

Assessment schedule – 2020

Chemistry: Demonstrate understanding of aspects of chemical reactions (90934)

Evidence Statement

Q1	Evidence	Achievement	Merit	Excellence
(a)(i) (ii)	Copper hydroxide Barium carbonate	<ul style="list-style-type: none"> One correct. 		<ul style="list-style-type: none"> Correct balanced equation. AND Comprehensively links all observations to the reactants and products.
(b)(i)	$\text{Pb}^{2+} + 2\text{Cl}^- \rightarrow \text{PbCl}_2$		<ul style="list-style-type: none"> Unbalanced equation correct. OR Reaction type explained.	<ul style="list-style-type: none"> Correct balanced equation. AND Comprehensively links all observations to the reactants and products.
(ii)	<p>This is a precipitation reaction (or exchange reaction), because when the two solutions (lead nitrate and sodium chloride) are added together, an insoluble solid called a precipitate (lead chloride) forms.</p> <p>OR Because when the two solutions are added together, ions from each substance are swapped or exchanged, and an insoluble substance, lead chloride forms.</p>	<ul style="list-style-type: none"> Precipitation with some description. 		<ul style="list-style-type: none"> Correct balanced equation. AND Comprehensively links all observations to the reactants and products.
(iii)	When colourless lead nitrate solution is added to colourless sodium chloride solution, a white precipitate of lead chloride forms and a colourless solution of sodium nitrate.	<ul style="list-style-type: none"> White precipitate formed. States that PbCl_2 formed. 	<ul style="list-style-type: none"> Links white precipitate to PbCl_2. 	<ul style="list-style-type: none"> Correct balanced equation. AND Comprehensively links all observations to the reactants and products.
(c)	<p>Heat a small amount of each white solid in a boiling-tube.</p> $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$ $\text{Li}_2\text{CO}_3 \rightarrow \text{Li}_2\text{O} + \text{CO}_2$ <p>Both solids will release carbon dioxide when heated. When CO_2 is bubbled into limewater, the limewater is turned cloudy white / milky.</p> <p>The sodium hydrogen carbonate will also release steam. A piece of cobalt chloride paper held in this gas will turn from blue to pink. It will remain blue with the lithium carbonate.</p>	<ul style="list-style-type: none"> ONE test for a product is described. Indicates both need to be heated. ONE decomposition reaction correctly described. 	<ul style="list-style-type: none"> Comprehensive method for the identification of two white solids. One unbalanced equation is correct. 	<ul style="list-style-type: none"> Comprehensive method for the identification of two white solids. AND Both correctly balanced equations.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	1a	2a	3a	4a	3m	4m	1e + 2m	2e

Q2	Evidence	Achievement	Merit	Excellence
(a)	<p>The catalase speeds up the reaction that turns the hydrogen peroxide into water and oxygen. The hydrogen peroxide is no longer available to damage the body.</p> <p>This reaction is a catalytic decomposition reaction, as a single reactant (hydrogen peroxide) forms two products (water and oxygen).</p> <p>O₂ can be tested for using a glowing splint, which will relight in the presence of O₂.</p> <p>Water can be tested for using cobalt chloride paper, which turns pink in the presence of water.</p> $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$	<ul style="list-style-type: none"> Explains decomposition reaction. States products formed. 	<ul style="list-style-type: none"> Explains catalytic decomposition reaction. Unbalanced equation. <p>OR</p> <p>Describes a test for O₂ or H₂O.</p>	<ul style="list-style-type: none"> Explain catalytic decomposition reaction. <p>AND</p> <p>Glowing splint test for O₂ or cobalt chloride paper for H₂O.</p> <p>AND</p> <p>Balanced equation is correct.</p>
(b)	<p>If the unknown solution is iron(II) sulfate:</p> <ul style="list-style-type: none"> There would be a reaction with magnesium metal. The observations would be the forming of a new grey solid, iron, and the solution would turn colourless as magnesium sulfate solution is formed. This is because magnesium is higher on the activity series compared to iron. There would not be a reaction with lead metal, as lead is lower on the activity series compared to iron. The solution would remain pale green, and there would be no evidence of a new solid being formed. There would be a reaction with barium nitrate. A white precipitate of barium sulfate would form. There would be a reaction when sodium hydroxide solution is added. A green precipitate of iron(II) hydroxide would form. <p>Equations:</p> $\text{Fe}^{2+} + \text{Mg} \rightarrow \text{Mg}^{2+} + \text{Fe}$ <p>OR</p> $\text{Fe}(\text{SO}_4)_2 + \text{Mg} \rightarrow \text{Fe} + \text{Mg}(\text{SO}_4)_2$ $\text{Ba}^{2+} + \text{SO}_4^{2-} \rightarrow \text{BaSO}_4$ <p>OR</p> $\text{FeSO}_4 + \text{Ba}(\text{NO}_3)_2 \rightarrow \text{Fe}(\text{NO}_3)_2 + \text{BaSO}_4$ $\text{Fe}^{2+} + 2\text{OH}^- \rightarrow \text{Fe}(\text{OH})_2$ <p>OR</p> $\text{Fe}(\text{NO}_3)_2 + \text{NaOH} \rightarrow \text{Fe}(\text{OH})_2 + \text{NaNO}_3$	<ul style="list-style-type: none"> One observation correctly described for reaction with magnesium. Recognises no reaction with lead. One observation correctly described with barium nitrate. One observation correctly described for reaction with sodium hydroxide. 	<ul style="list-style-type: none"> Links observations for reaction with magnesium or lack of reaction with lead. Links observations for reaction with barium nitrate or sodium hydroxide. One unbalanced equation is correct. 	<ul style="list-style-type: none"> A comprehensive answer of why each of the reagents can be used to identify the solution. <p>AND</p> <p>TWO balanced equations are correct.</p>

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	1a	2a	3a	4a	4m	5m	1e + 2m	2e

Q3	Evidence	Achievement	Merit	Excellence
(a)(i)	Combination Decomposition Displacement	<ul style="list-style-type: none"> Reaction types correct. 		<ul style="list-style-type: none"> Types of reactions correct in (i).
(ii)	Water $\text{Pb(OH)}_2 \rightarrow \text{PbO} + \text{H}_2\text{O}$	<ul style="list-style-type: none"> Word equation correct OR ONE product in symbol equation correct. 	<ul style="list-style-type: none"> Equations correct in (ii). 	AND Equations correct in (ii).
(iii)	The silvery-grey magnesium metal would disappear, and an orangey-brown solid of copper metal would form. The blue colour of the copper nitrate solution due to the copper ions would fade to colourless, as magnesium ions are formed. $\text{Mg} + \text{Cu}^{2+} \rightarrow \text{Cu} + \text{Mg}^{2+}$ OR $\text{Mg} + \text{Cu(NO}_3)_2 \rightarrow \text{Cu} + \text{Mg(NO}_3)_2$	<ul style="list-style-type: none"> ONE observation correct. Displacement described. 	<ul style="list-style-type: none"> Observations linked to reactants and products. OR Symbol equation given. 	AND All observations for reactants and products linked to species with equation correct for (iii).
(b)	This is a combination reaction, because two reactants, aluminium and iodine, combine to form one product, aluminium iodide. Electron transfer occurs, as the aluminium loses electrons to form aluminium ions, and the iodine gains electrons to form iodide ions. aluminium + iodine → aluminium iodide $2\text{Al} + 3\text{I}_2 \rightarrow 2\text{AlI}_3$	<ul style="list-style-type: none"> Combination reaction described. 	<ul style="list-style-type: none"> Correct explanation of combination reaction. OR Unbalanced symbol equation. 	<ul style="list-style-type: none"> Correct explanation of combination reaction. AND Electron transfer explained. AND Balanced equation is correct.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	1a	2a	3a	4a	4m	5m	1e + 2m	2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24