

Group 7

Mark Scheme 1

Level	International A Level
Subject	Chemistry
Exam Board	Edexcel
Topic	Application of Core Principles of Chemistry
Sub Topic	Group 7
Booklet	Mark Scheme 1

Time Allowed: 51 minutes
Score: /42
Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

Question Number	Correct Answer	Mark
1	A	1

Question Number	Correct Answer	Mark
2	D	1

Question Number	Correct Answer	Reject	Mark
3	D		1

Question Number	Correct Answer	Reject	Mark
4	A		1

Question Number	Correct Answer	Reject	Mark
5	C		1

Question Number	Correct Answer	Reject	Mark
6	A		1

Question Number	Correct Answer	Reject	Mark
7	C		1

Question Number	Correct Answer	Reject	Mark
8	B		1

Question Number	Correct Answer	Reject	Mark
9	C		1

Question Number	Correct Answer	Reject	Mark
10	A		1

Question Number	Acceptable Answers	Reject	Mark
11(a)	iodine IGNORE I ₂ / I	Iodide / I ⁻	(1)

Question Number	Acceptable Answers	Reject	Mark
11(b)	<p>Allow oxidation numbers written under species in equation or in the text below</p> <p>First mark - oxidation numbers of reactants F₂ F is 0 OH⁻ O is -2 (1)</p> <p>Second mark - oxidation numbers of products OF₂ O is +2 and F is -1 H₂O O is -2 F⁻ F is -1 (1)</p> <p>Third mark - redox Fluorine / F₂ is reduced as oxidation number decreases / changes from 0 to -1 and oxygen is oxidised as oxidation number increases / changes from -2 to +2</p> <p>OR Fluorine / F₂ is an oxidising agent as oxidation number decreases / changes from 0 to -1 and oxygen is a reducing agent as oxidation number increases / changes from -2 to +2</p> <p>ALLOW O²⁻ for oxygen (1)</p> <p>IGNORE gain / loss of electrons</p>	<p>Just 'ON F decreases and ON O increases'</p> <p>If O is -2 and F is +1 in OF₂, fluorine is oxidised from 0 to +1 and reduced from 0 to -1 (disproportionation)</p>	(3)

Question Number	Acceptable Answers	Reject	Mark
11(c)	$\text{S}_2\text{O}_3^{2-} + 5\text{H}_2\text{O} + 4\text{Cl}_2 \rightarrow 2\text{SO}_4^{2-} + 10\text{H}^+ + 8\text{Cl}^-$ <p>ALLOW multiples</p> <p>ALLOW</p> $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O} + 4\text{Cl}_2 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{SO}_4 + 8\text{H}^+ + 8\text{Cl}^-$ <p>IGNORE working</p>	<p>uncancelled electrons</p> <p>reverse reaction</p>	(1)

Question Number	Acceptable Answers	Reject	Mark
11(d)(i)	<p>Instantaneous / temporary dipole OR temporary asymmetric electron distribution (on one molecule) (1)</p> <p>Induces / creates / causes a dipole / charge and in adjacent / another molecule (and these opposite charges attract) (1)</p> <p>IGNORE ID - ID</p>	Just 'induces a dipole'	(2)

Question Number	Acceptable Answers	Reject	Mark
11(d)(ii)	<p>There are (18) more electrons in iodine (than bromine) OR There are more electrons in HI (than HBr)</p> <p>ALLOW There is a greater electron cloud in iodine (than bromine)</p> <p>ALLOW Iodide has more electrons (than bromide)</p> <p>ALLOW Iodine has a larger surface area (than bromine)</p> <p>IGNORE Iodine is larger / heavier / has larger instantaneous dipole / has a greater electron density / has more protons / has more neutrons (than bromine)</p>	There are more electrons in I ⁻ / iodide ions (than bromide ions / Br ⁻)	(1)

Question Number	Acceptable Answers	Reject	Mark
11(d)(iii)	<p>Identification of intermolecular forces HF (also) has hydrogen bonds (1)</p> <p>IGNORE HCl only has London forces</p> <p>Comparison of strength Hydrogen bonds are stronger than London forces / other intermolecular forces</p> <p>ALLOW Hydrogen bonding is stronger OR Hydrogen bonding is the strongest intermolecular force OR More energy is needed to break hydrogen bonds (than London forces) OR The intermolecular forces in HF are stronger (than those in HCl) (1)</p> <p>IGNORE Fluorine is more electronegative than chlorine / there is a greater electronegativity difference in HF than HCl</p>	<p>Any reference to breaking H-Hal bond</p> <p>London forces in HF are stronger (than those in HCl)</p>	(2)

Question Number	Acceptable Answers	Reject	Mark
11(e)	<p>(Shape $[\text{PCl}_4]^+$) tetrahedral (1)</p> <p>(Shape $[\text{PCl}_6]^-$) octahedral (1)</p> <p>Justification 4 electron / bond pairs in $[\text{PCl}_4]^+$ and 6 electron / bond pairs in $[\text{PCl}_6]^-$ (1)</p> <p>Electron/bond pairs / regions of electron density arranged to minimise repulsion</p> <p>ALLOW Maximum separation of electron/bond pairs / regions of electron density (1)</p> <p>IGNORE Lone pairs repel more than bond pairs / bond angles, even if incorrect</p>	<p>Penalise use of bonds for electron pairs once only</p> <p>Just 'minimise repulsion / maximum separation'</p>	(4)

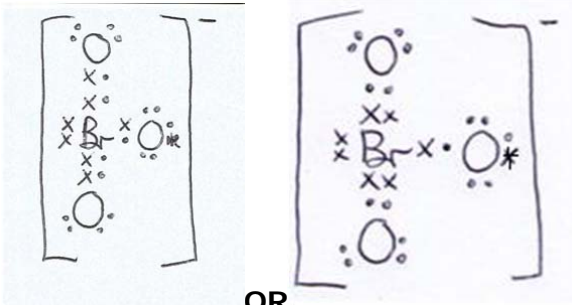
(Total for Question 11 = 14 marks)

Question Number	Acceptable Answers	Reject	Mark
12 (a)	$\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{HCl} + \text{NaHSO}_4$ ALLOW Multiples HNaSO_4 $2\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow 2\text{HCl} + \text{Na}_2\text{SO}_4$ IGNORE state symbols even if incorrect COMMENT ALLOW Capitals or lower case in formulae		1

Question Number	Acceptable Answers	Reject	Mark
12 (b)	Ammonia (gas) / NH_3 Allow Ammonia solution/ $\text{NH}_3(\text{aq})$ (1) White smoke/solid ALLOW white cloud / Dense white fumes (1) The observation mark is consequential on use of ammonia. If name and formula are given, both must be correct.	Ammonium Incorrect identification of white smoke Misty fumes / steamy fumes/ white gas/ white ppt	2

Question Number	Acceptable Answers	Reject	Mark
12 (c)	<p>White ppt/solid</p> <p>ALLOW white crystals (1)</p> <p>IGNORE identification of white solid, even if wrong</p> <p>(ppt/solid) dissolves (in excess) / (colourless) solution forms</p> <p>ALLOW (ppt/solid) disappears/ soluble (1)</p> <p>IGNORE clear solution</p> <p>(c.NH₃) dissolves AgBr (as well as AgCl) (1)</p>	<p>Just "white" Cream ppt</p> <p>other colours of solution</p> <p>Dissolves bromide ions/ bromine</p> <p>Just "Only AgCl dissolves in dilute NH₃" c.NH₃ dissolves other things</p>	3

TOTAL FOR Q12 = 6 MARKS

Question Number	Acceptable Answers	Reject	Mark
13 (a)(i)	 <p style="text-align: center;">OR</p> <p>7x and 5 • around the bromine. (1)</p> <p>Total of 8 electrons round each oxygen One octet MUST INCLUDE the electron represented by * (1)</p> <p>ALLOW x for oxygen and • for bromine if clear</p> <p>Electrons in bonds to be shown in rows eg xx •• or x•x• between the relevant atoms; non-bonded electrons not in pairs..</p> <p>All dots or all crosses then max 1</p> <p>Two dative covalent bonds by the bromine to the oxygens then max 1 (loses first mark)</p> <p>IGNORE circles round outer shells of atoms</p>		2

Question Number	Acceptable Answers	Reject	Mark
13 (a)(ii)	<p>There are vacant (3)d orbitals / They are using (3)d orbitals</p> <p>ALLOW Sub-shells for orbitals Use of D for d</p>	<p>2d p/ f orbitals</p> <p>Shell for sub-shell</p>	1

Question Number	Acceptable Answers	Reject	Mark
13 (b) (i)	<p>($n=8.35 \div 167 =$) 0.05(00) (mol) (1) Ignore any units even if incorrect.</p> <p>($c= 0.05 \div 0.25 =$) 0.2(00) (mol dm⁻³) TE on incorrect number of moles in first mark (1)</p> <p>Correct answer without working scores (2) If final units are given they must be correct.</p> <p>ALLOW 1sf mol /dm³ OR M</p>	mol /dm ⁻³	2

Question Number	Acceptable Answers	Reject	Mark
13 (b) (ii)	<p>($0.0025 \times 6 =$) 0.015 (mol) (1)</p> <p>($0.015 \times 166 = 2.49$ (g)) TE from first mark (1)</p> <p>2.6 ≤ value ≤ 5.0 (g)</p> <p>TE for third mark as long as a calculation has been done for second mark. Values should be at least 0.1 g above calculated value and less than double calculated value. (1)</p> <p>ALLOW 1sf for suitable mass</p>		3

Question Number	Acceptable Answers	Reject	Mark
13 (b) (iii)	<p>($0.001 \times 2 =$) $0.002 / 2 \times 10^{-3}$ (mol) (1)</p> <p>($V = 0.002 \div 0.1 \times 1000 =$) 20 (cm^3)</p> <p>ALLOW $0.02 \text{ dm}^3 / 0.020 \text{ dm}^3$ (1)</p> <p>If units are not in cm^3 they must be stated TE from incorrect number of mol</p> <p>Correct answer without working scores (2)</p>	<p>0.02 0.02 dm^{-3}</p>	2

Question Number	Acceptable Answers	Reject	Mark
13 (b) (iv)	<p>Mass of KBrO_3 (1)</p> <p>Second mark depends on correct choice in first. Percentage error/ uncertainty large with a small mass OR Mass is only to 1sf (1)</p> <p>IGNORE calculation, even if incorrect</p>	<p>Just "Mass is only to 2 decimal places" / "mass is only 0.07g" / "mass is not accurate"</p>	2

TOTAL FOR Q13 = 12 MARKS