

# Periodic Table, Group 2 & The Halogens AS & A Level

## Question Paper 1

Level	A Level
Subject	Chemistry
Exam Board	OCR
Module	Periodic Table & Energy
Topic	Periodic Table, Group 2 & The Halogens
Paper	AS & A Level
Booklet	Question Paper 1

**Time allowed:** 63 minutes

**Score:** /47

**Percentage:** /100

### Grade Boundaries:

A*	A	B	C	D	E
>85%	73%	60%	47%	34%	21%

## Question 1

This question is about the attraction between particles.

- (a) State how and explain why the attraction between nuclei and outermost electrons in gaseous atoms varies across Period 3. [2]

- (b) The table shows the boiling points of ammonia, fluorine and bromine.

	<b>Boiling point/°C</b>
ammonia, NH <sub>3</sub>	– 33
fluorine, F <sub>2</sub>	– 188
bromine, Br <sub>2</sub>	59

Explain the different boiling points of NH<sub>3</sub>, F<sub>2</sub> and Br<sub>2</sub>.

Include the names of any relevant forces and particles.

*In your answer you should use appropriate technical terms, spelled correctly.*

[5]

[Total 7 Marks ]

## Question 2

Group 2 elements react with halogens.

- (a) Describe and explain the trend in reactivity of Group 2 elements with chlorine as the group is descended.



*In your answer you should use appropriate technical terms, spelled correctly.*

[5]

- (b) A student was provided with an aqueous solution of calcium iodide.

The student carried out a chemical test to show that the solution contained iodide ions. In this test, a precipitation reaction took place.

- (i) State the reagent that the student would need to add to the solution of calcium iodide. [1]

- (ii) What observation would show that the solution contained iodide ions? [1]

- (iii) Write an ionic equation, including state symbols, for the reaction that took place. [1]

- (iv) The student is provided with an aqueous solution of calcium bromide that is contaminated with calcium iodide.

The student carries out the same chemical test but this time needs to add a second reagent to show that iodide ions are present.

- State the second reagent that the student would need to add. [1]

[Total 9 Marks]

### Question 3

Periodicity is a repeating pattern across different periods.

(a) First ionisation energy shows a trend across Period 2.

The first ionisation energies of lithium, carbon and fluorine are shown in **Table 5.1** below.

Element	Lithium	Carbon	Fluorine
First ionisation energy / $\text{kJ mol}^{-1}$	520	1086	1681

**Table 5.1**

(i) Explain the trend across Period 2 shown in **Table 5.1**.



*In your answer, you should use appropriate technical terms, spelled correctly.*

[3]

(ii) Solid carbon exists in two forms, diamond and graphite.

Explain why it is unnecessary to refer to carbon as either diamond or graphite in **Table 5.1**

[1]

(b) Lithium, carbon (in the form of diamond) and fluorine have very different melting points.

These differences in melting points are the result of different types of structure and different forces or bonds between the particles in the structures.

Part of the table below has been filled in.

Complete the table below.

[6]

	<b>Lithium</b>	<b>Carbon (diamond)</b>	<b>Fluorine</b>
<b>Melting point/°C</b>	181	3550	-220
<b>Structure</b>	Giant		Simple
<b>Force or bond overcome on melting</b>	Metallic bond		
<b>Particles between which the force or bond is acting</b>			

[Total 10 Marks]

## Question 4

Chemists can use the Periodic Table to predict the behaviour of elements.

- (a) What is the name of the term used to describe the repeating patterns in the Periodic Table?  
[1]

- (b) Melting points show a trend across a period.

The table below shows the melting points of three elements in Period 3 of the Periodic Table.

element	aluminium	silicon	phosphorus
melting point /°C	660	1410	44

Explain the trend shown in terms of bonding and structure.



*In your answer, you should use appropriate technical terms spelled correctly.*

[6]

(c) Scientists use 'sketch graphs' to show trends.

(i) Draw a sketch graph to show the general trend in **ionisation energy** across Period 3.

[1]



(ii) Draw a sketch graph to show the general trend in **atomic radius** across Period 3.

[1]



[Total 9 Marks]



## Question 5

This question is about halogens.

(a) Bromine is used to extract iodine from a solution containing iodide ions.

(i) Write an ionic equation for the reaction.

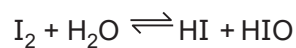
[1]

(ii) Explain why iodine is less reactive than bromine.

[3]

(b) Iodine can be used for the small-scale purification of drinking water.

(i) Iodine reacts with water as shown below.



Using oxidation numbers, explain why this reaction is a disproportionation.

[3]

(ii) Chlorine is used to purify water on a large scale.

State **one** disadvantage of using chlorine for the purification of drinking water.

[1]

(c) Hydrogen reacts with chlorine to form hydrogen chloride, HCl:

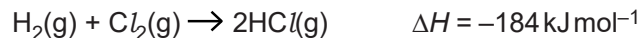


Table 3.1 shows bond enthalpies.

Bond	Bond Enthalpy/kJ mol <sup>-1</sup>
H-H	+436
Cl-Cl	+243

Table 3.1

Calculate the bond enthalpy for the H-Cl bond from the information above.

[2]

(d) 'Enthalpy change of vaporisation' is the enthalpy change when one mole of a substance changes from a liquid to a gas at its boiling point.

(i) Write an equation, including state symbols, to represent the enthalpy change of vaporisation of bromine.

[1]

(ii) Suggest whether the enthalpy change of vaporisation of bromine is exothermic or endothermic.

Explain your answer.

[1]

**(Total 12 marks)**