

11. Group 17

11.4 The reactions of chlorine

Paper 2

Marking Scheme

Q1.

(c)(i)	cold NaOH(aq)	1
(c)(ii)	a reaction where a species / same species is both oxidised and reduced simultaneously / in the same reaction	1

Q2.

(d)(i)	$\text{Cl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{HOCl} + \text{HCl}$	1
(d)(ii)	$3\text{Cl}_2 + 6\text{NaOH} \rightarrow 5\text{NaCl} + \text{NaClO}_3 + 3\text{H}_2\text{O}$	1
(e)(i)	ClO^-	1
(e)(ii)	$\text{NaClO} + \text{H}_2\text{O}_2 \rightarrow \text{O}_2 + \text{NaCl} + \text{H}_2\text{O}$	1
(e)(iii)	<p>M1 (show how to calculate) mol O_2 gas 42 cm^3 gas = $42 / 24000$ mol oxygen gas (= 1.75×10^{-3} mol) M2 (process to find) amount NaClO in 10 cm^3 sample = 100 cm^3 (diluted) bleach $\text{M1} \times 4$ (= $4 \times 1.75 \times 10^{-3}$ mol in 10 cm^3 = 0.007) M3 correct calculation using M2 to find concentration = $(\text{M2} / 10) \times 1000 \times 74.5 = 52.2 \text{ (g / dm}^3)$</p>	3

Q3.

(b)	NaClO / sodium hypochlorite / chlorate(I) AND H_2O / water	1
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Q4.

(c)	$2\text{NaOH} + \text{HCl} + \text{HClO} \rightarrow \text{NaCl} + \text{NaClO} + 2\text{H}_2\text{O}$ M1 Identifies the product NaClO M2 Correctly balances the equation OR The overall equation may be seen as: $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ AND $\text{NaOH} + \text{HClO} \rightarrow \text{NaClO} + \text{H}_2\text{O}$	2
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Q5.

(c)(i)	M1: $\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaCl} + \text{NaClO} + \text{H}_2\text{O}$ M2: chlorine is oxidised and reduced	2
(c)(ii)	NaClO ₃ / sodium chlorate(V)	1
(d)	M1: chloric(I) acid / hypochlorous acid / HClO M2: kills bacteria / micro-organisms / microbes	2