

Answers to examination–style questions

Answers	Marks	Examiner's tips
1 <i>trend</i> : decreases	1	If trend is wrong you lose all the marks for this part.
increase in size of atom or more levels in the atom	1	
weaker attraction by the nucleus for delocalised electrons	1	You could say weaker metallic bonding but this will only score one of the two explanation marks.
2 <i>hydroxides</i> : solubility increases	1	You need to learn these trends. They are almost always asked for.
<i>sulfates</i> : solubility decreases	1	
<i>add</i> : BaCl ₂ (aq) (<i>or</i>) Ba(NO ₃) ₂ (aq)	1	You must state (aq). You cannot just have Ba ²⁺ ions.
<i>with</i> Na ₂ SO ₄ , white precipitate is formed	1	
NaNO ₃ , no change	1	
BaCl ₂ + Na ₂ SO ₄ → BaSO ₄ + 2NaCl	1	You could write an ionic equation for this reaction by leaving out the spectator ions Ba ²⁺ (aq) + SO ₄ ²⁻ (aq) → BaSO ₄ (s)
3 (a) barium dissolves <i>or</i> forms solution	1	
gas evolved <i>or</i> hydrogen evolved	1	Evolution of any other gas is wrong.
gets hot	1	
Ba(s) + 2H ₂ O(l) → Ba ²⁺ (aq) + 2OH ⁻ (aq) + H ₂ (g) [<i>or</i> Ba(OH) ₂ (aq) + H ₂ (g)]		
species all correct	1	
state symbols correct	1	You only get the state symbol mark if the species are correct.
balanced equation	1	
white precipitate with sodium sulfate	1	
Ba ²⁺ (aq) + SO ₄ ²⁻ (aq) → BaSO ₄ (s) <i>or</i> Ba(OH) ₂ (aq) + Na ₂ SO ₄ (aq) → BaSO ₄ (s) + 2NaOH(aq)		You can write either the ionic or overall equation here since a specific one is not asked for. The ionic one is a lot easier to write!
state symbols correct	1	
balanced equation	1	
(b) with MgCl ₂ , white precipitate is formed	1	
because Mg(OH) ₂ is sparingly soluble (<i>or</i>) insoluble)	1	
with BaCl ₂ , no precipitate is formed (<i>or</i>) no reaction)	1	
because Ba(OH) ₂ is soluble	1	
solubility of hydroxides increases down the group	1	This is just learning the trends about hydroxides of Group 2.

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4 (a) <i>hydroxides</i> : solubility increases from Mg to Ba <i>sulfates</i> : solubility decreases from Mg to Ba	1 1	
(b) add hydrochloric acid	1	HNO ₃ or CH ₃ COOH can be allowed but not H ₂ SO ₄ . (HCl gas not allowed.)
<i>add</i> : BaCl ₂	1	Ba(NO ₃) ₂ will also be accepted even though it is not the recognised test.
MgCl ₂ : no change or no reaction	1	
MgSO ₄ : white precipitate	1	If you added the wrong reagent then you cannot get the observation marks.
MgSO ₄ + BaCl ₂ → BaSO ₄ + MgCl ₂	1	The ionic equation will be accepted too.
(c) reactivity increases down the group	1	
Ba + 2H ₂ O → Ba(OH) ₂ + H ₂	1	
5 increases	1	
heat or steam	1	You cannot just state 'hot'.
Mg + H ₂ O → MgO + H ₂	1	
6 decreases down the group	1	
there are more levels and more shielding of the nuclear charge	1	
so less energy is needed to remove an electron from the pull of the nucleus	1	
7 (a) BaCl ₂ or barium chloride	1	
(b) white precipitate or solid	1	You cannot just say it goes milky.
(c) Ba ²⁺ + SO ₄ ²⁻ → BaSO ₄	1	This asks for an ionic equation so no other is allowed here.
8 (a) <i>trend</i> : increases	1	
<i>reason</i> : more electron levels	1	You must imply more levels or sub-levels
(b) <i>trend</i> : decreases	1	If you mention molecules, intermolecular forces or ionic bonding you get no marks.
<i>explanation</i> : atoms larger	1	
metallic bonds weaker	1	You could say there is weaker attraction between nuclei and delocalised electrons.

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(c) <i>trend:</i> increases	1	
<i>equation for magnesium:</i> $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$	1	
<i>equation for strontium:</i> $\text{Sr} + 2\text{H}_2\text{O} \rightarrow \text{Sr}(\text{OH})_2 + \text{H}_2$	1	Examiners always ask for lots of equations in this section so it is worth learning them.
(d) <i>formula:</i> BaSO_4	1	
<i>use:</i> test for sulfate ion	1	Other uses would be allowed, e.g. pigment, for X-rays, barium meal, paint, since the question did not ask for a use in a chemical reaction.