatomic	**giant ionic**	**a fullerene**	**giant metallic**

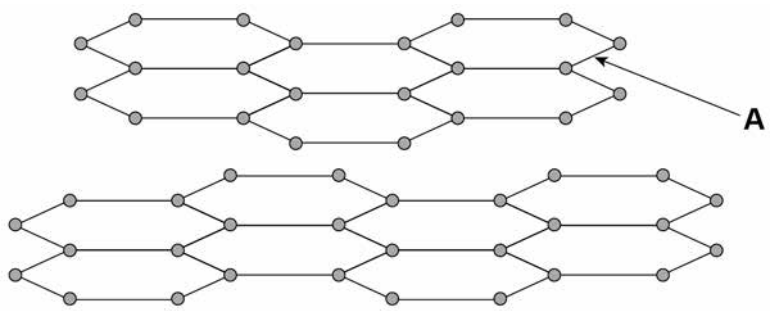
The structure of C_{60} is _____ .

5.2.1.1 Chemical bonds

Question 01 · continued

Figure 4 shows the structure of graphite.

Figure 4



0 1 . 4 What type of bond is labelled **A** in **Figure 4**?

[1 mark]

Tick **one** box.

covalent ☐

double ☐

ionic ☐

metallic ☐

0 1 . 5 In graphite, each carbon atom forms bonds with other carbon atoms as shown in **Figure 4**

How many electrons does **one** carbon atom use to form **one** bond?

[1 mark]

Tick **one** box.

1 ☐ **2** ☐ **3** ☐ **4** ☐

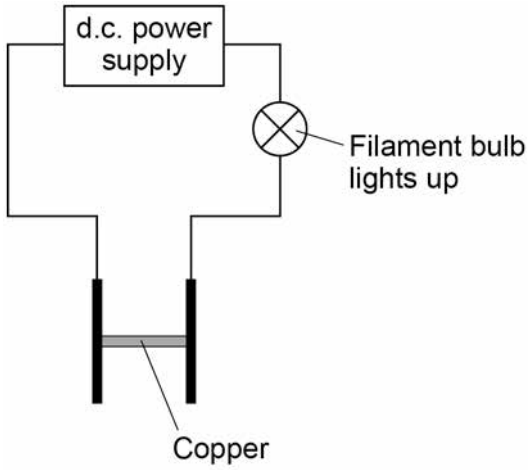
5.2.1.1 Chemical bonds

Question 01 · continued

An electric current is passed through copper.

Figure 5 shows the apparatus used.

Figure 5



0 1 . 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

gas	**liquid**	**solid**	**solution**

Figure 5 shows that copper conducts electricity as a _____ .

0 1 . 7 Complete the sentence.

Choose the answer from the box.

[1 mark]

atoms	**electrons**	**ions**	**molecules**

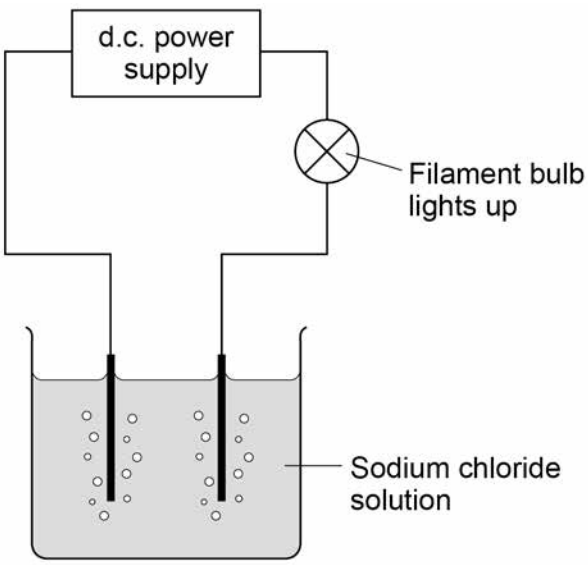
Copper conducts electricity because of the movement of delocalised _____ .

5.2.1.1 Chemical bonds

Question 01 · continued

0 1 . 8 **Figure 6** shows the apparatus used to investigate the effect of electricity on sodium chloride solution.

Figure 6



Complete the sentence.

Choose the answer from the box.

[1 mark]

dissolved	**gaseous**	**molten**

Figure 6 shows that sodium chloride conducts electricity when _____ .

5.2.1.1 Chemical bonds

Question 01 · continued

0 1 . 9 Sodium chloride is made up of ions.

Figure 7 shows the apparatus used to investigate the effect of electricity on solid sodium chloride and molten sodium chloride.

Figure 7

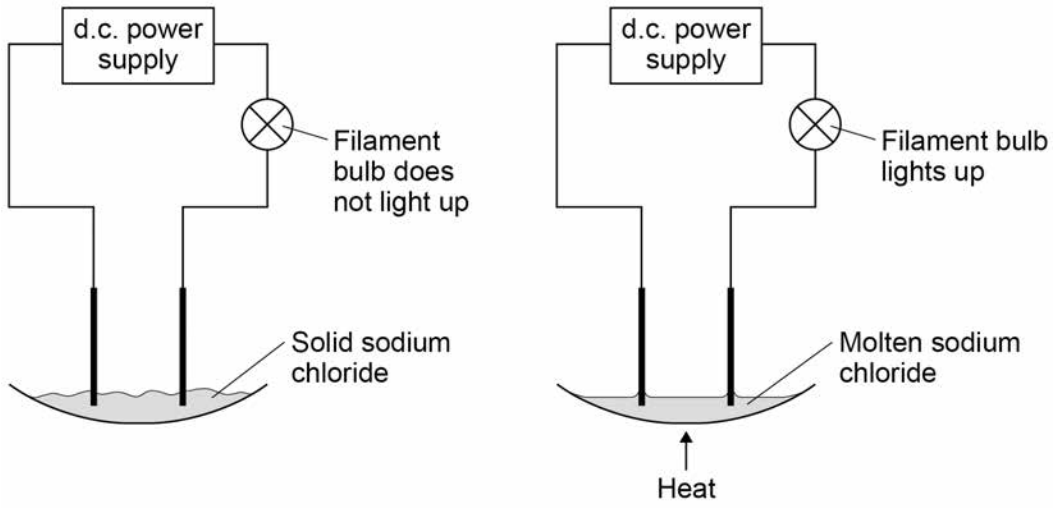


Table 1 shows the results.

Table 1

	Solid sodium chloride	Molten sodium chloride
Observation	The filament bulb does not light up	The filament bulb lights up
Deduction	Does not conduct electricity	Does conduct electricity

Draw **one** line from each statement to the correct reason.

[2 marks]

Statement	Reason
Solid sodium chloride does not conduct electricity.	The ions are fixed.
	The ions are mobile.
Molten sodium chloride conducts electricity.	The ions are neutral.
	The ions are vibrating.

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5.2.1.1 Chemical bonds

Question 02

0 2 Lithium, carbon, nitrogen, fluorine and neon are elements in the same row of the periodic table.

0 2 . 1 What is the chemical symbol of lithium?

Use the periodic table.

[1 mark]

_____

0 2 . 2 Lithium has metallic bonding.

Which electrons are involved in metallic bonding?

[1 mark]

Tick (✓) **one** box.

- Delocalised electrons from the inner shell ☐
- Delocalised electrons from the outer shell ☐
- Fixed electrons in the inner shell ☐
- Fixed electrons in the outer shell ☐

Question 2 continues on the next page

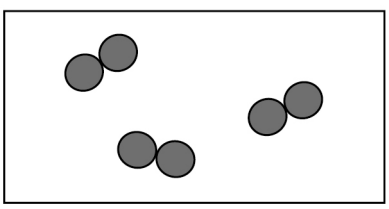
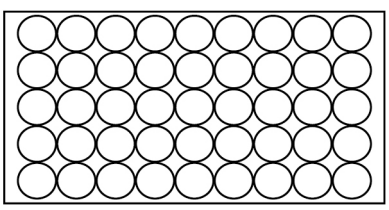
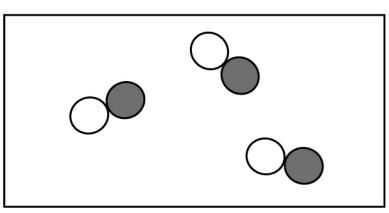
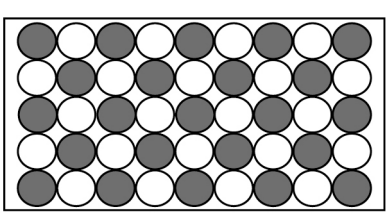
5.2.1.1 Chemical bonds

Question 02 · continued

0 2 . 3 Lithium reacts with fluorine to produce lithium fluoride.

Draw **one** line from each substance to the particle diagram that represents the substance.

[3 marks]

Substance	Particle diagram
Lithium solid	
Fluorine gas	
Lithium fluoride solid	
	

5.2.1.1 Chemical bonds

Question 02 · continued

0 2 . 4 **Table 2** shows the electrical conductivity of three substances.

Table 2

Substance	Electrical conductivity when solid	Electrical conductivity when liquid
C	Poor	Poor
D	Poor	Good
E	Good	Good

Lithium fluoride is an ionic compound.

Which substance is lithium fluoride?

[1 mark]

Tick (✓) **one** box.

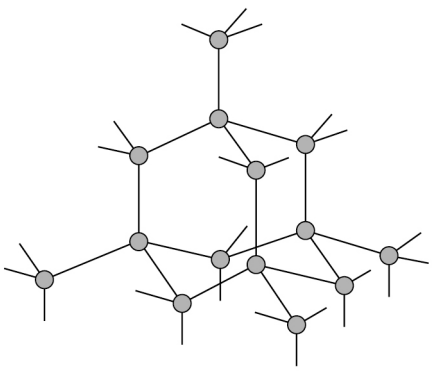
C ☐ **D** ☐ **E** ☐

Question 2 continues on the next page

0 2 . 5 Carbon can exist in different forms.

Figure 4 represents one form of carbon.

Figure 4



What is the name of the form of carbon in **Figure 4**?

[1 mark]

Tick (✓) **one** box.

Buckminsterfullerene ☐

Diamond ☐

Graphite ☐

0 2 . 6 Carbon and fluorine form a compound with the formula CF_4

Calculate the relative formula mass (M_r) of CF_4

Relative atomic masses (A_r): C = 12 F = 19

[2 marks]

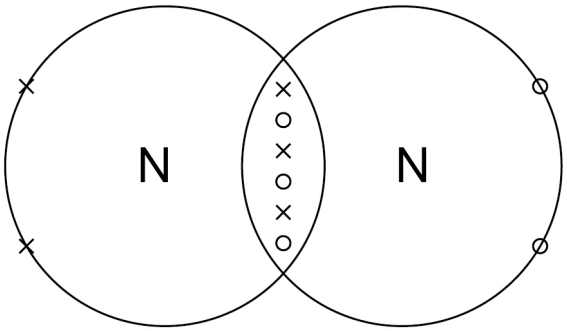
Relative formula mass (M_r) = _____

5.2.1.1 Chemical bonds

Question 02 · continued

0 2 . 7 **Figure 5** represents a molecule of nitrogen.

Figure 5



What is the total number of shared electrons in the covalent bond shown in **Figure 5**?

[1 mark]

_____

0 2 . 8 Lithium and nitrogen form a compound with the formula Li_3N

Complete the sentence.

Choose the answer from the box.

[1 mark]

nitrate	**nitride**	**nitrogen**

The name of the compound with the formula Li_3N is lithium _____.

Question 2 continues on the next page

5.2.1.1 Chemical bonds

Question 02 · continued

0 2 . 9 Neon does **not** react with other elements to form compounds.

Why is neon unreactive?

[1 mark]

Tick (✓) **one** box.

Neon has a stable arrangement of electrons. ☐

Neon is a gas at room temperature. ☐

Neon is a non-metallic element. ☐

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