Assessment schedule – 2016

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

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)(i) (ii)	Zinc carbonate Barium sulfate	• TWO precipitates named correctly.		
(b)(i)	$Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$	• Correct unbalanced equation.	• Correct equation MUST be balanced.	
(ii)	This is a precipitation reaction (or exchange reaction) because when the two solutions (copper sulfate and sodium hydroxide) are added together, an insoluble solid called a precipitate forms OR because when the two solutions are added together, ions from each substance are swapped or exchanged, and an insoluble substance forms.	• Describes a precipitation reaction.	• Explains the precipitation reaction.	
(iii)	When **colourless** sodium hydroxide solution is added to **blue** copper sulfate solution, a pale **blue** precipitate of copper hydroxide forms and a **colourless** solution of sodium sulfate.	• Describes an observation.	• Links observations to the reactants and products.	• Comprehensively links observations to the reactants and products.
(c)	**Test with iron:** Add a piece of iron to 2 mL of the solution in a test tube and leave for a day. If the solution turns **pale green** and a **grey deposit** forms on the iron metal, then the solution contains lead ions, **as Fe is higher on the activity series than Pb**. The pale green solution is due to iron(II) ions being formed. The grey deposit is lead. $Fe + Pb^{2+} \rightarrow Fe^{2+} + Pb$ If the solution remains **colourless** and **no deposit (no reaction acceptable)** forms on the iron metal, then the solution contains zinc ions, **as Zn is higher on the activity series than Fe**. **Test with sodium chloride:** Add drops of sodium chloride solution using a pipette to 2 mL of the unknown solution in a test tube. If a **white precipitate** forms, then the solution contains lead ions **as $PbCl_2$ is insoluble**. $Pb^{2+} + 2Cl^- \rightarrow PbCl_2$ If the solution remains **colourless,** then the unknown solution contains zinc ions.	• One correct observation for one of the reactions. • One correct unbalanced equation.	• Explains one method with relevant observations for determining which ion is present in solution.	• A comprehensive method, linking observations to the species for BOTH reactions, including both balanced symbol equations.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	3a	4a	5a	3m	4m	1e + 2m must include part (c)	2e

Q	Evidence	Achievement	Merit	Excellence
TWO (a)(i)	Combination/ addition reaction.	• Correct reaction.		
(ii)	The mixture of grey/black iron powder and yellow sulfur powder reacts with a bright glow to form a black/grey solid, iron sulfide.	• Describes correct observation **OR** Word equation.	• Links 2 observations to the correct species. **AND** Correctly balanced equation.	
(iii)	$Fe + S \rightarrow FeS$			
(b)	**Magnesium and oxygen (Reaction One)** This is a combination reaction Two reactants (magnesium and oxygen) combine to form one single product (magnesium oxide). Magnesium + oxygen → magnesium oxide Each Mg loses two electrons to form Mg^{2+}. Each O atom gains two electrons to form O^{2-}. **Magnesium and copper sulfate solution (Reaction Two)** This is a displacement reaction. A metal higher on the activity series (magnesium) displaces a metal ion in solution (copper ions) lower on the activity series. Magnesium + copper sulfate → copper + magnesium sulfate Each magnesium loses two electrons to form Mg^{2+}. Each Cu^{2+} gains two electrons to form Cu.	• ONE correct reaction type indicated. • ONE correct word equation. • Recognises that electron transfer has occurred e.g. $Mg \rightarrow Mg^{2+} + 2e$	• ONE correct reaction type correctly explained and linked to the species. • Explains electron transfer for ONE reaction, linked to the reactants and products.	• TWO correct reaction types correctly explained, linked to the species and BOTH equations correct. • Full explanation of electron transfer for both reactions linked to the reactants and products.

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

Q	Evidence	Achievement	Merit	Excellence
THREE (a)(i) (ii)	The **colourless** solution of hydrogen peroxide, when **black** MnO_2 is added, would produce **a colourless** liquid of water, and bubbles of **colourless** oxygen gas would form and it would get **warm.** This reaction is a decomposition reaction, as a single reactant (hydrogen peroxide) forms two products (water and oxygen).	• TWO observations described. • Decomposition reaction.	• FOUR observations are linked to reactants and products. • Decomposition reaction explained.	• Catalytic decomposition, with correct explanation.
(b)	Heat a small amount of each white solid in a boiling-tube. The boiling tube should have a bung in it, with a delivery tube going into a test-tube of limewater. If the limewater turns from colourless to cloudy during heating, this indicates that carbon dioxide gas has been produced and the white solid is either calcium carbonate or sodium hydrogen carbonate. If the colourless solution remains colourless, then the white solid is lead hydroxide, as no carbon dioxide is produced in this reaction. PbO can also be identified as it is red / yellow / orange. $Pb(OH)_2 \rightarrow PbO + H_2O$ $2NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$ $CaCO_3 \rightarrow CaO + CO_2$ For the remaining two white solids, 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 calcium carbonate.	• ONE test for a product is described. • Indicates all 3 need to be heated. • ONE reaction correctly described.	• One powder correctly identified. **OR** Two correct thermal decompositions explained with equations, but no tests.	• Comprehensive method for the identification of three white solids, with three correctly balanced equations.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1 a	3 a	4a	5 a	2 m must include part (b)	3 m	1 e +1 m must include part (b)	2 e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 12	13 – 18	19 – 24