AQA A-Level Chemistry

Group 2 mark scheme · goes with “Group 2” · whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions

Mark schemes

Group 2 · 13 questions

Q1 · June 2024 · AS Paper 1 · Q2 · [7 marks]

(a) Electron is removed from 1(s) (rather than 2(s))

Mark independently

Lower in energy (than 2s)/Less/No shielding/closer to the nucleus

Stronger attraction between nucleus and outer electron

[3 marks]

(b) Similarity: produce hydrogen/produce gas/produce white solids/produce Mg^{2+} compounds/produce a base

Difference: magnesium oxide formed with steam and magnesium hydroxide formed with (cold) water

[2 marks]

(c) Oxidation state of Ca increases, so Ca is oxidised

OR

Oxidation state of Ca from 0 to +2, so Ca is oxidised

If no marks awarded, then correct oxidation states of Ca and H before and after the reaction scores 1 mark

Oxidation state of H decreases, so H is reduced

OR

Oxidation state of H from +1 to 0, so H is reduced

[2 marks]

Q2 · November 2021 · AS Paper 1 · Q2 · [8 marks]

(a) Bright light / white light / white powder/ash/solid

[1 mark]

$Mg(s) + H_2O(g) \rightarrow MgO(s) + H_2(g)$

State symbols essential

[1 mark]

(b) M1: Attraction between (lattice of) Mg^{2+} ions

M1 attraction between nucleus and delocalised electrons or between + ions and delocalised electrons

[1 mark]

M2: And delocalised electrons

M2 outer shell electrons delocalised

[1 mark]

(c) (Giant) ionic lattice / lots of Mg^{2+} and Cl^- ions

[1 mark]

Strong (electrostatic) forces of attraction

[1 mark]

Between Mg^{2+} and Cl^- ions

Allow oppositely charged ions

[1 mark]

(d) Indigestion relief / laxative / neutralise (excess stomach) acid

Allow milk of magnesia

[1 mark]

Q3 · June 2023 · Paper 3 · Q21 · [1 mark]

Answer: **B**

a colourless solution with effervescence

Q4 · June 2024 · AS Paper 1 · Q4 · [6 marks]

This question is marked using levels of response.

Level 3 5-6	**All stages are covered and the explanation of each stage is generally correct and virtually complete. Answer is well structured with no repetition or irrelevant points. Accurate and clear expression of ideas with no errors in use of technical terms.**
Level 2 3-4	All stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies OR two stages are covered and the explanations are generally correct and virtually complete. Answer shows some attempt at structure. Ideas are expressed with reasonable clarity with, perhaps, some repetition or some irrelevant points. Answer shows some attempt at structure. Ideas are expressed with reasonable clarity with, perhaps, some repetition or some irrelevant points. Some minor errors in use of technical terms.
Level 1 1-2	Two stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies, OR only one stage is covered but the explanation is generally correct and virtually complete. Answer includes isolated statements but these are not presented in a logical order or show some confusion. Answer may contain valid points which are not clearly linked to an argument structure. Errors in the use of technical terms.
Level 0 0	Insufficient correct chemistry to gain a mark.

In order to score 6 marks all 4 compounds must be identified in some way

Stage 1: Suggested tests **(3 + virtually 'complete', 1 + 'covered')**

1a: add NaOH

1b: add NaOH (and warm) then hold damp red litmus at mouth of tube (if sequential tests performed NaOH can be scored from 1a)

1c: add nitric acid/hydrochloric acid

1d: add acidified $BaCl_2$ / acidified $Ba(NO_3)_2$

(if sequential tests performed acidified can be scored from 1c)

Stage 2: Observations linked to correct solution and test **(3 + virtually 'complete', 1 + 'covered')**

2a: Mg^{2+} / $Mg(NO_3)_2$ will give a white ppt with NaOH

2b: red litmus (at mouth of the tube) will turn blue for NH_4^+ / NH_4NO_3 with NaOH

(do not award if red litmus is placed in the solution)

2c: CO_3^{2-} / Na_2CO_3 will effervesce with acid/gas formed turns limewater cloudy

2d: SO_4^{2-} / K_2SO_4 will give a white ppt with $BaCl_2$

2e: the final tube will be the remaining solution (if only three tests have been done).

Stage 3: Equations **(3 + virtually 'complete', 1 + 'covered')**

3a: $Mg^{2+} + 2OH^- \rightarrow Mg(OH)_2$

3b: $NH_4^+ + OH^- \rightarrow NH_3 + H_2O$

3c: $CO_3^{2-} + 2H^+ \rightarrow CO_2 + H_2O$

3d: $SO_4^{2-} + Ba^{2+} \rightarrow BaSO_4$

(Ignore state symbols; allow multiples)

Q5 · June 2024 · AS Paper 1 · Q14 · [1 mark]

Answer: **A**

Calcium oxide is used to remove sulfur dioxide from flue gases.

Q6 · November 2021 · AS Paper 1 · Q22 · [1 mark]

Answer: **C**

In medicine to produce an X-ray image

Q7 · June 2022 · AS Paper 1 · Q22 · [1 mark]

Answer: **A**

Magnesium oxide is a product when magnesium reacts with steam.

Q8 · June 2019 · AS Paper 1 · Q16 · [1 mark]

Answer: **C**

Q9 · June 2019 · AS Paper 1 · Q17 · [1 mark]

Answer: **C**

Q10 · June 2025 · AS Paper 1 · Q4 · [6 marks]

04.1

M1 (For Sr)

cations / positive ions / atoms are larger

OR

(cation / positive ion / atom or) it has more (electron) shells / levels / more shielding

OR

cation / positive ion has a lower charge density

M2 (Sr) has weaker attraction between the cations / positive ions / nucleus and the <u>delocalised</u> electrons

OR weaker metallic bonding

allow converse for Ca

[2 marks]

04.2

more (electron) shells / energy levels

[1 mark]

04.3

$Ba(s) + 2H_2O(l) \rightarrow Ba(OH)_2(aq) + H_2(g)$

State symbols essential

Allow multiples

Allow ionic equation

[1 mark]

04.4

$Ca^{+}(g) \rightarrow Ca^{2+}(g) + e^{-}$

$Ca^{+}(g) + e^{-} \rightarrow Ca^{2+}(g) + 2e^{-}$

State symbols essential

[1 mark]

04.5

Ba (barium)

allow Ra (radium)

[1 mark]

Q11 · June 2025 · Paper 1 · Q1 · [11 marks]

01.1

M1 $TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$

M2 reducing agent

M2 accept electron donor

[2 marks]

01.2

M1 $Ca(OH)_2$

M2 $CaCO_3$ or CaO

[2 marks]

01.3

magnesium hydroxide is insoluble/sparingly soluble/less soluble (than sodium hydroxide)

OR

magnesium hydroxide is less/not corrosive (but sodium hydroxide is corrosive)

Ignore references to base strength or pH

[1 mark]

01.4

M1 Mg^{2+}

M2 $Mg^{2+} + 2OH^{-} \rightarrow Mg(OH)_2$

M1 and M2 allow Ca^{2+}

Ignore state symbols

[2 marks]

01.5

M1 Br^- / bromide

M2 $Ag^+(aq) + Br^-(aq) \rightarrow AgBr(s)$

M3 to remove carbonate ions OR to remove other ions that give a precipitate (with silver nitrate)

Ignore other substances/impurities that interfere with the reaction

[3 marks]

01.6

Insoluble

OR

Shows up on/blocks/absorbs/scatters X-ray

OR

Radiopaque

Ignore barium meal if no qualification

Ignore X-rays if no qualification

[1 mark]

Q12 · June 2025 · Paper 3 · Q14 · [1 mark]

Answer: **B**

Colourless solution and effervescence

Q13 · June 2025 · Paper 3 · Q20 · [1 mark]

Answer: **A**

Atomic radius

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