

Assessment Schedule – 2015**Chemistry: Demonstrate understanding of aspects of chemical reactions (90934)****Evidence Statement**

Q	Evidence	Achievement	Merit	Excellence
ONE (a)(i)	Displacement reaction.	<ul style="list-style-type: none"> Identifies the correct reaction type. 		
(ii)	When the orange / pink / brown solid (copper) is added to the colourless solution (silver nitrate), a grey solid (silver) forms, and the solution turns blue as copper nitrate solution is formed.	<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. 	
(iii)	$\text{Cu}(s) + 2\text{Ag}^+(aq) \rightarrow 2\text{Ag}(s) + \text{Cu}^{2+}(aq)$		<ul style="list-style-type: none"> Unbalanced equation. 	<ul style="list-style-type: none"> Correct balanced (ionic) equation.
(b)	<p>If the metal is silver, the metal strip will remain silver-grey, and the copper sulfate solution will remain blue.</p> <p>If the metal is magnesium, then an orange / pink / brown solid will form (copper), and the blue copper sulfate solution will fade and form a colourless solution of magnesium sulfate.</p> <p>When magnesium is added to the copper sulfate solution, a displacement reaction occurs as magnesium is able to displace the copper from solution, as magnesium is higher than copper on the activity series / magnesium is more reactive than copper.</p> <p>A displacement reaction will not occur if the metal strip is silver, as copper is more reactive than silver / silver is not able to displace copper ions from solution.</p>	<ul style="list-style-type: none"> Describes correct observations for either metal. Identifies species formed. Describes a displacement reaction for silver and magnesium metals. 	<ul style="list-style-type: none"> Links observations to species for EITHER silver or magnesium. Links the identification of the metals through displacement to the activity series. 	<ul style="list-style-type: none"> Explains why there would be a reaction with magnesium AND why there would not be a reaction with silver, with observations fully linked to species for both metals.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence	1a	2a	3a	4a	3m	4m	2e (minor omission / error accepted)	2e

Q	Evidence			Achievement	Merit	Excellence
TWO (a)		Precipitate? Yes / No	Name of precipitate	<ul style="list-style-type: none"> • TWO rows correctly identified. 		
	Beaker A	No				
	Beaker B	Yes	Magnesium hydroxide			
	Beaker C	Yes	Magnesium carbonate			
(b)(i)	$\text{Fe}^{2+} + 2\text{OH}^- \rightarrow \text{Fe}(\text{OH})_2$			<ul style="list-style-type: none"> • Describes a precipitate reaction. • Describes TWO observations in (b)(ii) or (c). • Identifies a chemical that will produce a precipitate for either experiment 1 or 2. • Names ONE of the precipitates formed. 	<ul style="list-style-type: none"> • Unbalanced symbol equation. • Links formation of the precipitate to ions involved in the reaction, with observations. • Chooses a valid solution and links the result to the presence of ONE of the ions, WITH observations OR name / formula of the precipitate. 	<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. • Links solutions added and observations to the formation of precipitates for experiments 1 and 2, AND justifies how the results are used to show which cations are absent or present.
(ii)	<p>This is a precipitation reaction (or exchange reaction) because when the two solutions (sodium hydroxide and iron (II) sulfate) 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 iron II ions and hydroxide ions forms a precipitate of iron(II) hydroxide. When colourless sodium hydroxide solution is added to pale green iron(II) sulfate solution, a green precipitate of iron(II) hydroxide forms (and a colourless solution of sodium sulfate).</p>					
(c)	<p>Experiment 1 Add a few mL of the water sample into a test-tube. (Using a pipette) add an aqueous solution of chloride or iodide ions, e.g. NaCl or KI solution, and observe to see if a white or a cream / pale yellow precipitate forms. This precipitate would be silver chloride or silver iodide. This is because calcium ions do not form a precipitate with chloride or iodide ions.</p> <p>Experiment 2 To a new sample of the water, add an aqueous solution of sulfate ions and observe to see if a precipitate forms. If a white precipitate forms, it is calcium sulfate. This proves calcium ions are present. Silver sulfate is soluble so it would not form a precipitate with this solution. OR a feasible method that correctly distinguishes the ions with correct observations</p> <p>Which ions are present / absent If a precipitate forms in both experiment 1 and 2, then the water sample contains both silver and calcium ions. If a precipitate does not form in either experiment 1 or 2, then the solution does not contain calcium or silver ions.</p>					

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No response or no relevant evidence	1a	2a	3a	4a	2m	3m	1e (minor omission)	2e (minor omission)

Q	Evidence	Achievement	Merit	Excellence
THREE (a)(i)	Reaction 1: (thermal) decomposition Reaction 2: (thermal) decomposition Reaction 3: combination	<ul style="list-style-type: none"> Correctly identifies two of the three reactions. 		
(ii)	Reaction 1: when heated, the green copper carbonate powder changes colour to form black copper oxide powder. Reaction 2: when heated, the blue copper hydroxide powder changes colour to form black copper oxide powder, and condensation would form on the tube. Reaction 3: when heated, the orange / pink / brown copper would become coated with a black layer of black copper oxide.	<ul style="list-style-type: none"> Describes observations for one reaction. 	<ul style="list-style-type: none"> Links the observations to the reactants and products for two reactions. 	
(b)	Reaction 1: the carbon dioxide can be collected and bubbled through limewater, which would go milky. Reaction 2: the condensation forming in the tube could be tested with CoCl_2 paper, which would turn from blue to pink.	<ul style="list-style-type: none"> Describes a test for one of the products. 	<ul style="list-style-type: none"> Links one test to the correct species in the reaction with the correct observation. 	
(c)	Copper carbonate \rightarrow copper oxide + carbon dioxide $\text{CuCO}_3(s) \rightarrow \text{CuO}(s) + \text{CO}_2(g)$ Copper hydroxide \rightarrow copper oxide + water $\text{Cu}(\text{OH})_2(s) \rightarrow \text{CuO}(s) + \text{H}_2\text{O}(g)$ Copper + oxygen \rightarrow copper oxide $2\text{Cu}(s) + \text{O}_2(g) \rightarrow 2\text{CuO}(s)$	<ul style="list-style-type: none"> Describes a decomposition or combination reaction. 	<ul style="list-style-type: none"> Two word equations or two symbol equations. 	<ul style="list-style-type: none"> Three correct balanced equations (<i>states are not required</i>).
	In reaction 1 and 2, one substance is broken down into two products. In Reaction 1, copper carbonate breaks down (decomposes) into copper oxide and carbon dioxide. Reaction 2, copper hydroxide breaks down (decomposes) into copper oxide and water. Reaction 3 is a combination, as two reactants (elements), copper and oxygen, are combined to form one product. Only reaction 3 involves electron transfer. Each Cu loses electrons to form Cu^{2+} . Oxygen atoms gains 2 electrons to form two O^{2-} . Cu^{2+} and O^{2-} ions attract to form an ionic bond / compound.	<ul style="list-style-type: none"> Describes a decomposition or combination reaction. 	<ul style="list-style-type: none"> Compares OR contrasts two reactions with reference to the species involved. Links copper to losing two electrons and oxygen gaining two electrons. 	<ul style="list-style-type: none"> Compares and contrasts all three reactions with an explanation of electron transfer, which includes the number of electrons transferred, and recognises the formation of an ionic bond / compound.

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No response or no relevant evidence	1a	2a	3a	4a	3m	4m	2e (minor omission / error accepted)	2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24