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# CHEMISTRY

## INORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	GROUP 7 HALOGEN
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	10
TOTAL MARKS	41

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## Group 7 the Halogens - 1

1. 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.

(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.

(3)

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



Give the oxidation state of chlorine in  $\text{NaClO}_3$  and in  $\text{NaCl}$

(1)

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

(1)

2. 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.

3. Which equation represents a reaction that does take place?

(6)

- A.  $\text{Cl}_2 + 2\text{NaI} \rightarrow 2\text{NaCl} + \text{I}_2$
- B.  $\text{Br}_2 + 2\text{NaCl} \rightarrow 2\text{NaBr} + \text{Cl}_2$
- C.  $\text{NaCl} + \text{H}_2\text{O} \rightarrow \text{HCl} + \text{NaOH}$
- D.  $2\text{HCl} + \text{H}_2\text{SO}_4 \rightarrow \text{Cl}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$

(1)

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

- A.  $\text{CH}_3\text{CHO}$
- B.  $\text{Fe}^{2+}$
- C.  $\text{I}^-$
- D.  $\text{MnO}_4^-$

(1)

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5. Which species is the best oxidising agent?

- A.  $\text{Cl}_2$
- B.  $\text{Cl}^-$
- C.  $\text{Br}_2$
- D.  $\text{Br}^-$

(1)

6. This question is about elements in Group 7 of the Periodic Table and their compounds.

- (a) 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.

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(3)

- (b) Phosphorus pentabromide in the solid state consists of  $\text{PBr}_4^+$  and  $\text{Br}^-$  ions.

Draw the shape of the  $\text{PBr}_4^+$  ion and suggest its bond angle.

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(2)

7. 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

(1)

8. Separate unlabelled solid samples of three anhydrous sodium compounds are provided for a student to identify.

These compounds are known to be sodium carbonate, sodium fluoride and sodium chloride but it is not known which sample is which.

Outline a logical sequence of test-tube reactions that the student could carry out to identify each of these compounds.

Include the observations the student would expect to make.

Give equations, including state symbols, for any reactions that would take place.

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(6)

9. 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

(1)

10. Strontium chloride is used in toothpaste for sensitive teeth.

(a) Both strontium carbonate and strontium sulfate are white solids that are insoluble in water.

- i. Write an equation for the reaction between strontium chloride solution and sodium sulfate solution. Include state symbols in your equation.

(1)

- ii. Strontium carbonate reacts with nitric acid to produce a solution of strontium nitrate.

Strontium sulfate does not react with nitric acid.

Describe briefly how you could obtain strontium sulfate from a mixture of strontium carbonate and strontium sulfate.

You are not required to describe the purification of the strontium sulfate.

(2)

**(b)** A solution of magnesium sulfate is sometimes given as first aid to someone who has swallowed barium chloride.  
Explain why drinking magnesium sulfate solution is effective in the treatment of barium poisoning.

(1)

**(c)** Medicines for the treatment of nervous disorders often contain calcium bromide.  
Silver nitrate, acidified with dilute nitric acid, can be used together with another reagent to test for the presence of bromide ions in a solution of a medicine.  
Describe briefly how you would carry out this test and state what you would observe.

(3)

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