

Assessment schedule – 2022**Chemistry: Demonstrate understanding of aspects of chemical reactions (90934)****Evidence Statement**

Q	Evidence	Achievement	Merit	Excellence
ONE (a)(i)	Orange / brown solid copper metal reacts with the clear colourless silver nitrate solution, forming solid silver / grey metal on the copper surface, and the solution turns a blue colour as copper nitrate solution forms.	<ul style="list-style-type: none"> Describes THREE observations. 	<ul style="list-style-type: none"> Links the observations to THREE of the reactants and products. 	<ul style="list-style-type: none"> Comprehensively links all observations to the reactants and products. AND
(ii)	Displacement / redox reaction This is a displacement / redox reaction because copper metal is more reactive (higher on the activity series) than silver metal. Copper displaces the silver ions in the solution. The silver ions form solid silver metal and are replaced with copper ions in the solution. (Or explains in terms of electron transfer.)	<ul style="list-style-type: none"> Correct reaction type. 	<ul style="list-style-type: none"> Reaction type justified. (with reference to the activity series) 	<ul style="list-style-type: none"> Reaction type justified. AND
(iii)	$\text{Cu}(s) + 2\text{Ag}^+(aq) \rightarrow 2\text{Ag}(s) + \text{Cu}^{2+}(aq)$ ($\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$ acceptable for achieved)	<ul style="list-style-type: none"> Reactants / products correct. 	<ul style="list-style-type: none"> Unbalanced equation (either (a)(iii) or (b)(iii)) 	Correct balanced equation. (states not necessary)
(b)(i)	Precipitation reaction.	<ul style="list-style-type: none"> Correct reaction type. 		<ul style="list-style-type: none"> Reaction type given. AND
(ii)	Clear, colourless NaOH is added to clear colourless $\text{Mg}(\text{NO}_3)_2$. A solid white precipitate of $\text{Mg}(\text{OH})_2$ forms in a clear solution containing colourless Na^+ and NO_3^- ions.	<ul style="list-style-type: none"> Describes TWO observations. 	<ul style="list-style-type: none"> Links the observations to THREE of the reactants and products. 	Comprehensively links all observations to the reactants and products. AND
(iii)	$\text{Mg}^{2+}(aq) + 2\text{OH}^-(aq) \rightarrow \text{Mg}(\text{OH})_2(s)$ ($2\text{NaOH} + \text{Mg}(\text{NO}_3)_2 \rightarrow \text{Mg}(\text{OH})_2 + 2\text{NaNO}_3$)	<ul style="list-style-type: none"> Reactants / products correct. 		Correct balanced equation.

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

Q	Evidence				Achievement	Merit	Excellence																
TWO (a)	<table border="1"> <thead> <tr> <th>Solutions</th> <th>NaI</th> <th>Na₂CO₃</th> <th>NaOH</th> </tr> </thead> <tbody> <tr> <td>Ca(NO₃)₂</td> <td>No reaction</td> <td>White ppt Calcium carbonate CaCO₃</td> <td>White ppt Calcium hydroxide Ca(OH)₂</td> </tr> <tr> <td>Pb(NO₃)₂</td> <td>Yellow ppt Lead Iodide PbI₂</td> <td>White ppt Lead carbonate PbCO₃</td> <td>White ppt Lead hydroxide Pb(OH)₂</td> </tr> <tr> <td>Cu(NO₃)₂</td> <td>No reaction</td> <td>Green ppt Copper carbonate CuCO₃</td> <td>Blue ppt Copper hydroxide Cu(OH)₂</td> </tr> </tbody> </table>	Solutions	NaI	Na ₂ CO ₃	NaOH	Ca(NO ₃) ₂	No reaction	White ppt Calcium carbonate CaCO ₃	White ppt Calcium hydroxide Ca(OH) ₂	Pb(NO ₃) ₂	Yellow ppt Lead Iodide PbI ₂	White ppt Lead carbonate PbCO ₃	White ppt Lead hydroxide Pb(OH) ₂	Cu(NO ₃) ₂	No reaction	Green ppt Copper carbonate CuCO ₃	Blue ppt Copper hydroxide Cu(OH) ₂				<ul style="list-style-type: none"> • 6+ correctly completed boxes 	<ul style="list-style-type: none"> • 8+ correctly completed boxes. 	<ul style="list-style-type: none"> • Correctly completed boxes. AND
Solutions	NaI	Na ₂ CO ₃	NaOH																				
Ca(NO ₃) ₂	No reaction	White ppt Calcium carbonate CaCO ₃	White ppt Calcium hydroxide Ca(OH) ₂																				
Pb(NO ₃) ₂	Yellow ppt Lead Iodide PbI ₂	White ppt Lead carbonate PbCO ₃	White ppt Lead hydroxide Pb(OH) ₂																				
Cu(NO ₃) ₂	No reaction	Green ppt Copper carbonate CuCO ₃	Blue ppt Copper hydroxide Cu(OH) ₂																				
(b)	<p>This is a precipitation reaction (or exchange reaction) because when the two solutions (sodium iodide and lead nitrate) are added together, an insoluble precipitate forms OR because when the two solutions are added together, ions from each substance are swapped or exchanged, and an insoluble substance (precipitate) forms. In this experiment, the combination of lead ions and iodide ions forms a precipitate of lead iodide. When colourless sodium iodide solution is added to colourless lead nitrate solution, a yellow precipitate of lead iodide forms (and a colourless solution of sodium nitrate).</p> $\text{Pb}^{2+}(\text{aq}) + 2\text{I}^{-}(\text{aq}) \rightarrow \text{PbI}_2(\text{s})$ $(2\text{NaI} + \text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{NaNO}_3 + \text{PbI}_2)$				<ul style="list-style-type: none"> • Describes a precipitate reaction. • Correct word equation. 	<ul style="list-style-type: none"> • Links formation of the precipitate to all ions, with observations (including colourless sodium nitrate) AND Unbalanced equation 	<ul style="list-style-type: none"> Elaborates on precipitate formation and links the observations to the reactants and products. AND Gives a balanced ionic equation. 																
(c)	<p>Explains how to heat them with a Bunsen burner and how to carry out a limewater test to confirm CO₂ gas for the carbonate decomposing, and cobalt chloride paper test for H₂O gas for the hydroxide decomposing (including what a positive result for each test would look like). Observations of product colours should be included for excellence.</p> $\text{MgCO}_3(\text{s}) \rightarrow \text{CO}_2(\text{g}) + \text{MgO}(\text{s})$ $\text{Mg}(\text{OH})_2(\text{s}) \rightarrow \text{MgO}(\text{s}) + \text{H}_2\text{O}(\text{g})$				<ul style="list-style-type: none"> • Describes decomposition reactions. • Describes an observation. • Gives a correct equation 	<ul style="list-style-type: none"> • Explains method of carrying out decomposition reactions. • Explains how to test for a product and gives a correct equation. OR Explains how to test for two products. OR Gives two correct equations. 	<ul style="list-style-type: none"> • Comprehensive explanation of how to carry out thermal decomposition reaction including tests for CO₂ and H₂O. AND Two correct equations. 																

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

Q	Evidence	Achievement	Merit	Excellence
THREE (a)(i)	Reaction A – Combination Reaction B – No reaction Reaction C – Combination	<ul style="list-style-type: none"> Reaction types correct. 		
(ii)	The reaction between Mg metal and O ₂ gas is a combination reaction because the two reactants have combined to form one product, MgO / electrons have been transferred. $2\text{Mg (s)} + \text{O}_2\text{ (g)} \rightarrow 2\text{MgO (s)}$	<ul style="list-style-type: none"> Combination reaction described. Product in symbol equation correct. 	<ul style="list-style-type: none"> Reaction type explained. AND Unbalanced symbol equation. OR Lack of reaction for reaction B explained.	<ul style="list-style-type: none"> Reaction type explained. AND Correct symbol equation for reaction A. AND Lack of reaction for reaction B explained.
(iii)	There is no reaction observed as zinc is lower on the activity series than magnesium.	<ul style="list-style-type: none"> Correct answer. 		
(b)	Green / yellow Cl ₂ gas reacts with the grey Fe, which glows a bright orange to form a brown solid, FeCl ₃ . Electron transfer occurs, as the iron loses electrons to form iron ions, and the chlorine gains electrons to form chloride ions. $2\text{Fe(s)} + 3\text{Cl}_2\text{(g)} \rightarrow 2\text{FeCl}_3\text{(s)}$	<ul style="list-style-type: none"> A correct observation. OR Electron transfer described. <ul style="list-style-type: none"> Reactants / products correct. 	<ul style="list-style-type: none"> Correct observations OR electron transfer explained. <ul style="list-style-type: none"> Unbalanced equation. 	<ul style="list-style-type: none"> Observations. AND Electron transfer explained. AND Balanced equation.
(c)(i)	H ₂ O ₂ solution	<ul style="list-style-type: none"> Correct labels. 	<ul style="list-style-type: none"> Correct labels. 	<ul style="list-style-type: none"> Correct.
(ii)	MnO ₂			AND
(iii)	O ₂ gas		AND	
(iv)	H ₂ O			
(v)	Decomposition Hydrogen peroxide decomposes / breaks down to form H ₂ O and O ₂ gas (two smaller products). The (catalyst) MnO ₂ causes the H ₂ O ₂ solution to decompose more rapidly to form bubbles of O ₂ gas. The isolated O ₂ gas could be tested for with a glowing splint, which would re-light.	<ul style="list-style-type: none"> Correct reaction type. OR Glowing splint test described.	Reaction type explained. OR Glowing splint test explained.	Reaction type explained. AND Glowing splint test described.

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

Cut Scores

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