Assessment schedule – 2019

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

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Yes – calcium sulfate. No.	• All correct.		
(b)(i)	Sodium hydroxide is a colourless solution and copper(II) sulfate is a blue solution. When they are mixed, a pale blue precipitate of copper hydroxide will be seen in a colourless solution of sodium and sulfate ions.	• Precipitation reaction. (with some description)	• Links three observations to the reactants and products.	• Links three observations to the reactants and products. AND Gives correctly balanced ionic equation.
(ii)	$Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$		• Unbalanced equation.	
(c)(i)	Combination reaction. Two reactants (iron and chlorine) combine to form one single product, (iron(III) chloride).	• Combination reaction described (allow redox reaction described).	• Justifies combination / redox reaction, with specific reference to the reactants and product.	• Fully justifies combination / redox reaction. AND Gives correctly balanced equation.
(ii)	$2Fe + 3Cl_2 \rightarrow 2FeCl_3$		• Unbalanced equation.	
(iii)	A white precipitate of silver chloride will form due to the presence of chloride ions. The (reddish-brown) $FeCl_3$ will form Fe^{3+} and Cl^- ions in the water (dissolve), and when silver nitrate solution is added, the silver ions will combine with the chloride ions to form insoluble silver chloride. The reaction is a precipitation reaction.	• Gives one observation.	• Precipitation reaction explained linking to reactant and products.	• Gives comprehensive explanation of precipitate reaction occurring, including reference to the **Fe^{3+} and Cl^- ions** when water is added to the combination reaction product.

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

Q	Evidence	Achievement	Merit	Excellence
TWO (a)(i)	Combination / Redox Displacement Decomposition	• Identifies ALL reaction types correctly.		
(ii)	sodium chloride $Fe + Pb(NO_3)_2 \rightarrow Fe(NO_3)_2 + Pb$	• Completes word equation correctly.	• Gives symbol equation.	
(iii)	The blue solid copper hydroxide will react to form solid black copper oxide, and water vapour will also be seen given off during the reaction (liquid water due to condensation seen on the boiling tube). $Cu(OH)_2 \rightarrow CuO + H_2O$	• One observation given.	• Either: Two observations linked to reactant / products. OR Gives symbol equation.	• Links all observations to reactant and products and gives correct equation.
(b)(i)	iron**(II)** carbonate + sodium chloride	• Either: Correctly completes word equation.		
(ii)	Diagram showing Fe^{2+} and CO_3^{2-} particles clumped together; with Cl^- and Na^+ ions separate – do not need to show lattice.	OR Incomplete diagram (e.g. relative size or ratio or ions not shown).	• Correct diagram.	• Gives clear accurate diagram and justifies precipitation reaction and gives correct equation.
(iii)	$Fe^{2+} + CO_3^{2-} \rightarrow FeCO_3$ (accept balanced symbol equation with spectator species)			
(iv)	This is a precipitation reaction because when the two solutions (iron(II) chloride and sodium carbonate) are added together, an insoluble precipitate forms of iron(II) carbonate. 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 case, the combination of iron(II) and carbonate ions forms a precipitate of iron(II) carbonate.	• Precipitation reaction (with some description).	• Justifies precipitation reaction, with specific reference to the reactants and product. • Gives symbol equation.	

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

Q	Evidence	Achievement	Merit	Excellence
THREE (a)(i)	Because the carbonate ions from the sodium carbonate solution and the calcium ions in the water will form insoluble calcium carbonate. Therefore, the calcium ions are removed from the water. The reaction is a precipitation reaction.	• Describes precipitation reaction.	• Justifies precipitation reaction, with specific reference to the reactants and products.	
(ii)	The reaction is thermal decomposition, since heat is being used to break down one substance (calcium carbonate) into two products – calcium oxide and carbon dioxide. The calcium carbonate is a white powder, and the calcium oxide is also a white powder. CO_2 is also formed. You could bubble the gas produced during the reaction into limewater, which will turn milky / cloudy to confirm the presence of carbon dioxide. $CaCO_3 \rightarrow CaO + CO_2$	• Describes thermal decomposition. • Identifies use of limewater to test product. • Gives an observation.	• TWO observations of the thermal decomposition reaction, with links to the reactants and products including observations. • Describes limewater test to test for carbon dioxide. OR Gives equation.	• Elaborates fully on thermal decomposition reaction. AND Explains limewater test to confirm carbon dioxide. AND Gives correct symbol equation for decomposition reaction.
(b)(i)	A. copper sulfate B. iron sulfate C. zinc sulfate D. magnesium sulfate	• ALL sulfate solutions correct.		
(ii)	The reactions occurring are displacement reactions. Reactions occur in the wells where a more reactive metal (higher on the activity series) will displace a less reactive metal (lower on the activity series) ion from the solution. The more reactive metals will transfer electrons to the metal ions during the displacement reactions. In the spotting tiles with zinc metal and copper sulfate, and zinc metal with iron sulfate, displacement reactions occur because zinc metal is more reactive (higher on the activity series) than copper and iron metal, so it displaces the copper and iron ions in the solutions. This results in a (brownish) solid (copper) forming in the first well and fading of the blue copper sulfate solution to form a colourless zinc sulfate solution. In the second well, a silvery grey solid (iron) forms, and the pale green iron(II) sulfate solution becomes colourless. In the well with zinc metal and magnesium sulfate, no reaction occurs / no change seen because the magnesium ions are not displaced by the zinc metal since magnesium is more reactive than zinc. The zinc metal will not react with zinc sulfate because a metal ion will not displace the same metal – no change in the well.	• Either: Describes displacement reactions (cannot just state displacement reactions). OR Identifies reaction / no reaction in the spotting tiles with zinc metal.	• Either: Explains displacement reaction with reference to activity series. OR Explains displacement reaction with reference to electron transfer. • Explains observations in TWO of the spotting tiles with zinc metal.	• Elaborates on displacement reaction with reference to activity series and electron transfer AND explains the observations in all spotting tiles with zinc metal.

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

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 8	9 –13	14 – 18	19 – 24