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CHLORINE AND ITS COMPOUNDS

1. **1990 Q 19 P1A**

When aqueous barium chloride was added to an aqueous sodium salt W, a white precipitate was formed on addition of dilute hydrochloric acid, the white precipitate dissolved, and a gas evolved. Give two possible identities of W. (2 marks)

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2. **1993 P1A Q 15**

When excess chloride gas is bubbled through dilute sodium hydroxide solution the resulting solution acts as a bleaching agent.

(a) Write an equation for the reaction between chlorine gas and sodium hydroxide solution (1 mark)

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(b) Explain how the resulting solution acts as a bleaching agent. (2 marks).

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3. **1995 P1A Q11**

A solution of chloride in tetra chloromethane turns colourless when propene gas is bubbled through it:

(a) What type of reaction takes place? (1 mark)

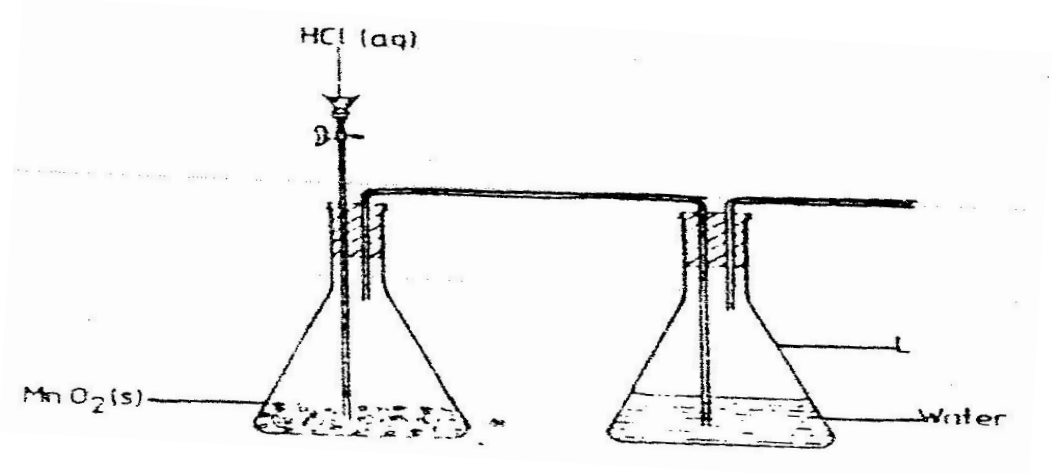
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(b) Write an equation for the above reaction. (1 mark)

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4. **1996 Q 2 P2**

a) The diagram below shows incomplete set – up of the laboratory and preparation collection of chlorine gas. Study it and answer the questions that follow.



i) Complete the set – up to show how dry chloride gas may be collected.

ii) The equation for the redox reaction that takes place is

$MnO_{2(s)} + 4\ HCl_{(aq)} \longrightarrow MnCl_{2\ (aq)}) + 2H_2O_{(l)} + Cl_{2\ (g)}$

Explain, using oxidation numbers, which species is reduced (2marks)

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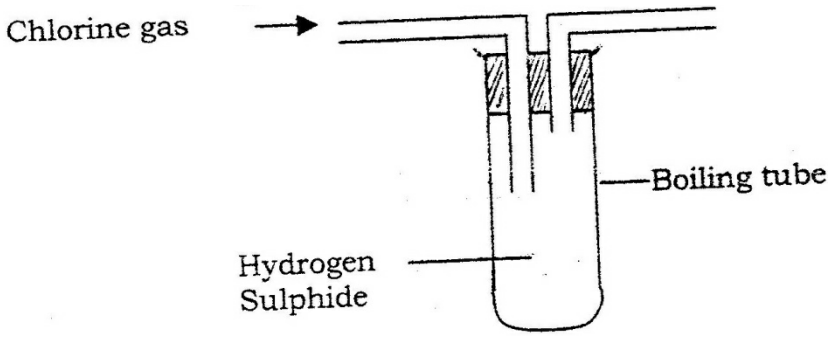
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iii) What is the purpose of water in flask L? (1mark)

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5. 1997 Q 14 P1

In an experiment, chlorine gas was passed into moist hydrogen sulphide contained in a boiling tube as shown in the diagram



a) What observation was made in the boiling tube?

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b) Write an equation for the above reaction.

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c) What precaution should be taken in carrying out this experiment? Give a reason.

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6. 1997 Q 28 PP1

What is the role of Chlorine gas in

i) Water treatment?

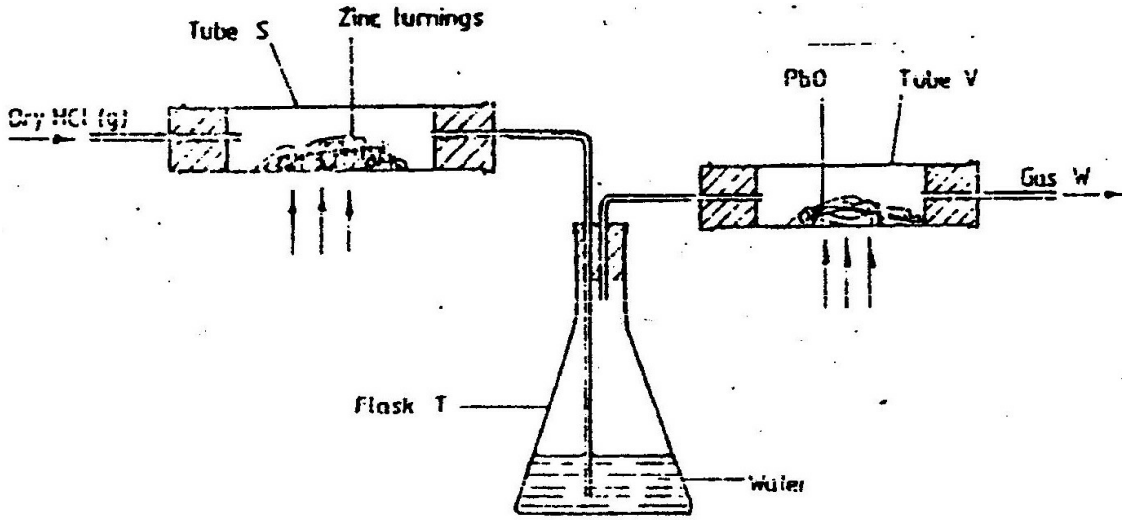
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ii) Paper manufacture? (1 mark)

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7. 1997 Q 7 PP2

(a) In an experiment, dry hydrogen chloride gas was passed through heated zinc turnings as shown in the diagram below. The gas produced was then passed through heated lead (II) oxide.



(i) What is the function of water in the flask?

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Write equations for the reactions that took place in the tubes

S

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V

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(ii) How would the total mass of tube V and its contents compare before after the experiment? Explain

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(b) Chloride can be prepared by using the following three agents; solid sodium chloride, concentrated sulphuric acid and potassium permanganate

(i) What is the role of each of the following in the reaction?

I concentrated sulphuric acid

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II potassium permanganate

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(ii) Name the bleaching agent formed when chlorine gas is passed through cold dilute sodium hydroxide solution

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(iii) Name one other use of the compound formed in (ii) above other than bleaching

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(c) 1.9 gm of magnesium chloride was dissolved in distilled water. Silver nitrate solution was added until in excess. Calculate the mass of silver nitrate that was used for the complete reaction.
Relative molecular mass of magnesium chloride = 95, N = 14.0, O = 16.0,
Ag = 108.0

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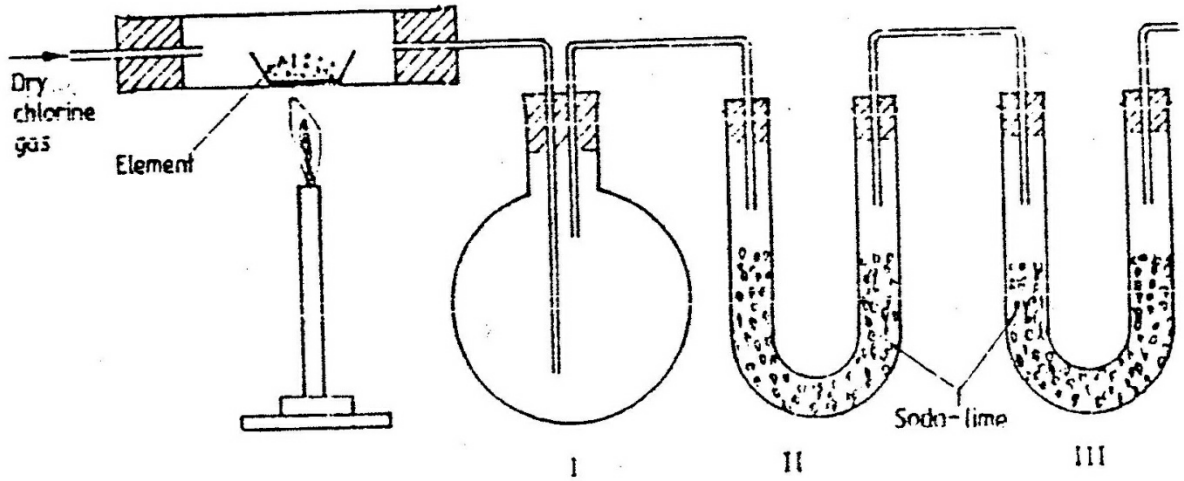
8. 1998 Q 29 PP1

What is the oxidation number of chlorine in ClO_4^-?

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9. 1998 Q 4 PP2

The set – up below was used to prepare anhydrous chlorides of a number of elements in a laboratory where no fine cupboard was available. The chlorides were to be collected in flask.



The following table shows the melting and boiling points of the chlorides that were prepared.

(a) Explain why it is necessary to pass dry chlorine through the apparatus before heating each element

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(b) Give two reasons why tubes II and III were filled with Soda lime (solid mixture of sodium hydrogen and calcium hydrogen)

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(c) Explain why it would not be possible to collect any sodium chloride in flask 1

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(d) Name one other substance that can be used in tubes II and III

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(e) Write an equation for the reaction that forms phosphorous (III) chloride

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(f) Describe how you would separate a mixture of sodium chloride and aluminium chloride

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10. 2000 Q 4a P2

(a) (i) In the space provided sketch a labelled diagram to show how hydrogen chloride gas can be prepared and collected in the laboratory using sodium chloride and concentrated sulphuric acid (the gas need not be dry)

(ii) Write an equation for the reaction that takes place

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(iii) Name one drying agent for hydrogen chloride

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(vi) State and explain the observation that would be made when hydrogen chloride gas is bubbled through a solution of lead (II) nitrate

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(v) Concentrated hydrochloric acid is used for removing oxide from metal surfaces (picking). Explain why concentration nitric acid cannot be used for the purpose.

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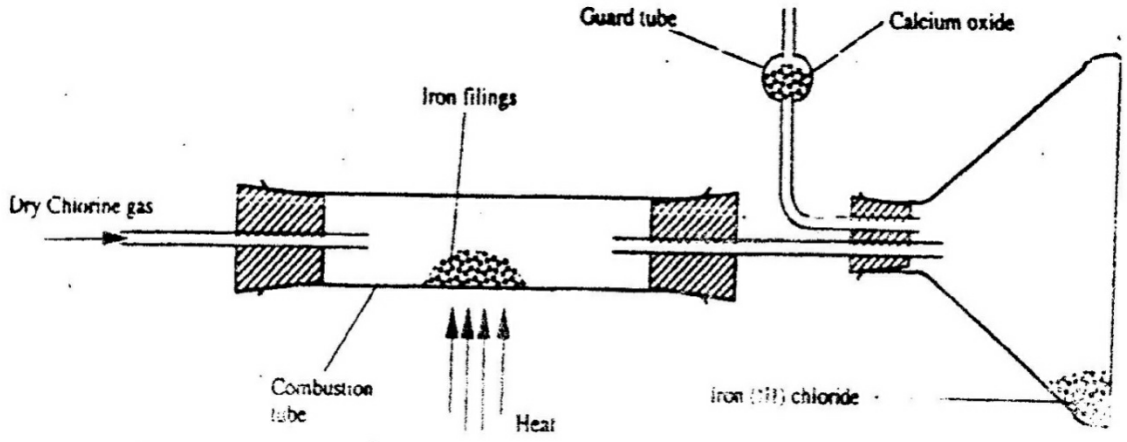
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11. 2001 Q 5 P2

a) Give the name of reagent which when reacted with concentrated hydrochloric acid produce chlorine gas.

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b) A student out to prepare iron III chloride using the apparatus shown in the diagram below.



i) Explain why:

I. It is necessary to pass chlorine gas through the apparatus before heating begins.

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II Calcium oxide would be preferred to calcium chloride in the guard tube.

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ii) What property of iron (III) chloride makes it possible to be collected as shown in the diagram?

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iii) Write an equation form one chemical reaction that took place in the guard tube

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iv) The total mass of iron (III) chloride formed was found to be 0.5g.
Calculate the volume of chlorine gas the reacted with iron.
(Fe - = 56.0,Cl = 35.5 and Molar gas volume at 298K is 24,000cm^3

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c) When hydrogen sulphide gas was passed through a solution of iron (III) chloride, the following observation were made:

i) The colour of the solution changed from reddish – brown to green and a yellow solid was deposit .Explain these observations.

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d) State and explain the observations that would be made if a moist blue litmus paper was placed in a gas jar full of chloride gas.

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12. 2002 Q 4

The following two tests were carried out on chlorine water contained in two test tubes

(a) A piece of blue flower was dropped into the first – tube. Explain why the flower was bleached

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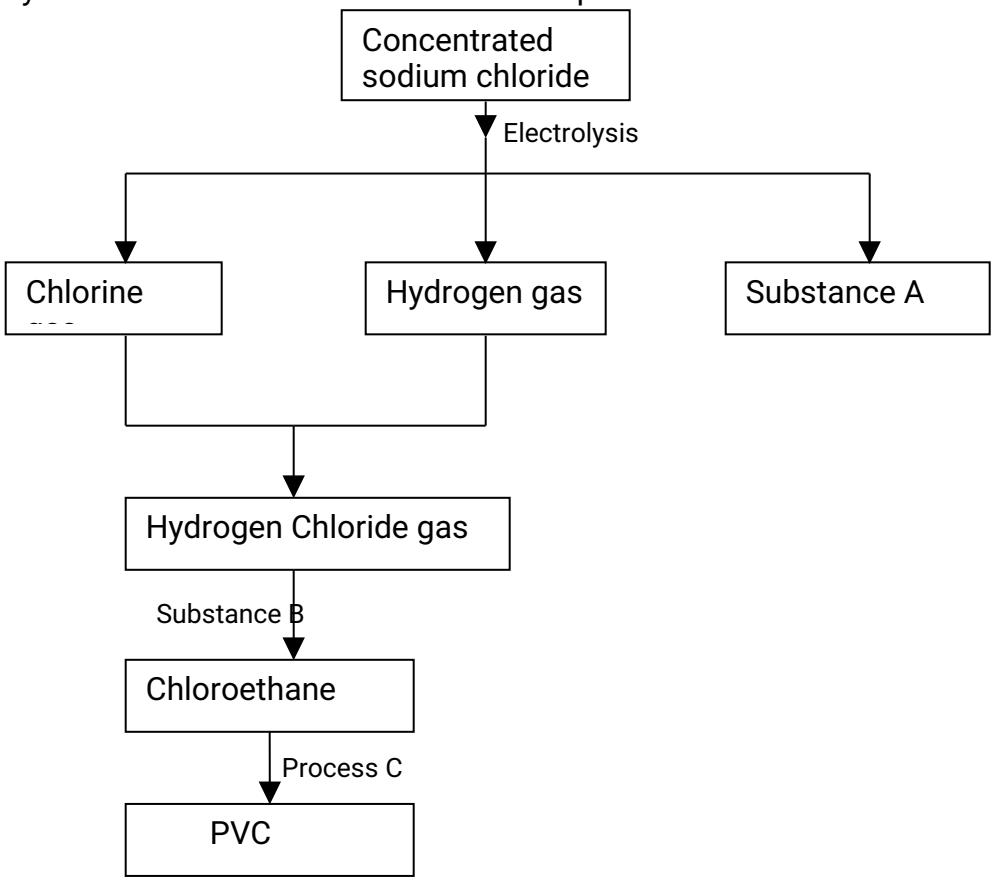
(b) The second test- tube was corked and exposed to sunlight after a few days, it was found to contain a gas that rekindled a glowing splint. Write an equation for the reaction which produced the gas

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13. 2002 Q 2 P2

Study the flow chart below and answer the questions follow



(a) Identify substance

(i) A .....

(ii) B.....

(b) Name process C

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(c) Give one use of PVC

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(d) Write an equation for the reaction in which chlorine gas is produced

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(e) State and explain the observation that would be made if chlorine gas was bubbled into an aqueous solution of sodium iodide

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(f) In the preparation of a bleaching agent (Sodium hypochlorite), Excess chlorine gas was bubbled into 15 litres of cold 2 m sodium hydroxide

(i) Write an equation for the reaction between chlorine gas and cold dilute sodium hydroxide

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(ii) Calculate the:

Number of moles of sodium hydroxide used

Mass in kilograms of the sodium hypochlorite produced = 1. 1175

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14. 2003 Q 1

Some sodium chloride was found to be contaminated with copper (II) oxide.

Describe how a sample of sodium chloride can be separated from the mixture

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15. 2003 Q 11

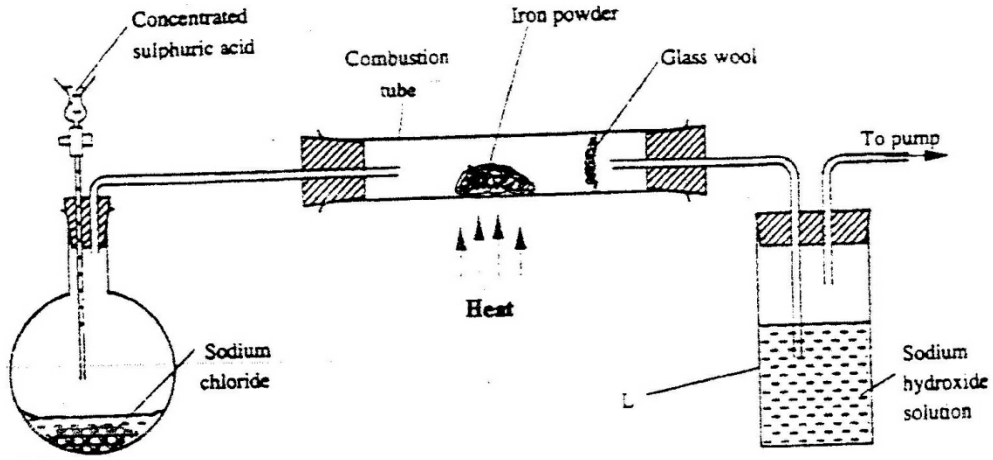
Yellow phosphorous reacts with chlorine gas to form a yellow liquid. The liquid fumes when exposed to air. Explain these observations (2 marks)

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16. 2003 Q 22

The set – up below was used to prepare hydrogen chloride a gas and react it with iron powder. Study it and answer the questions that follow.



At the end of the reaction, the iron powder turned into a light green solid.

a) Identity the light green solid. (1mark)

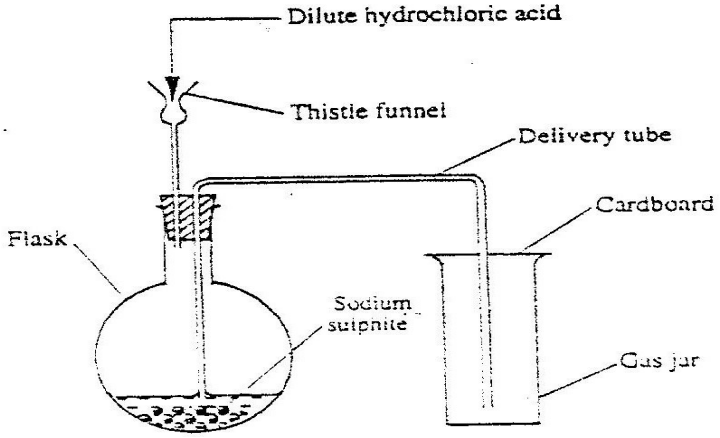
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b) At the beginning of the experiment, the Ph of the solution in container L was about 14. At the end, the pH was found to be 2. Explain (2marks)

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17. 2004 Q 4

Dilute hydrochloric acid and solid sodium sulphite were reacted as shown in the set- up below



a) Name the gas produced in the flask (2marks)

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b) Give two reasons why no gas was collected in the gas jar. (2marks)

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18. 2004 Q 1b-e P2

b) Chlorine gas is prepared by reacting concentrated hydrochloric acids with manganese (IV) oxide

i) Write the equation for reaction between concentrated hydrochloric acid and manganese (IV) oxide. (1 mark)

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ii) What is the role of manganese (Iv) oxide in this reaction (1 mark)

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c) i) Iron (II) chloride reacts with chlorine gas to form substance E. (1 mark)
Identify substance E

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ii) During the reaction in c(i) above,6.30g of iron chloride were converted to 8.06 of substance E. Calculate the volume of chlorine used.
(Cl = 35.5, Molar gas volume at room temperature = 24000cm3, Fe =56
(2 marks)

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d) Draw and name the structure of the compound formed when excess chlorine gas is reacted with ethane gas. (2 marks)

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e) Give the industrial use of chlorine (1 mark)

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19. 2005 Q 2

Calcium oxide can be used to dry ammonia gas. (2 marks)

a) Explain why calcium oxide is not used to dry hydrogen chloride gas (2 marks)

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b) Name one drying agent for hydrogen chloride gas

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20. 2005 Q 11

The reaction between how concentrated sodium hydroxide and chlorine produces sodium chlorate (V), sodium chloride and water

(a) Write the equation for the reaction

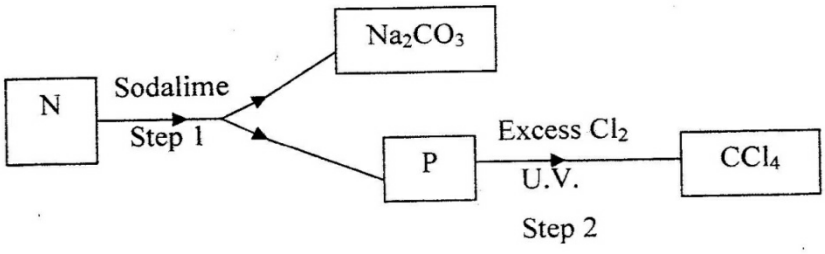
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(b) Give one use of sodium chlorate (V)

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21. 2005 Q 22

Study the flow chart below and answer the questions that follow



(a) Identify N and P (2 marks)

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(b) What name is given to the type of halogenations/ chlorination reaction in step 2?

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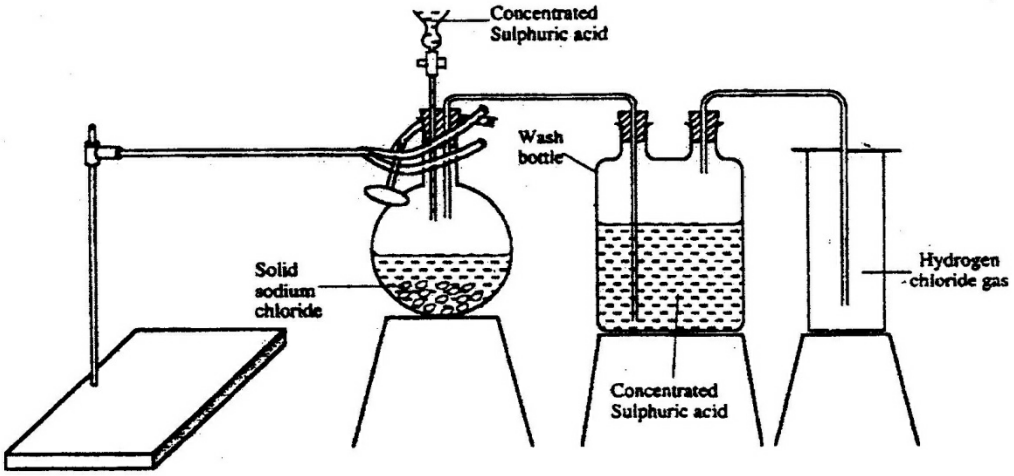
22. 2006 Q 10b

Name the process which takes place when:

b) A red litmus paper turns white when dropped into chlorine water. (1 mark)

23. 2006 Q 13

The diagram below represents the set-up that was used to prepare and collect hydrogen chloride gas in the laboratory.



a) State the purpose of concentrated sulphuric acid in the wash bottle. (1 mark)

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b) Write an equation for the reaction between dry hydrogen chloride gas and heated iron (1 mark)

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c) Hydrogen chloride gas is dissolved in water to make hydrochloric acid. State one use of hydrochloric acid.

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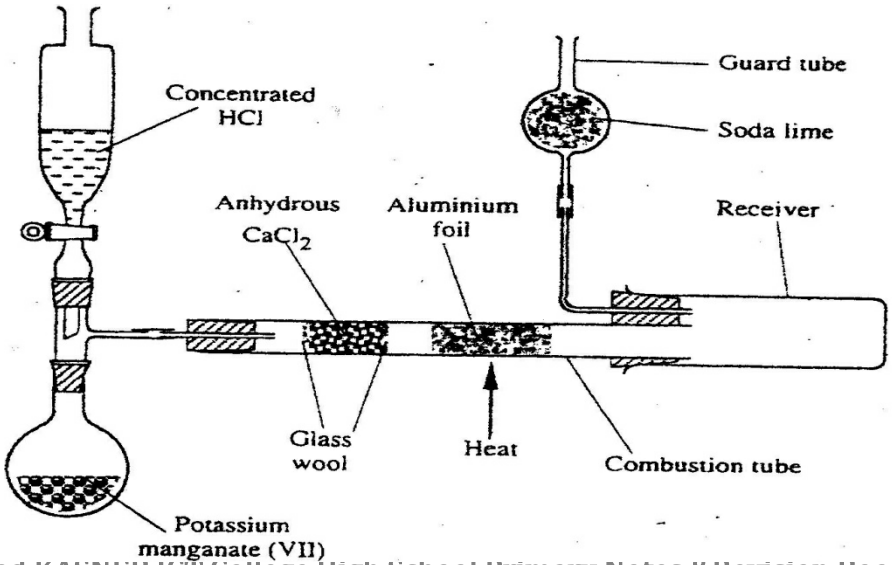
24. 2007 Q 24

State and explain the observations made when excess ammonia gas reacts with chlorine gas (3marks)

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25. 2007 Q 7 P2

The diagram below shows the set up used in an experiment to prepare chlorine gas and react it with aluminium foil. Study it and answer the question that follows.



(a) In the experiment, concentrated hydrochloric acid and potassium manganate (VII) were used to prepare chlorine gas. State two precautions that should be taken in carrying out this experiment (2marks)

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(b) Write the formula of another compound that could be used instead of potassium manganate (VII) (1 mark)

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(c) Explain why it is necessary to allow the acid to drip slowly onto potassium manganate (VII) before the aluminium foil is heated. (2 marks)

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(d) State the property of the product formed in the combustion tube that makes it possible for
it to be collected in the receiver (1mark)

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(e) When 1.08g of aluminium foil were heated in a stream of chlorine gas, the mass of the product formed was 3.47 g. Calculate the:
(i) Maximum mass of the product formed if chlorine was in excess; (Al= 27; Cl = 35.5)

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(ii) Percentage yield of the product formed (1 mark)

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(f) Phosphorous trichloride is a liquid at room temperature. What modification should be made to set up if it is to be used to prepare phosphorous trichloride? (1 mark)

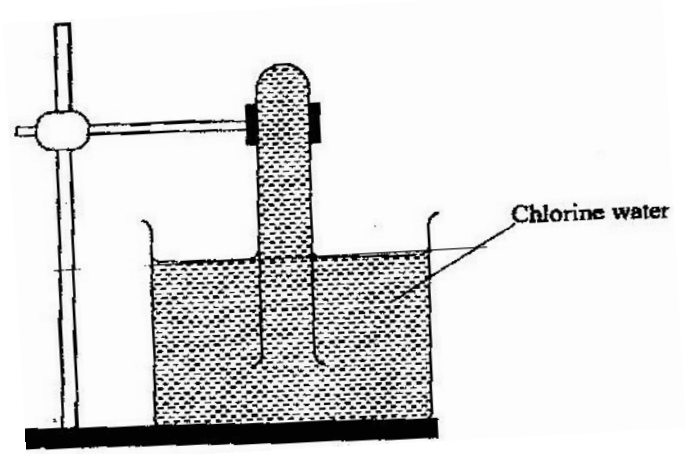
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26. 2008 Q 12

In an experiment, a test-tube full of chlorine water was inverted in chlorine water as shown in the diagram below and the set up left in sunlight for one day.



After one day, a gas was found to have collected in the test-tube

a) Identify the gas. .....

b) What will happen to the PH of the solution in the beaker after one day? Give an explanation. (2marks)

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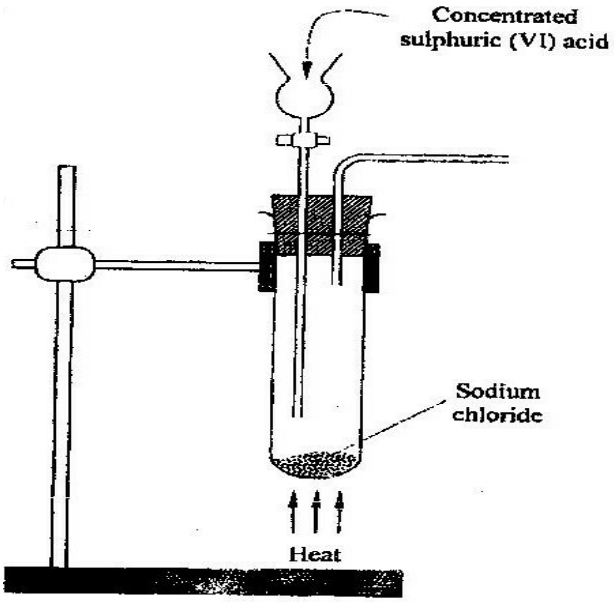
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27. 2008 Q 22

The diagram below is part of a set up used in the laboratory preparation of a gas.



Complete the diagram to show how a dry sample of the gas can be collected. (3marks)

28. 2009 Q 1 P2

(a) Two reagents that can be used to prepare chlorine gas are manganese (IV) oxide and a concentrated hydrochloric acid.

(i) Write an equation for the reaction (1mark)

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(ii) Give the formula of another reagent that can be reacted with concentrated hydrochloric acid to produce chlorine gas (1mark)

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(iii) Describe how the chlorine gas could be dried in the laboratory (2marks)

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(b) In an experiment, dry chlorine gas was reacted with aluminium as shown In Figure 1

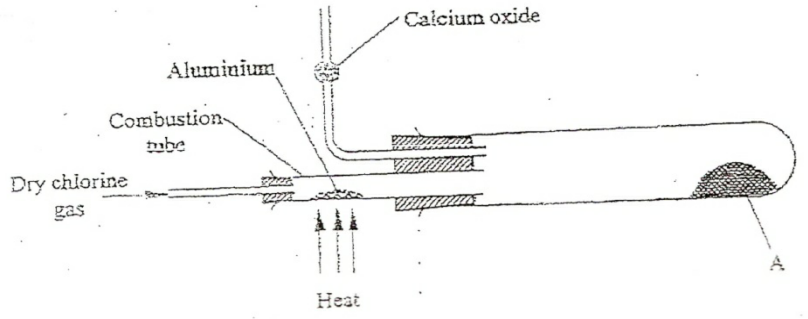


Figure 1

(i) Name substance A (1mark)

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(ii) Write an equation for the reaction that took place in the combustion tube (1mark)

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(iii) 0.8 g of aluminum reacted completely with chlorine gas. Calculate the the volume of chlorine gas used (Molar gas volume is $24dm^3$, Al =27) (3 marks)

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(iv) Give two reasons why calcium oxide is used in the set up (2 marks)

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29. 2011 Q 18

Under certain conditions, chlorine gas reacts with sodium hydroxide to form Sodium hypochlorite.

a) Name the conditions under which sodium hydroxide to form sodium hypochlorite. (1 mark)

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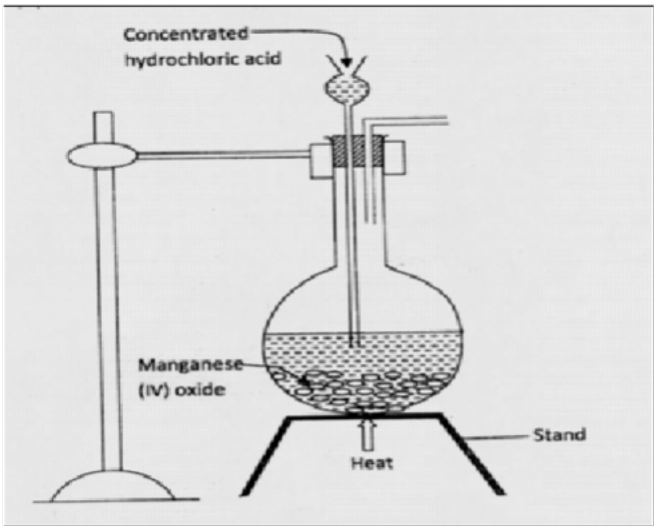
b) State the uses of sodium hypochlorite. (1 mark)

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30. 2012 Q7 P2

(a) The diagram below is part of a set up used to prepare and collect dry chlorine gas.



(i) Complete the diagram to show how a dry sample of chlorine gas can be collected (3 marks)

(ii) Name another substance and condition that can be used instead of manganese (IV) oxide (1 mark)

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(iii) Write an equation for each of the following:

1. Chlorine gas reacting with iron (1 mark)

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II. Chlorine gas reacting with hot concentrated sodium hydroxide solution (1 mark)

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(b) An oxide of chlorine of mass 1.83g was found to contain 1.12g of oxygen. Determine the empirical formula of the oxide (O=0.16.0; CL=35.5). (3 marks)

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(c) Other than the manufacture of weed killers, name **two** other uses of chlorine. (2 marks)

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