

Q1.

This question is about chlorine.

- (a) Chlorine has a low boiling point because the forces between the molecules are weak.

Explain how these forces arise between molecules of chlorine.

(3)

- (b) Give an equation for the reaction of chlorine with water.

Give a reason why chlorine is added to drinking water.

Equation

Reason _____

(2)

- (c) Chlorine reacts with cold, aqueous sodium hydroxide in the manufacture of bleach.

Give an equation for this reaction.

(1)

(Total 6 marks)**Q2.**

Which pair of solutions, when mixed, reacts to form a dark brown solution?

- A $\text{NaF(aq)} + \text{Cl}_2\text{(aq)}$
- B $\text{NaCl(aq)} + \text{Br}_2\text{(aq)}$
- C $\text{NaBr(aq)} + \text{Cl}_2\text{(aq)}$
- D $\text{NaI(aq)} + \text{Br}_2\text{(aq)}$

(Total 1 mark)**Q3.**

Some solid sodium halides are reacted with concentrated sulfuric acid.

Which solid sodium halide does **not** produce a sulfur-containing gas as one of the products?

- A NaCl
- B NaBr
- C NaI
- D NaAt

(Total 1 mark)**Q4.**

This question is about Group 7 chemistry.

- (a) Give an equation for the reaction of solid sodium bromide with concentrated sulfuric acid to form bromine.

State **one** observation made during this reaction.

Equation

Observation

(2)

Q5.

This question is about Group 7 elements and their compounds.

- (a) Chlorine is used to treat water even though it is toxic to humans.

Give **one** reason why water is treated with chlorine.

Explain why chlorine is added to water even though it is toxic.

Give an equation for the reaction of chlorine with cold water.

Reason

Explanation

Equation

(3)

- (b) Solid sodium iodide reacts with concentrated sulfuric acid to form iodine and sulfur in a redox reaction.

Give a half-equation to show the conversion of iodide ions to iodine.

Give a half-equation to show the conversion of sulfuric acid to sulfur.

Give an overall equation for this redox reaction.

Identify one other sulfur-containing reduction product formed when solid sodium iodide reacts with concentrated sulfuric acid.

Half-equation for the conversion of iodide ions to iodine

Half-equation for the conversion of sulfuric acid to sulfur

Overall equation

Other sulfur-containing reduction product

(4)

A student completes an experiment to determine the percentage by mass of sodium chloride in a mixture of sodium chloride and sodium iodide.

The student uses this method.

- 600 mg of the mixture are dissolved in water to form a solution.
- An excess of aqueous silver nitrate is added to the solution. This forms a precipitate containing silver chloride and silver iodide.
- Excess dilute ammonia solution is then added to the precipitate. The silver chloride dissolves.
- The silver iodide is filtered off from the solution, and is then washed and dried.

The mass of the silver iodide obtained is 315 mg

(c) Silver nitrate is added to the solution.

Suggest why an excess is used.

(1)

(d) Calculate the amount, in moles, of silver iodide obtained.

$M_r(\text{AgI}) = 234.8$

Amount of silver iodide _____ mol

(1)

- (e) Calculate, using your answer to part (d), the mass, in grams, of sodium iodide in the mixture.

$$M_r(\text{NaI}) = 149.9$$

Mass of sodium iodide _____ g

(1)

- (f) Calculate, using your answer to part (e), the percentage by mass of sodium chloride in the mixture.

Percentage of sodium chloride _____

(2)

(Total 12 marks)

Q6.

Which property increases down Group 7?

- A ability to oxidise a given reducing agent
- B boiling point
- C electronegativity
- D first ionisation energy

(Total 1 mark)

Q7.Which equation shows a redox reaction that does **not** occur?

- A $\text{Br}_2(\text{aq}) + 2 \text{KI}(\text{aq}) \rightarrow \text{I}_2(\text{aq}) + 2 \text{KBr}(\text{aq})$
- B $\text{Cl}_2(\text{g}) + 2 \text{KI}(\text{aq}) \rightarrow \text{I}_2(\text{aq}) + 2 \text{KCl}(\text{aq})$
- C $\text{Cl}_2(\text{g}) + 2 \text{KBr}(\text{aq}) \rightarrow \text{Br}_2(\text{aq}) + 2 \text{KCl}(\text{aq})$
- D $\text{I}_2(\text{aq}) + 2 \text{KBr}(\text{aq}) \rightarrow \text{Br}_2(\text{aq}) + 2 \text{KI}(\text{aq})$

(Total 1 mark)

Q8.

This question is about sodium halides.

- (a) State what is observed when silver nitrate solution is added to sodium fluoride solution.

(1)

- (b) State **one** observation when solid sodium chloride reacts with concentrated sulfuric acid.

Give an equation for the reaction.

State the role of the chloride ions in the reaction.

Observation

Equation

Role

(3)

- (c) Give an equation for the redox reaction between solid sodium bromide and concentrated sulfuric acid.

Explain, using oxidation states, why this is a redox reaction.

Equation

Explanation

(3)

- (d) State what is observed when aqueous chlorine is added to sodium bromide solution.

Give an ionic equation for the reaction.

Observation

Ionic equation

(2)**(Total 9 marks)****Q9.**

Which shows the major product(s) formed when chlorine reacts with cold, dilute, aqueous sodium hydroxide?

- A NaCl only
- B NaClO only
- C NaCl and NaClO
- D NaCl and NaClO₃

(Total 1 mark)**Q10.**

What is the best oxidising agent?

- A F₂
- B F⁻
- C I₂
- D I⁻

(Total 1 mark)

Q11.

Which statement is correct about reactions involving halide ions?

- A** Sodium chloride forms chlorine when added to concentrated sulfuric acid.
- B** Sodium chloride forms chlorine when added to bromine.
- C** Sodium bromide forms bromine when added to concentrated sulfuric acid.
- D** Sodium bromide forms bromine when added to iodine.

(Total 1 mark)

Q12.

Which statement is **not** correct about the trends in properties of the hydrogen halides from HCl to HI ?

- A** The boiling points decrease.
- B** The bond dissociation energy of H-X decreases.
- C** The polarity of the H-X bond decreases.
- D** They are more easily oxidised in aqueous solutions.

(Total 1 mark)

Q13.

This question is about some Group 7 compounds.

- (a) Solid sodium chloride reacts with concentrated sulfuric acid.

Give an equation for this reaction.

State the role of the sulfuric acid in this reaction.

Equation

Role

(2)

- (b) Fumes of sulfur dioxide are formed when sodium bromide reacts with concentrated sulfuric acid.

For **this** reaction

- give an equation
- give **one** other observation
- state the role of the sulfuric acid.

Equation

Observation

Role

(3)

- (c) Chlorine reacts with hot aqueous sodium hydroxide as shown in the equation.



Give the oxidation state of chlorine in NaClO_3 and in NaCl

NaClO_3 _____

NaCl _____

(1)

- (d) State, in terms of redox, what happens to chlorine in the reaction in part (c).

(1)

- (e) Solution **Y** contains **two** different negative ions.

To a sample of solution **Y** in a test tube a student adds

- silver nitrate solution
- then an excess of dilute nitric acid
- finally an excess of concentrated ammonia solution.

The observations after each addition are recorded in the table.

Reagent added to solution Y	Observation
silver nitrate solution	cream precipitate containing compound D and compound E
excess dilute nitric acid	cream precipitate D and bubbles of gas F
excess concentrated ammonia solution	colourless solution containing complex ion G

Give the formulas of **D**, **E** and **F**.

Give an **ionic** equation to show the formation of **E**.

Give an equation to show the conversion of **D** into **G**.

Formula of **D** _____

Formula of **E** _____

Formula of **F** _____

Ionic equation to form **E**

Equation to show the conversion of **D** into **G**

(6)

(Total 13 marks)

Q16.

Which is the best technique to remove the silver chloride that forms when aqueous solutions of silver nitrate and sodium chloride react?

- A Refluxing
- B Evaporation
- C Filtration
- D Distillation

(Total 1 mark)

Q17.

Which statement about astatine is correct?

- A Astatine has a greater electronegativity than bromine
- B Astatine is a better oxidising agent than bromine
- C Astatine has a greater boiling point than bromine
- D Astatine has a greater first ionisation energy than bromine

(Total 1 mark)

Q18.

Which species is **not** produced by a redox reaction between solid sodium iodide and concentrated sulfuric acid?

- A Na_2SO_4
- B H_2S
- C S
- D SO_2

(Total 1 mark)

Disadvantage _____

(3)

- (c) Bromine reacts with phosphorus to form phosphorus tribromide.

Write an equation for this reaction and draw the shape of the phosphorus tribromide molecule formed.

Suggest the bond angle in phosphorus tribromide.

Equation

Shape

Bond angle

(3)

- (d) Phosphorus pentabromide in the solid state consists of PBr_4^+ and Br^- ions.

Draw the shape of the PBr_4^+ ion and suggest its bond angle.

Shape

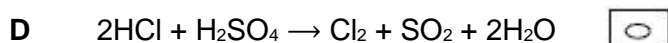
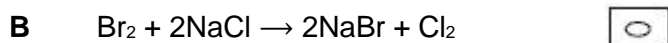
Bond angle

(2)

(Total 14 marks)

Q21.

Which equation represents a reaction that does take place?



(Total 1 mark)

Q22.

Which species is the best oxidising agent?



(Total 1 mark)

Q23.

This question is about the chemical properties of chlorine, sodium chloride and sodium bromide.

- (a) Sodium bromide reacts with concentrated sulfuric acid in a different way from sodium chloride.

Write an equation for this reaction of sodium bromide and explain why bromide ions react differently from chloride ions.

Equation

Explanation

(3)

