

# 11. Group 17

## 11.2 The chemical properties of the halogen elements and the hydrogen halides

### Paper 1

#### Question Paper

- 1 The table refers to the hydrogen halides.

Which row is correct?

	oxidation	thermal stability
<b>A</b>	easier to oxidise down the group	increases down the group
<b>B</b>	more difficult to oxidise down the group	increases down the group
<b>C</b>	easier to oxidise down the group	decreases down the group
<b>D</b>	more difficult to oxidise down the group	decreases down the group

- 2 In this question, Q represents an atom of chlorine, bromine or iodine.

Which explanation for the variation in volatility down Group 17 is correct?

- A** Instantaneous dipole–induced dipole forces between molecules become stronger.  
**B** Permanent dipole–permanent dipole forces between molecules become stronger.  
**C** The bond energy of the  $Q_2$  molecules decreases.  
**D** The first ionisation energy  $Q(g) \rightarrow Q^+(g) + e^-$  decreases.

- 3 Chlorine reacts with aqueous sodium hydroxide forming two chlorine-containing products.

Which row shows the oxidation states of chlorine in the products under the conditions stated?

	conditions	oxidation state of Cl in products
<b>A</b>	cold NaOH(aq)	-1 and +3
<b>B</b>	cold NaOH(aq)	-1 and +5
<b>C</b>	hot NaOH(aq)	-1 and +3
<b>D</b>	hot NaOH(aq)	-1 and +5

- 4 In a series of nine experiments, to test the reactivity of the halogens, an aqueous solution of each halogen is added to an equal volume of an aqueous solution containing halide ions, as shown in the table.

halogen solution	halide solution		
	sodium chloride (aq)	sodium bromide (aq)	sodium iodide (aq)
chlorine (aq)	experiment 1	experiment 2	experiment 3
bromine (aq)	experiment 4	experiment 5	experiment 6
iodine (aq)	experiment 7	experiment 8	experiment 9

The nine resulting mixtures are then shaken separately with an equal volume of hexane. The nine tubes are left to stand so that the aqueous and organic solvents separate into layers.

How many test-tubes contain a purple upper hexane layer?

- A** 1                      **B** 2                      **C** 3                      **D** 5

- 5 Redox reactions are common in the chemistry of Group 17 elements.

Which statement is correct?

- A**  $\text{Br}^-$  ions will reduce  $\text{Cl}_2$  but not  $\text{I}_2$ .  
**B**  $\text{Cl}_2$  will oxidise  $\text{Br}^-$  ions but not  $\text{I}^-$  ions.  
**C**  $\text{F}_2$  is the weakest oxidising agent out of  $\text{F}_2$ ,  $\text{Cl}_2$ ,  $\text{Br}_2$  and  $\text{I}_2$ .  
**D**  $\text{I}^-$  ions are the weakest reducing agent out of  $\text{F}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$  and  $\text{I}^-$ .

- 6 Which statement about Group 17 elements and their compounds is correct?

- A** Chlorine reacts with cold concentrated sodium hydroxide to form  $\text{NaCl}$  and  $\text{NaClO}_3$ .  
**B**  $\text{HCl}$  is more thermally stable than  $\text{HBr}$  because chlorine is less electronegative than bromine.  
**C** Iodide ions are oxidised to iodine by concentrated sulfuric acid.  
**D** Silver iodide is soluble in dilute aqueous ammonia.

7 Astatine, At, is below iodine in Group 17 of the Periodic Table.

Which statement is most likely to be correct?

- A  $\text{AgAt(s)}$  reacts with an excess of dilute aqueous ammonia to form a solution of a soluble complex.
- B Astatine and  $\text{KCl(aq)}$  react to form  $\text{KAt(aq)}$  and chlorine.
- C  $\text{KAt(aq)}$  and dilute sulfuric acid react to form  $\text{HAt(g)}$ .
- D  $\text{NaAt(s)}$  and concentrated sulfuric acid react to form astatine.

8 A test-tube of  $\text{HBr(g)}$  and a separate test-tube of  $\text{HI(g)}$  are heated to the same temperature.

Which combination of observations is possible?

	test-tube of $\text{HBr(g)}$	test-tube of $\text{HI(g)}$
<b>A</b>	a brown vapour appears	no change
<b>B</b>	a purple vapour appears	no change
<b>C</b>	no change	a brown vapour appears
<b>D</b>	no change	a purple vapour appears

9 Which statement about the halogens is correct?

- A Iodine cannot behave as an oxidising agent.
- B The volatility of the elements increases from chlorine to iodine because of the increase in molecular size down the group.
- C When an equimolar mixture of chlorine and hydrogen is exploded, only one product is formed.
- D When concentrated sulfuric acid is added to solid sodium bromide, hydrogen sulfide is one of the products.