Q1. (a) State the trend in electronegativity of the elements down Group VII. Explain this trend.

Trend .....

Explanation .....

.....

.....

(3)

(b) (i) State the trend in reducing ability of the halide ions down Group VII.

.....

(ii) Give an example of a reagent which could be used to show that the reducing ability of bromide ions is different from that of chloride ions.

.....

(2)

(c) The addition of silver nitrate solution followed by dilute aqueous ammonia can be used as a test to distinguish between chloride and bromide ions. For each ion, state what you would observe if an aqueous solution containing the ion was tested in this way.

Observations with chloride ions .....

.....

Observations with bromide ions .....

.....

(4)

(d) Write an equation for the reaction between chlorine and cold, dilute aqueous sodium hydroxide. Give two uses of the resulting solution.

Equation .....

Use 1 .....

Use 2 .....

(3)
(Total 12 marks)

Q2. (a) When using silver nitrate to test for the presence of chloride ions in an aqueous solution, it is important to add another reagent to prevent interference by any carbonate ions which would form a white precipitate of Ag_2CO_3

(i) Identify this other reagent.

.....

(ii) Write an equation to show how this other reagent reacts with sodium carbonate.

.....

(2)

(b) The presence of some halide ions in solution can be detected using aqueous silver nitrate and aqueous ammonia.

(i) Identify a halide ion which, on addition of aqueous silver nitrate, forms a precipitate that is insoluble in concentrated aqueous ammonia.

.....

(ii) Identify a halide ion which cannot be detected using these reagents.

.....

(2)

(c) A mixture of two precipitates, **P** and **Q**, was formed by adding aqueous silver nitrate to a solution containing two different halide ions. Precipitate **P** dissolved on addition of an excess of dilute aqueous ammonia. The remaining precipitate, **Q**, was filtered

off.

(i) Identify the halide ion in **P**.

.....

(ii) Precipitate **Q** was soluble in concentrated aqueous ammonia. Identify the halide ion in **Q**.

.....

(2)
(Total 6 marks)

Q3.(a) Describe and explain the trend in the boiling points of the elements down Group VII from fluorine to iodine.

(4)

(b) Describe what you would observe when aqueous silver nitrate, followed by dilute aqueous ammonia, is added to separate aqueous solutions of sodium chloride and sodium bromide.

(4)

(c) State the trend in the oxidising abilities of the elements down Group VII from chlorine to iodine.
Explain how this trend can be shown by displacement reactions between halogens and halide ions in aqueous solutions.
Illustrate your answer with appropriate observations and equations.

(7)
(Total 15 marks)

Q4. (a) State and explain the trend in electronegativity down Group VII from fluorine to iodine.

Trend .....

Explanation .....

.....

.....

(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.

Observation .....

Equation ….....

(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.

Reduction product 1 .....

Half-equation .....

Reduction product 2 .....

Half-equation .....

(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.

Equation .....

Name of product 1 .....

Oxidation state of chlorine in product 1 .....

Name of product 2 .....

Oxidation state of chlorine in product 2 .....

(5)

(Total 14 marks)

Q5.(a) State the trend in the boiling points of the halogens from fluorine to iodine and explain this trend.

Trend .....

Explanation .....

.....

.....

(4)

(b) Each of the following reactions may be used to identify bromide ions. For each reaction, state what you would observe and, where indicated, write an appropriate equation.

(i) The reaction of aqueous bromide ions with chlorine gas

Observation .....

Equation .....

(ii) The reaction of aqueous bromide ions with aqueous silver nitrate followed by the addition of concentrated aqueous ammonia

Observation with aqueous silver nitrate .....

Equation .....

Observation with concentrated aqueous ammonia .....

.....

(iii) The reaction of solid potassium bromide with concentrated sulphuric acid

Observation 1 .....

Observation 2 .....

(7)

(c) Write an equation for the redox reaction that occurs when potassium bromide reacts with concentrated sulphuric acid.

.....

(2)
(Total 13 marks)