



CHEMISTRY ONLINE
— **TUITION** —

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CHEMISTRY

Physical Chemistry

Level & Board	AQA (A-LEVEL)
TOPIC:	BONDING
PAPER TYPE:	QUESTION PAPER -4
TOTAL QUESTIONS	10
TOTAL MARKS	49

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Bonding

1. Thallium is in Group 3 of the Periodic Table.

Thallium reacts with halogens to form many compounds and ions.

(a) Draw the shape of the TlBr_3^{2-} ion and the shape of the TlCl_4^{3-} ion.

Include any lone pairs of electrons that influence the shapes.

Name the shape made by the atoms in TlBr_3^{2-} and suggest a value for the bond angle.

(4)

(b) Thallium(I) bromide (TlBr) is a crystalline solid with a melting point of 480°C .

Suggest the type of bonding present in thallium(I) bromide and state why the melting point is high.

(3)

(c) Write an equation to show the formation of thallium(I) bromide from its elements.

2. Silicon dioxide (SiO_2) has a crystal structure similar to diamond. (1)

(a) Give the name of the type of crystal structure shown by silicon dioxide.

(b) Suggest why silicon dioxide does not conduct electricity when molten. (1)

(c) Silicon dioxide reacts with hydrofluoric acid (HF) to produce hexafluorosilicic acid (H_2SiF_6) and one other substance. (1)

Write an equation for this reaction.

3. Which compound contains a co-ordinate bond? (1)

- A. HF
- B. NH_3
- C. CHCl_3
- D. NH_4Cl

(Total 1 mark)

4. Which has a bond angle of 109.5° ?

- A. C (diamond)
- B. C (graphite)
- C. NH_2^-

D. NH₃

(Total 1 mark)

5. This question is about structure and bonding.

(a) Draw a diagram to show the strongest type of interaction between two molecules of ammonia (NH₃) in the liquid phase.

Include all lone pairs and partial charges in your diagram.

(3)

(b) Draw the shape of the SF₄ molecule.

Include any lone pairs of electrons that influence the shapes.

In an SF₄ molecule, the sulfur atom is attached to four fluorine atoms and has one lone pair of electrons.

Name each shape.

Suggest a value for the bond angle in SF₄.

(5)

6. This question is about compounds that contain chlorine.

(a) Potassium chloride has potassium ions (K^+) and chloride ions (Cl^-).
 K^+ and Cl^- have the same electron configuration.

Explain why a chloride ion is larger than a potassium ion.

(2)

(b) Explain, in terms of structure and bonding, why the melting point of potassium chloride is high.

(2)

(c) Fluoroantimonic acid contains ions, $SbCl_6^-$

Draw the shape of the $SbCl_6^-$ ion.

Include any lone pairs that influence the shape.

Name the shape of ion.

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(4)

7. Which substance contains delocalised electrons?

- A. cyclohexane
- B. graphite
- C. iodine
- D. sodium chloride

(Total 1 mark)

8. This question is about shapes of molecules and ions.

Draw the shape of XeF_4 and of XeF_6 .

Include any lone pairs of electrons that influence the shape.

Name the shape of XeF_4 .

State and explain the bond angle in XeF_6 .

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(Total 5 marks)

9. The boiling point of propanal and ethene as:

The boiling point of propanal is 49 °C.
The boiling point of ethene is -104 °C.

Explain why propanal has a higher boiling point than ethene.

(3)

10. In which substance do covalent bonds break when it melts?

- A. hexane
- B. ice
- C. iodine
- D. silicon dioxide

(Total 1 mark)

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- Founder & CEO of Chemistry Online Tuition Ltd.
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