

Q1.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

(Total 1 mark)

Q2.Which one of the following statements is true?

- A** Bromine liberates iodine from aqueous sodium iodide.
- B** Chlorine liberates fluorine from aqueous sodium fluoride.
- C** Silver iodide is soluble in aqueous ammonia.
- D** Concentrated sulphuric acid liberates chlorine from solid sodium chloride.

(Total 1 mark)

Q3.Which one of the following is **not** a correct trend down Group VII?

- A** The first ionisation energy of the atom decreases.
- B** The oxidising power of the element increases.
- C** The electronegativity of the atom decreases.
- D** The boiling point of the element increases.

(Total 1 mark)

Q4.The reaction between sodium iodide and concentrated phosphoric acid produces hydrogen iodide but no iodine. The reaction of sodium iodide with concentrated sulphuric acid produces mainly iodine. The difference in product occurs because, in comparison with sulphuric acid, phosphoric acid is

- A the weaker acid.
- B the stronger oxidising agent.
- C the weaker oxidising agent.
- D the stronger reducing agent.

(Total 1 mark)

Q5. Which one of the following statements is true?

- A A blue solution containing the ion $[\text{CoCl}_4]^{2-}$ turns pink when added to an excess of water.
- B A purple solution is formed when chlorine is bubbled into aqueous sodium bromide.
- C A yellow precipitate is formed when aqueous silver nitrate is added to aqueous sodium chloride.
- D A green solution containing the ion $[\text{CuCl}_4]^{2-}$ turns blue when added to an excess of concentrated hydrochloric acid.

(Total 1 mark)

Q6. In which one of the following reactions does the metal species undergo reduction?

- A $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$
- B $[\text{Cu}(\text{H}_2\text{O})_6]^{2+} + 4\text{Cl}^- \rightarrow [\text{CuCl}_4]^{2-} + 6\text{H}_2\text{O}$
- C $\text{CrO}_7^{2-} + 2\text{OH}^- \rightarrow 2\text{CrO}_4^{2-} + \text{H}_2\text{O}$
- D $\text{TiO}_2 + 2\text{C} + 2\text{Cl}_2 \rightarrow \text{TiCl}_4 + 2\text{CO}$

(Total 1 mark)

Q7. (a) State and explain the trend in electronegativity down Group VII from fluorine to iodine.

Trend

Explanation

.....

(3)

- (b) (i) Describe what you would observe when an aqueous solution of bromine is added to an aqueous solution containing iodide ions. Write an equation for the reaction occurring.

Observation

Equation

- (ii) Explain why bromine does not react with aqueous chloride ions.

.....

.....

(3)

- (c) Describe what you would observe when aqueous silver nitrate is added to separate aqueous solutions of potassium fluoride and potassium bromide.

Observation with KF(aq)

Observation with KBr(aq)

(2)

- (d) Write an equation to show how solid potassium fluoride reacts with concentrated sulphuric acid.

.....

(1)

- (e) Write an equation for the redox reaction of sodium bromide with concentrated sulphuric acid.

.....

(2)

(Total 11 marks)

Q8.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

(Total 1 mark)

Q9.An aqueous solution of a white solid gives a yellow precipitate with aqueous silver nitrate. The formula of the white solid could be

- A** AgBr
- B** AgI
- C** NaBr
- D** NaI

(Total 1 mark)

Q10.Which one of the following statements concerning halogen chemistry is true?

- A** Sodium chloride produces chlorine when treated with concentrated sulphuric acid.
- B** Sodium chloride produces chlorine when treated with bromine.
- C** Sodium bromide produces bromine when treated with concentrated sulphuric acid.
- D** Sodium bromide produces bromine when treated with iodine in aqueous potassium iodide.

(Total 1 mark)

Q11. (a) Samples of solid sodium fluoride, sodium chloride, sodium bromide and sodium iodide are each warmed separately with concentrated sulphuric acid. All four compounds react with concentrated sulphuric acid but only two can reduce it.

- (i) Identify the **two** halides which do **not** reduce concentrated sulphuric acid. Write an equation for the reaction which does occur with **one** of these two halides.
- (ii) Identify the **two** halides which reduce concentrated sulphuric acid to sulphur dioxide. Using half-equations for the oxidation and reduction processes, deduce an overall equation for the formation of sulphur dioxide when concentrated sulphuric acid reacts with **one** of these halides.
- (iii) In addition to sulphur dioxide, two further reduction products are formed when one of these two halides reacts with concentrated sulphuric acid. Identify the two reduction products and write a half-equation to show the formation of **one** of them from concentrated sulphuric acid.

(9)

- (b) How would you distinguish between separate solutions of sodium chloride, sodium bromide and sodium iodide using solutions of silver nitrate and ammonia?

(6)

(Total 15 marks)

Q12. Which one of the following can act as an oxidising agent but not as a reducing agent?

- A CH_3CHO
- B Fe^{2+}
- C I^-
- D MnO_4^-

(Total 1 mark)

Q13. 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

(Total 1 mark)

Q14. (a) Concentrated sulphuric acid can be reduced by some solid sodium halides to H_2S

(i) Give the oxidation state of sulphur in H_2S

.....

(ii) Give **one** solid sodium halide which will reduce concentrated sulphuric acid, forming H_2S

.....

(iii) State **one** way in which the presence of H_2S could be recognised.

.....

(iv) Write a half-equation for the formation of H_2S from sulphuric acid.

.....

(4)

(b) A different solid sodium halide reacts with concentrated sulphuric acid without reduction forming a halogen-containing product **X**.

(i) Suggest an identity for **X**.

.....

(ii) Identify the solid sodium halide which produces **X**.

.....

(iii) State the role of sulphuric acid in the formation of **X**.

.....

(iv) Write an equation for the reaction with concentrated sulphuric acid in which **X** is formed.

.....

(4)
(Total 8 marks)

Q15.The boiling points of the halogens increase down Group VII because

- A** covalent bond strengths increase.
- B** bond polarities increase.
- C** the surface areas of the molecules increase.
- D** electronegativities increase.

(Total 1 mark)

Q16.An aqueous solution of a sodium salt gave no precipitate when treated with either silver

nitrate solution or barium chloride solution. Which one of the following could be the formula of the sodium salt?

- A NaI
- B Na_2SO_4
- C NaBr
- D NaF

(Total 1 mark)