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CHEMISTRY

INORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	GROUP 7 HALOGEN
PAPER TYPE:	QUESTION PAPER - 4
TOTAL QUESTIONS	10
TOTAL MARKS	46

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Group 7 the Halogens - 4

1. Chlorine is a powerful oxidising agent.

(a) Chlorine displaces iodine from aqueous potassium iodide.

i. Write the simplest ionic equation for this reaction.

(1)

ii. Give one observation that you would make when this reaction occurs.

(1)

(b) In bright sunlight, chlorine reacts with water to form oxygen as one of the products.

Write an equation for this reaction.

(1)

(c) Explain why chlorine has a lower boiling point than bromine.

(2)

2. The boiling points of the halogens increase down Group VII because

A. A covalent bond strengths increase.

B. bond polarities increase.

- C. the surface areas of the molecules increase.
- D. electronegativities increase.

(1)

3. Chlorine gas is used in the manufacture of chlorine-containing organic compounds.

(a) Write equations for the following steps in the mechanism for the reaction of chlorine with ethane to form chloroethane ($\text{CH}_3\text{CH}_2\text{Cl}$).

Initiation step

First propagation step

Second propagation step

A termination step producing butane

(4)

(b) Give one essential condition and name the type of mechanism in this reaction of chlorine with ethane.

(2)

4. A white salt dissolves in water to give a solution which gives a cream coloured precipitate when aqueous silver nitrate is added. This precipitate is insoluble in dilute aqueous ammonia but is soluble in concentrated aqueous ammonia. The original white salt could be

A. AgI

- B. NaI
- C. AgBr
- D. NaBr

(1)

5. This question is about Group VII.

(a) State and explain the trend in electronegativity down Group VII from fluorine to iodine.

(3)

(b) State what you would observe when chlorine gas is bubbled into an aqueous solution of potassium iodide.
Write an equation for the reaction that occurs.

(2)

(c) Identify two sulphur-containing reduction products formed when concentrated sulphuric acid oxidises iodide ions.
For each reduction product, write a half-equation to illustrate its formation from sulphuric acid.

(4)

(d) Write an equation for the reaction between chlorine gas and dilute aqueous sodium hydroxide.

Name the two chlorine-containing products of this reaction and give the oxidation state of chlorine in each of these products.

(5)

6. When chlorine reacts with water in bright sunlight, only two products are formed.

One of these products is a colourless, odourless gas and the other is an acidic solution that reacts with silver nitrate solution to give a white precipitate.

Write an equation for the reaction of chlorine with water in bright sunlight.

Name the white precipitate and state what you would observe when an excess of aqueous ammonia is added to it.

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(3)

7. Iodide ions can reduce sulphuric acid to three different products.

(a) Name the three reduction products and give the oxidation state of sulphur in each of these products.

(3)

(b) Describe how observations of the reaction between solid potassium iodide and concentrated sulphuric acid can be used to indicate the presence of any two of these reduction products.

(4)

(c) Write half-equations to show how two of these products are formed by reduction of sulphuric acid.

(3)

8. On heating, magnesium reacts vigorously with element X to produce compound Y.

An aqueous solution of Y, when treated with aqueous silver nitrate, gives a white precipitate that is readily soluble in dilute aqueous ammonia.

What is the minimum mass of X that is needed to react completely with 4.05 g of magnesium?

A. 11.83 g

B. 5.92 g

- C. 5.33 g
- D. 2.67 g

(1)

9. Consider the following reaction in which iodide ions behave as reducing agents.



In terms of electrons, state the meaning of the term reducing agent.

Deduce the half-equation for the conversion of chlorine into chloride ions.

Explain why iodide ions are stronger reducing agents than chloride ions.

(4)

10. What will you see when a solution of silver nitrate is added to a solution containing bromide ions, and concentrated aqueous ammonia is added to the resulting mixture?

- A. a white precipitate soluble in concentrated aqueous ammonia
- B. a white precipitate insoluble in concentrated aqueous ammonia
- C. a cream precipitate soluble in concentrated aqueous ammonia
- D. a yellow precipitate insoluble in concentrated aqueous ammonia

(1)



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