

**Assessment Schedule – 2011****Chemistry: Demonstrate understanding of aspects of chemical reactions (90934)****Evidence Statement**

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE	<p>A <b>white precipitate</b> forms in a colourless solution.</p> <p><b>Calcium hydroxide <math>\text{Ca(OH)}_2</math> precipitate</b> would form.</p> <p>The <b><math>\text{Ca}^{2+}</math> and <math>\text{OH}^-</math> ions</b> would be <b>attracted</b> to each other to form the insoluble <b>precipitate</b>.</p> <p>The <b><math>\text{Na}^+</math> and <math>\text{NO}_3^-</math> ions</b> are soluble and would be found on their own <b>in the solution as spectator ions</b>.</p> <p><math>\text{Ca}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{Ca(OH)}_2(\text{s})</math> OR <math>\text{Ca(NO}_3)_2(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Ca(OH)}_2(\text{s}) + 2\text{NaNO}_3(\text{aq})</math></p> <p>(Candidates are not required to write states in equations, but if molecular equation used, somewhere in answer calcium hydroxide must be correctly identified as the precipitate.)</p>	<p>THREE of: Correct observation, eg the precipitate formed is white.</p> <p>OR Names or writes the formula of the precipitate.</p> <p>OR Correctly identifies ions remaining in solution.</p> <p>OR Correctly writes a word equation / unbalanced full equation / unbalanced ionic equation.</p> <p>NØ no response or no relevant evidence. N1 one correct. N2 two correct. A3 meets criteria. A4 all four correct.</p>	<p>Links the observation of a white ppt to the correct name or formula <math>\text{Ca(OH)}_2</math>.</p> <p>AND</p> <p>Provides a unbalanced full equation / unbalanced ionic equation.</p> <p>M5 meets criteria. M6 has a balanced equation.</p>	<p>Explains the reaction occurring AND writes a balanced chemical equation.</p> <p>E7 meets criteria E8 meets criteria and explains that <math>\text{Na}^+</math> and <math>\text{NO}_3^-</math> are <b>spectator ions still in solution</b>.</p>

TWO	<p>A <b>grey / black / silver deposit</b> slowly forms on the copper wire. This is the formation of silver (Ag) as silver ions are displaced out of solution.</p> <p>The colourless <b>solution will slowly turn blue</b> and <b>copper wire dissolves / decreases in mass</b>. This is because <math>\text{Cu}^{2+}</math> ions are moving into solution.</p> <p>The displacement reaction occurs because <b>copper is more reactive than silver</b>. (Copper is higher than silver on the metals Activity Series.) The <b>copper atoms will form copper ions</b> in the solution, and the <b>silver ions in the solution will form silver metal</b> on the surface of the wire.</p> <p>Equations:  <math>2\text{Ag}^+(\text{aq}) + \text{Cu}(\text{s}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{Ag}(\text{s})</math></p>	<p>THREE of: States TWO observations.</p> <ul style="list-style-type: none"> <li>Links one physical observation to the chemical species involved.</li> <li>Identifies copper as being more reactive than silver.</li> <li>Writes a word equation / unbalanced full equation / unbalanced ionic equation / balanced full equation.</li> </ul> <p>NØ no response or no relevant evidence.  N1 one correct.  N2 two correct.  A3 meets criteria.  A4 all four correct.</p>	<p>BOTH of: <b>Explains why the displacement reaction occurs.</b></p> <p>Writes an unbalanced ionic equation using the correct formulae.</p> <p>M5 meets criteria.  M6 balanced full / ionic equation.</p>	<p>BOTH of: Explains <b>ONE observation</b> of the displacement reaction, eg the build-up of silver or the formation of the blue solution by <b>linking to the chemical species involved</b> and <b>explains why the displacement reaction occurs.</b></p> <p>AND</p> <p>Writes a balanced <b>ionic</b> equation with correct formulae.</p> <p>E7 meets criteria.  E8 meets criteria for both observations.</p>
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THREE	<p><math>\text{Cu}(\text{OH})_2(\text{s}) \rightarrow \text{CuO}(\text{s}) + \text{H}_2\text{O}(\text{g})</math></p> <p>This goes from blue to a <b>black powder</b>, and <b>condensation (a colourless liquid)</b> may form. The condensation can be tested with <b>cobalt chloride paper</b> which will turn from <b>blue to pink</b>.</p> <p><math>\text{Na}_2\text{CO}_3</math> does <b>not decompose</b> so no colour change will be observed and no gases will be formed.</p> <p><math>2\text{NaHCO}_3(\text{s}) \rightarrow \text{Na}_2\text{CO}_3(\text{s}) + \text{H}_2\text{O}(\text{g}) + \text{CO}_2(\text{g})</math></p> <p><math>\text{NaHCO}_3</math> is a white powder that will decompose to form a <b>white powder. Two gases will form. (Or condensation (a colourless liquid) may form.)</b> One will turn <b>limewater milky</b> / extinguish burning splint / turn damp blue litmus red, and the other would turn <b>cobalt chloride paper from blue to pink</b>.</p>	<p>THREE of:</p> <p>States that <math>\text{Cu}(\text{OH})_2</math> is blue.</p> <p>OR</p> <p>States that <math>\text{CuO}</math> is black.</p> <p>OR</p> <p>States that <math>\text{Na}_2\text{CO}_3</math> does not decompose.</p> <p>OR</p> <p>Identifies gases that are formed for <math>\text{Cu}(\text{OH})_2</math> / <math>\text{NaHCO}_3</math>.</p> <p>OR</p> <p>Describes limewater or cobalt chloride as suitable testing agents.</p> <p>OR</p> <p>Writes ONE word equation / unbalanced equation</p> <p>NØ no response or no relevant evidence. N1 one correct. N2 two correct. A3 three correct. A4 four correct.</p>	<p>Explains observations for TWO powders.</p> <p>AND</p> <p>An unbalanced equation.</p> <p>M5 meets criteria. M6 meets criteria and has a balanced equation.</p>	<p>Explains the reactions of <math>\text{Cu}(\text{OH})_2</math> and <math>\text{NaHCO}_3</math> with <b>links made between observations and products formed, and a description of one test to identify one gaseous product.</b> (Products for these two powders must be correct).</p> <p>AND</p> <p>ONE balanced equation.</p> <p>E7 meet criteria. E8 explains the lack of reaction of <math>\text{Na}_2\text{CO}_3</math> / use of cobalt chloride paper to identify water.</p>
FOUR	<p>At room temperature, iron and sulfur can be mixed in a beaker as a mixture. <b>Heat</b> is required for the reaction to occur.</p> <p><b>Iron:</b> Physical: solid, black / grey, magnetic, metallic properties. Chemical: 2 electrons to lose so it is relatively reactive.</p> <p><b>Sulfur:</b> Physical: yellow solid, brittle, non metallic properties. Chemical: reactive due to requiring 2 valence electrons for a stable octet.</p> <p><b>Iron sulfide:</b> Physical: black solid, no longer magnetic. Chemical: a stable ionic compound.</p> <p>In the reaction, there is a <b>glow</b> as the sulfur <b>melts</b> and reacts with the iron. Each Fe atom loses 2 electrons forming <math>\text{Fe}^{2+}</math>, each sulfur atom gains 2 electrons, <math>\text{S}^{2-}</math>. <math>\text{Fe}(\text{s}) + \text{S}(\text{s}) \rightarrow \text{FeS}(\text{s})</math></p>	<p>THREE of:</p> <p>condition required an observation of the experiment description of Fe and description of S description of FeS writes a word equation / balanced symbol equation.</p> <p>NØ no response or no relevant evidence. N1 one correct. N2 two correct. A3 three correct. A4 four correct.</p>	<p>Explains properties <b>(physical and chemical)</b> of <b>TWO</b> species in the reaction.</p> <p>M5 explains two. M6 explains properties <b>(physical and chemical)</b> of all <b>THREE</b> species.</p>	<p>Explanation that compares properties <b>(physical and chemical)</b> of all <b>THREE</b> species and links them to the formation of the ionic compound FeS.</p> <p>AND</p> <p>Writes a balanced symbol equation.</p> <p>E7 meets criteria. E8 answer demonstrates an understanding of ionic bond formation.</p>

**Judgement Statement**

	<b>Not Achieved</b>	<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<b>Score range</b>	0 – 9	10 – 18	19 – 24	25 – 32