11. Group 17

11.4 The reactions of chlorine

Paper 2

Question Paper

1 **(c)** $CHCl_3$ is another halogenoalkane. $CHCl_3$ forms when propanone reacts with NaClO.

NaClO is made from chlorine in a disproportionation reaction.

(i) Identify a reagent and conditions that can be used to convert chlorine to NaClO.

..... [1]

(ii) Define disproportionation.

.....

..... [1]

(d) **(i)** Write an equation for the reaction of chlorine with water.

..... [1]

(ii) Write an equation for the reaction of chlorine with hot NaOH(aq).

..... [1]

(e) Bleach is used as a cleaning product to kill bacteria. It is made by adding compounds like sodium chlorate(I), NaClO, to water.

(i) Identify the formula of the ion present in bleach that kills bacteria.

..... [1]

(ii) Sodium chlorate(I), NaClO, reacts with hydrogen peroxide to produce sodium chloride, water and oxygen gas.

Construct an equation for this reaction.

..... [1]

(iii) A sample of bleach **W** contains an unknown concentration of sodium chlorate(I).

$10.0\,cm^3$ of **W** is diluted with distilled water to make a total volume of $100\,cm^3$ of bleach solution. $25.0\,cm^3$ of this diluted bleach solution is added to an excess of hydrogen peroxide and the volume of gas produced measured under room conditions. The experiment is repeated and on average $25.0\,cm^3$ of diluted bleach solution produces $42.0\,cm^3$ of gas.

Calculate the concentration, in $g\,dm^{-3}$, of sodium chlorate(I) in **W**.

concentration of NaClO in **W** = ... $g\,dm^{-3}$ [3]

2 Some of the common chlorides of Period 3 elements are shown in the list.

$$NaCl \quad MgCl_2 \quad AlCl_3 \quad SiCl_4 \quad PCl_5$$

(b) $NaCl$ is one product of the reaction of chlorine gas and cold aqueous sodium hydroxide.

Identify the other products.

..... [1]

3 Period 3 elements react with chlorine gas, $Cl_2(g)$, to form chlorides.

(c) A mixture of HCl and $HClO$ is added to cold dilute NaOH. One of the products behaves as a bleach.

Suggest the equation for the reaction occurring.

..... [2]

4 **(c)** Chlorine undergoes disproportionation during many chemical reactions.

(i) Write an equation for the reaction of chlorine with cold aqueous sodium hydroxide, NaOH.

Explain why it is a disproportionation reaction.

equation .....

explanation .....

.....

[2]

(ii) One of the products of the reaction of chlorine with **hot** aqueous sodium hydroxide differs from those in **(c)(i)**.

Identify the compound that is formed in this reaction that is different from that formed in the reaction in **(c)(i)**.

..... [1]

(d) State and explain the use of chlorine in water purification.

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..... [2]