AQA GCSE Chemistry

Bonding, structure, and the properties of matter · Foundation tier

Questions only

The newest questions on the Foundation papers, about an hour. All 11 are in the exam generator.

Questions	Total marks	Time allowed
5	**50**	**53 min**

Name _____ Class or teacher _____ Date _____

Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the periodic table insert.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2023 P1F Q4	10	
2	2024 P1F Q4	10	
3	2024 P1F Q5	10	
4	2025 P1F Q6	9	
5	2025 P1F Q9 / P1H Q2	11	

Total _____ / 50 **Percentage** _____ %

Questions from AQA GCSE past papers, 2023–2025, reproduced for revision. Practise these topics online, with instant marking: `whiteboardchemistry.com/revision/gcse-chemistry/exam-questions?topics=c2-bonding-structure&demand=low,standard&len=0`

Questions

Bonding, structure, and the properties of matter · Foundation tier · 5 questions · 50 marks · time allowed 53 min

Q1 · June 2023 · Paper 1 Foundation · Q4 · [10 marks]

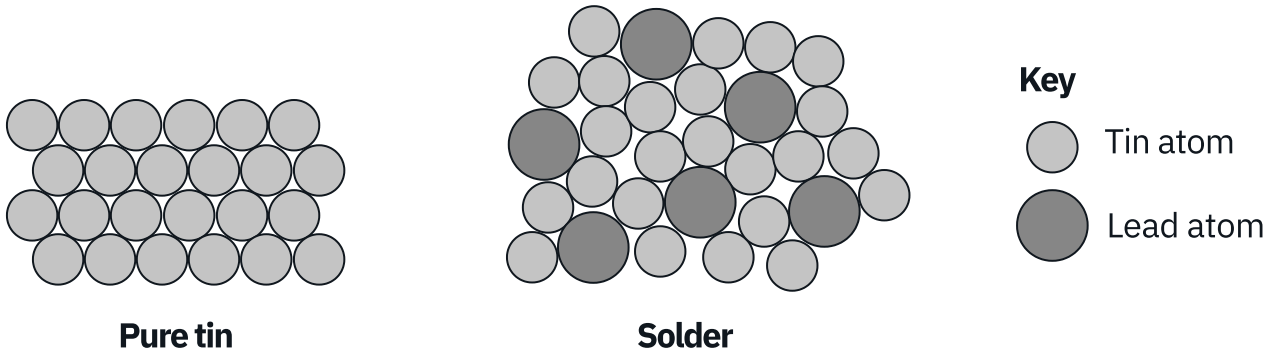
This question is about alloys.

Solders are alloys of tin and lead.

Different solders have different percentages of tin and lead.

Figure 4 shows the arrangement of atoms in pure tin and in a solder.

Figure 4



04.1 The solder in Figure 4 has 6 lead atoms for every 24 tin atoms.

Determine the percentage of atoms that are lead atoms in the solder in Figure 4.

Percentage of lead atoms = _____ %

[3 marks]

04.2 Explain why solder is harder than pure tin.

Complete the sentences.

Use Figure 4.

In solder the layers are distorted.

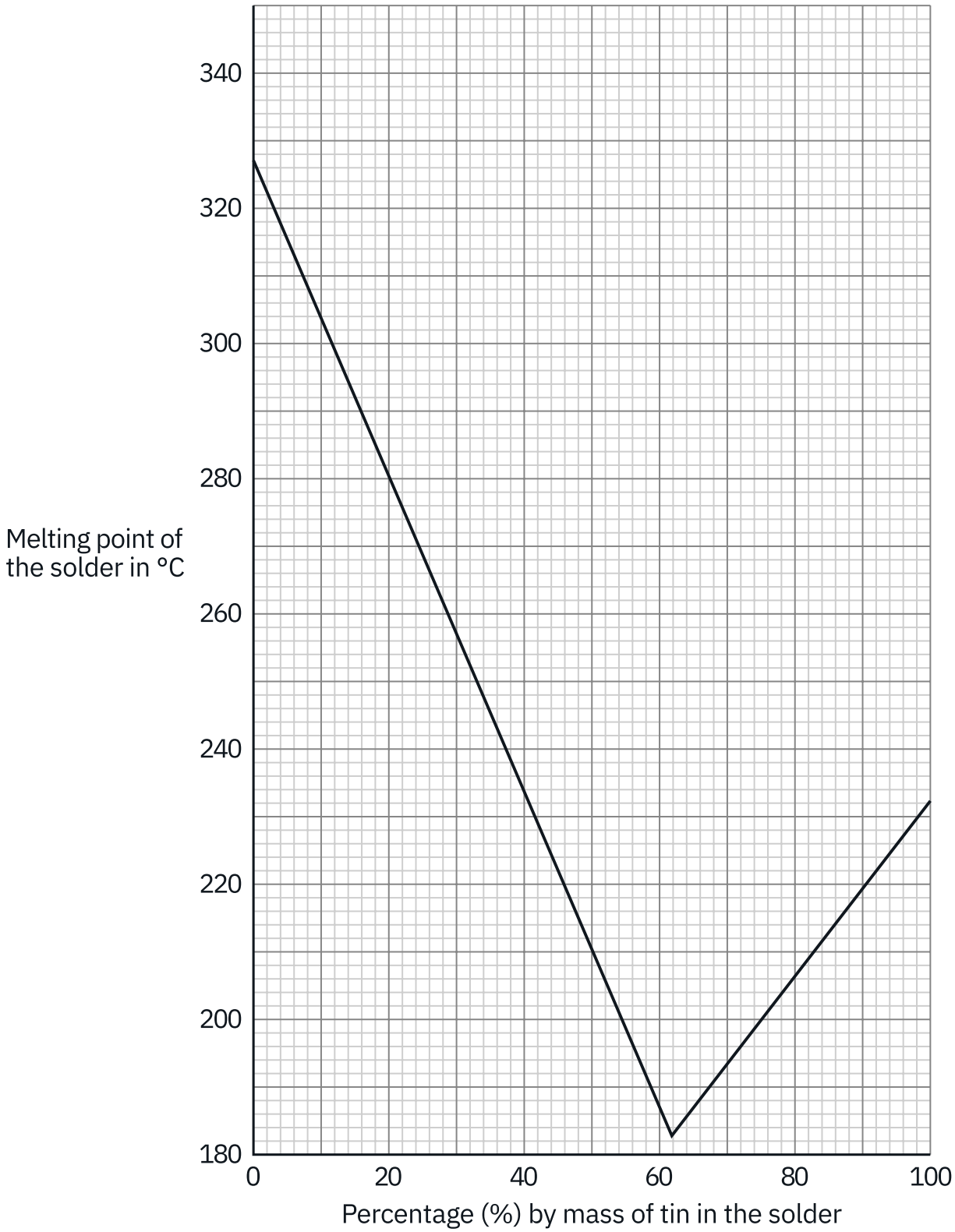
This is because the atoms of tin and lead have different _____ .

Therefore the layers cannot easily _____ .

[2 marks]

04.3 Figure 5 shows how the melting point of the solder changes with the percentage by mass of tin in the solder.

Figure 5



Describe what happens to the melting point of the solder as the percentage by mass of tin increases.

Use data from Figure 5.

[3 marks]

04.4 What is the melting point of pure tin?

Use Figure 5.

Melting point of pure tin = _____ °C

[1 mark]

04.5 What happens to the atoms in pure tin as the tin melts?

Tick (✓) **one** box.

The atoms gain energy and their arrangement becomes less ordered.	☐
The atoms gain energy and their arrangement becomes more ordered.	☐
The atoms lose energy and their arrangement becomes less ordered.	☐
The atoms lose energy and their arrangement becomes more ordered.	☐

[1 mark]

Q2 · June 2024 · Paper 1 Foundation · Q4 · [10 marks]

This question also needs Atomic structure and the periodic table.

This question is about small particles.

04.1 What is the approximate number of atoms in a nanoparticle?

Tick (✓) **one** box.

A few hundred atoms	☐
A few thousand atoms	☐
A few million atoms	☐
A few billion atoms	☐

[1 mark]

04.2 Nanoparticles of some elements can be used as catalysts.

Which element is most likely to be used as a catalyst?

Use the periodic table.

Tick (✓) **one** box.

Aluminium	☐
Iron	☐
Magnesium	☐

[1 mark]

04.3 Nanoparticles are used in sun creams and in wound dressings.

A wound dressing is placed next to the skin to prevent infection.

Figure 8 shows a wound dressing.

Figure 8

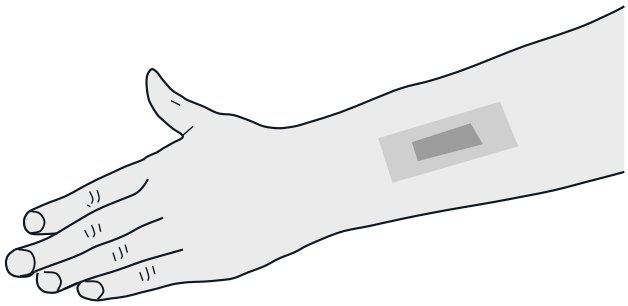
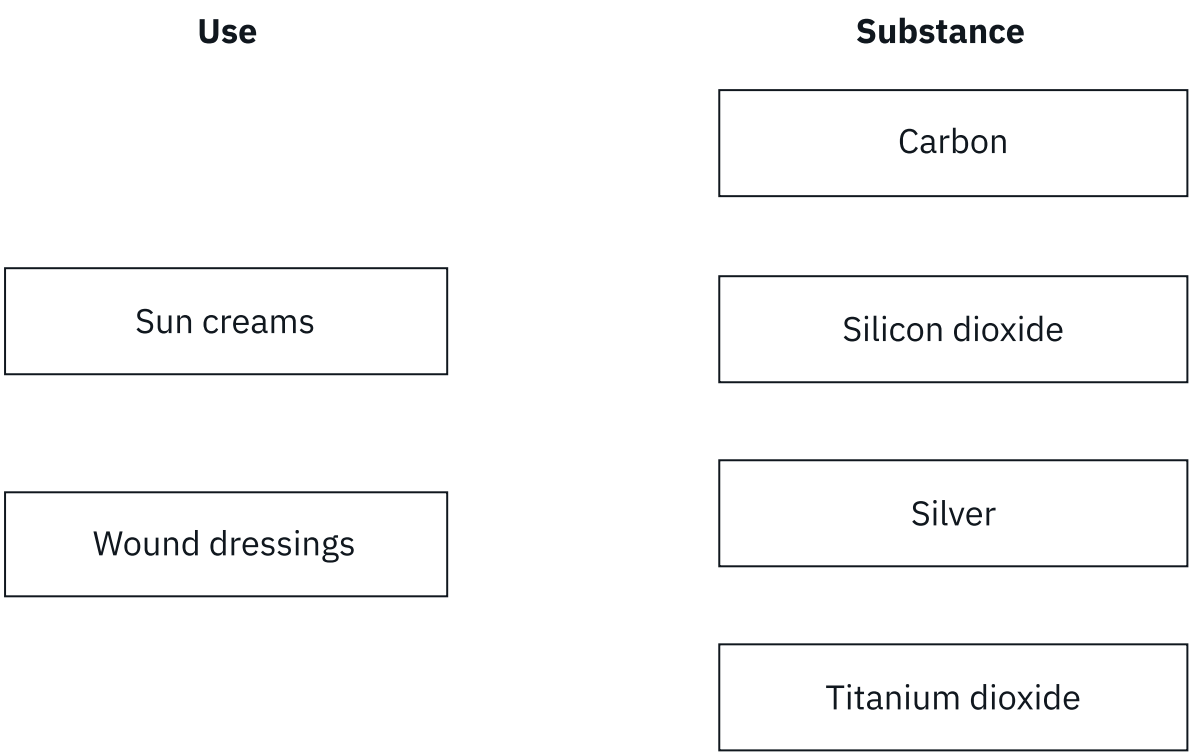


Table 2 shows some information about substances used in the form of nanoparticles.

Table 2

Substance	Property
Carbon	Strong
Silicon dioxide	Hard
Silver	Kills bacteria
Titanium dioxide	Blocks light

Draw **one** line from each use to the best substance for that use.

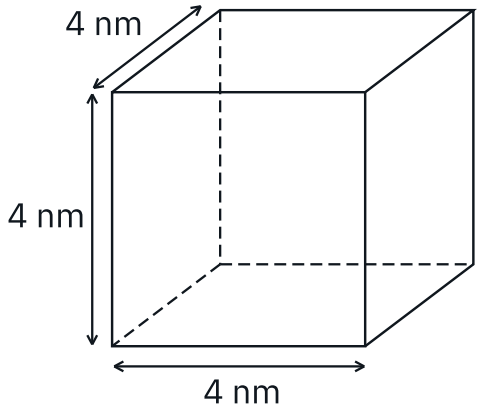


[2 marks]

Draw your answer on the figure above.

04.4 Figure 9 shows a cubic nanoparticle.

Figure 9



Calculate:

- the surface area of the cubic nanoparticle
- the volume of the cubic nanoparticle
- the simplest whole number ratio of surface area : volume for the cubic nanoparticle.

Use the equation:

surface area of cubic nanoparticle = 6 × surface area of one face

Surface area of cubic nanoparticle = _____ nm^2

Volume of cubic nanoparticle = _____ nm^3

Simplest whole number ratio of surface area: volume = _____ : _____

[6 marks]

Q3 · June 2024 · Paper 1 Foundation · Q5 · [10 marks]

This question also needs Atomic structure and the periodic table.

This question is about carbon and carbon compounds.

An atom of carbon is represented as:

$$\begin{matrix}\text{(Mass number)} & 13 \\ \text{(Atomic number)} & 6\end{matrix}\ \mathrm{C}$$

05.1 What is the number of protons in this atom of carbon?

Tick (✓) **one** box.

1	☐
6	☐
7	☐
13	☐

[1 mark]

05.2 What is the number of neutrons in this atom of carbon?

Tick (✓) **one** box.

1	☐
6	☐
7	☐
13	☐

[1 mark]

05.3 What is the number of electrons in this atom of carbon?

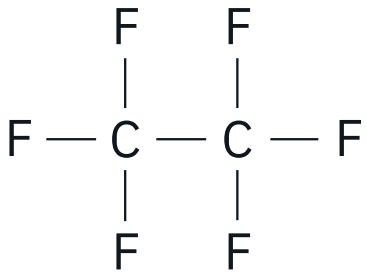
Tick (✓) **one** box.

1	☐
6	☐
7	☐
13	☐

[1 mark]

05.4 Figure 10 shows the structure of a carbon compound.

Figure 10



Complete the formula of the carbon compound.

C_____F_____

[1 mark]

05.5 Methane:

- is a carbon compound
- exists as small molecules
- has a low boiling point.

What is the reason for the low boiling point of methane?

Tick (✓) **one** box.

Covalent bonds **and** intermolecular forces are weak.	☐
Only covalent bonds are weak.	☐
Only intermolecular forces are weak.	☐

[1 mark]

05.6 Buckminsterfullerene (C_{60}) is a form of carbon.

Buckminsterfullerene was the first fullerene to be discovered.

What is the shape of a buckminsterfullerene molecule?

Tick (✓) **one** box.

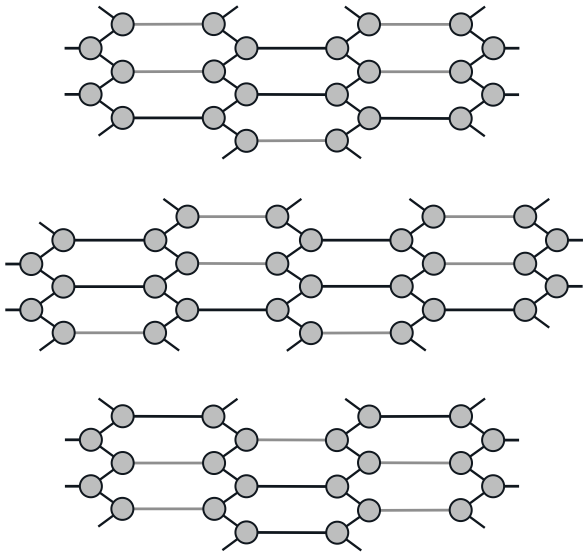
Cubic	☐
Cylindrical	☐
Spherical	☐

[1 mark]

05.7 Graphite is a form of carbon.

Figure 11 represents the structure of graphite.

Figure 11



Key

● = carbon atom

How many covalent bonds does each carbon atom form in graphite?

Tick (✓) **one** box.

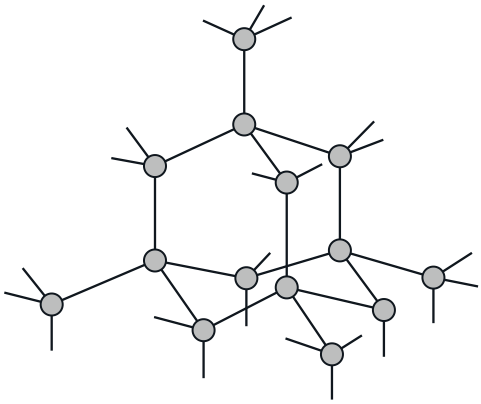
1	☐
2	☐
3	☐
4	☐

[1 mark]

05.8 Diamond is another form of carbon.

Figure 12 represents the structure of diamond.

Figure 12



Key

○ = carbon atom

Describe the structure and bonding in diamond.

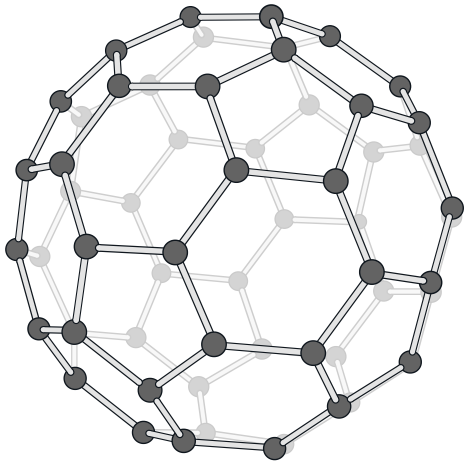
[3 marks]

Q4 · June 2025 · Paper 1 Foundation · Q6 · [9 marks]

This question is about nanoparticles.

Figure 9 represents a type of nanoparticle made of carbon atoms.

Figure 9



06.1 What is the name of the type of nanoparticle in Figure 9?

Tick (✓) **one** box.

Buckminsterfullerene	☐
Carbon nanotube	☐
Graphene	☐

[1 mark]

06.2 Nanoparticles of the type in Figure 9 are slippery.

Which structural feature of these nanoparticles makes them slippery?

Tick (✓) **one** box.

The nanoparticles are hollow.	☐
The nanoparticles are made of carbon atoms.	☐
The nanoparticles are spherical.	☐

[1 mark]

06.3 A nanoparticle of a metal has a diameter of 15 nm.

A fine particle of the metal has a diameter of 1500 nm.

How many times larger is the diameter of the fine particle than the diameter of the nanoparticle?

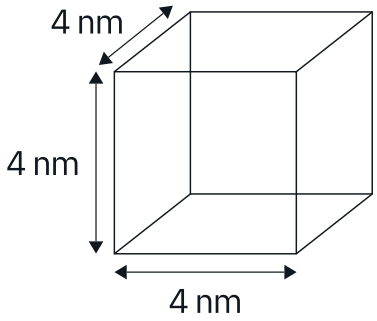
Tick (✓) **one** box.

10	☐
10^2	☐
10^3	☐
10^4	☐

[1 mark]

06.4 Figure 10 represents a cubic nanoparticle.

Figure 10



The surface area of the cubic nanoparticle is 96 nm^2.

Calculate:

- the volume of the cubic nanoparticle
- the simplest whole number ratio of surface area : volume for the cubic nanoparticle.

The volume of a cube = $(\text{length of side})^3$

Volume of nanoparticle = _____ nm^3

Ratio of surface area : volume = _____ : _____

Simplest whole number ratio of surface area : volume = _____ : _____

[4 marks]

06.5 A substance can be used to provide a scratchproof coating on reading glasses.

The coating is a single layer of particles of the substance.

Nanoparticles are used instead of normal-sized particles.

Complete the sentences.

When using nanoparticles instead of normal-sized particles, the thickness of the layer that can be used is much _____ .

This means the amount of light passing through the layer is _____ .

[2 marks]

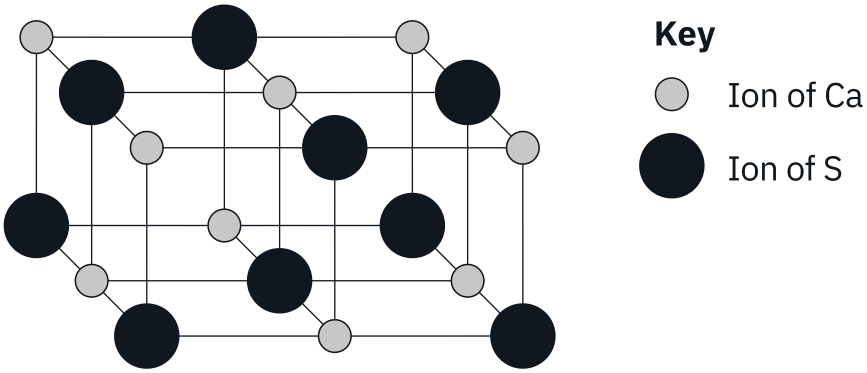
Q5 · June 2025 · Paper 1 Foundation · Q9 · Paper 1 Higher · Q2 · [11 marks]

This question is about structure and bonding.

Calcium sulfide is an ionic compound.

Figure 13 represents the structure of calcium sulfide.

Figure 13



09.1 Determine the empirical formula of calcium sulfide.

Empirical formula

[1 mark]

09.2 Calcium is in Group 2 of the periodic table.

Sulfur is in Group 6 of the periodic table.

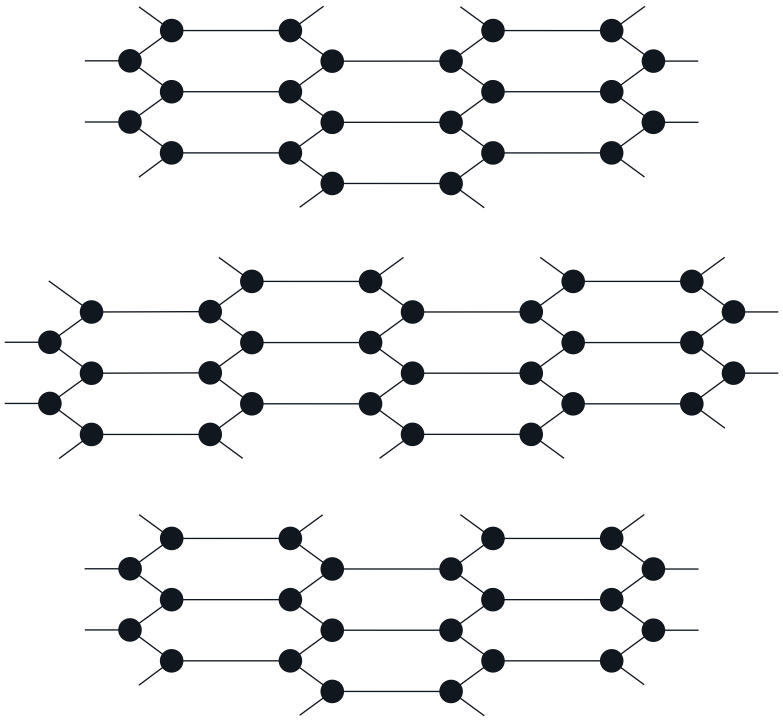
Describe what happens when a calcium atom reacts with a sulfur atom.

Answer in terms of electrons and ions.

[4 marks]

09.3 Figure 14 shows the structure of graphite.

Figure 14



Key

● Carbon atom

Describe the structure and bonding of graphite.

[4 marks]

09.4 Substances that consist of small molecules do **not** conduct electricity.

Give **one** reason why.

[1 mark]

09.5 Methane consists of small molecules.

Poly(ethene) is a polymer.

Why does poly(ethene) have a higher melting point than methane?

Tick (✓) **one** box.

Poly(ethene) has more covalent bonds to break than methane.	☐
Poly(ethene) has no intermolecular forces to overcome.	☐
Poly(ethene) has stronger covalent bonds to break than methane.	☐
Poly(ethene) has stronger intermolecular forces to overcome than methane.	☐

[1 mark]

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