

Assessment Schedule – 2008

Chemistry: Describe chemical reactions (90171)

Evidence Statement

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE	<p>Correctly identifies reaction 1.</p> <p>The ions in this mixture are Pb^{2+}, NO_3^-, Na^+ and Cl^-.</p> <p>The sodium and nitrate ions are spectator ions and do not react. The lead ion and chloride ion do react to form the insoluble solid lead chloride.</p> <p>A (white) precipitate of lead chloride will form in the bottom of the beaker.</p> $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$	<p>Correctly identifies reaction 1</p> <p>AND</p> <p>identifies the ions in solution</p> <p>OR</p> <p>correctly identifies the precipitate as lead chloride</p> <p>OR</p> <p>correctly balances the ionic equation.</p>	<p>Correctly identifies reaction 1</p> <p>AND</p> <p>identifies the ions in solution</p> <p>AND</p> <p>correctly identifies the precipitate as lead chloride, which is insoluble</p> <p>OR</p> <p>correctly balances the ionic equation.</p>	<p>Correctly identifies reaction 1</p> <p>AND</p> <p>identifies the ions in solution</p> <p>AND</p> <p>correctly identifies the precipitate as lead chloride, which is insoluble</p> <p>AND</p> <p>gives a correctly balanced ionic equation.</p>
TWO	$\text{Cl}_2(\text{g}) + 2\text{Br}^-(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{g}) \text{ or } (\text{aq})$ <p>OR</p> $\text{Cl}_2(\text{g}) + 2\text{NaBr}(\text{aq}) \rightarrow 2\text{NaCl}(\text{aq}) + \text{Br}_2(\text{g}) \text{ or } (\text{aq})$ <p>Chlorine / Cl_2 gains electrons and is reduced to form the chloride ion, Cl^-.</p> <p>The bromide ion / Br^- lose electrons and is oxidised to form bromine, Br_2. The bromine produces an orange colour.</p> $2\text{e}^- + \text{Cl}_2 \rightarrow 2\text{Cl}^-$ $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$	<p>Links orange colour to Br_2</p> <p>OR</p> <p>a correct word equation is given</p> <p>OR</p> <p>an unbalanced equation is given (formulae must all be correct)</p> <p>OR</p> <p>2 correct half-equations</p> <p>OR</p> <p>oxidation-reduction is explained in terms of electron transfer.</p>	<p>Links orange colour to Br_2</p> <p>OR</p> <p>Cl_2 gains electrons, so is reduced, OR Br^- loses electrons so is oxidised.</p> <p>AND</p> <p>writes a correctly balanced equation.</p> <p>OR</p> <p>two half-equations.</p> <p>States are not required.</p>	<p>Links Orange colour to Br_2</p> <p>AND</p> <p>Cl_2 gains electrons so is reduced AND Br^- loses electrons so is oxidised.</p> <p>AND</p> <p>writes a correctly balanced equation.</p> <p>OR</p> <p>two half-equations.</p> <p>States are not required.</p>

THREE	$M(\text{NaOH}) = 23.0 + 16.0 + 1.0$ $= 40.0$ $M(\text{Zn}(\text{OH})_2) = 65.4 + (16.0 \times 2) + (1 \times 2)$ $= 99.4$ $\frac{m(\text{NaOH})}{2 \times 40.0} = \frac{7.50}{99.4} \quad \text{accept} \quad \frac{(\text{NaOH})}{2(23 + 16 + 1)} = \frac{7.50}{99.4}$ $m(\text{NaOH}) = 0.0755 \times 80.0$ $= 6.04 \text{ g}$ Accept 6 → 6.036 g 7.50 g of $\text{Zn}(\text{OH})_2$ is produced from 6.04 g of NaOH.	Both molar masses are correctly calculated.	Both molar masses are correctly calculated Evidence of the correct use of the 2:1 ratio is shown in working. (This could be shown in the working of the calculation of the molar mass of NaOH).	
FOUR	Copper(II) hydroxide, when heated, undergoes thermal decomposition. It is broken down into copper(II) oxide and water. Solid blue copper(II) hydroxide turns into a black solid when heated. It has formed copper(II) oxide, CuO , (accept powder or crystals in lieu of solid). The blue cobalt chloride paper turned pink because water vapour / gas is formed in this reaction. $\text{Cu}(\text{OH})_2(\text{s}) \rightarrow \text{CuO}(\text{s}) + \text{H}_2\text{O}(\text{g})$	States CuO and H_2O formed OR links a species to its colour OR states CoCl_2 is a test for H_2O OR states that there is a reduction in mass OR correctly balanced equation.	States CuO and H_2O formed AND links a species to its colour AND states CoCl_2 is a test for H_2O OR states that there is a reduction in mass, <u>due to loss of water / steam</u> OR correctly balanced equation.	States CuO and H_2O formed AND links a species to its colour AND correctly balanced equation AND states CoCl_2 is a test for H_2O OR states that there is a reduction in mass, <u>due to loss of water / steam</u> .

FIVE	In a sample there are 108 g carbon, 18.0 g hydrogen and 48.0 g oxygen.	One calculation process correct	TWO calculation processes are correct	Correct answer and working															
	<table border="1"> <thead> <tr> <th></th> <th>C</th> <th>H</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>Mass</td> <td>108</td> <td>18</td> <td>48</td> </tr> <tr> <td>Mass / molar mass</td> <td>$\frac{108}{12} = 9$</td> <td>$\frac{18}{1} = 18$</td> <td>$\frac{48}{16} = 3$</td> </tr> <tr> <td>Ratio (divide by smallest number)</td> <td>$\frac{9}{3} = 3$</td> <td>$\frac{18}{3} = 6$</td> <td>$\frac{3}{3} = 1$</td> </tr> </tbody> </table> <p>Formula = C₃H₆O₁</p> <p>Molecular mass = (3 × 12) + (6 × 1) + (1 × 16) = 58</p> <p>Molecular formula has molar mass of 116.0</p> $\frac{116.0}{58} = 2$ <p>Molecular formula = C₃H₆O₁ × 2 = C₆H₁₂O₂</p> <p>ALTERNATIVE METHOD</p> <p>% C = 108/174 × 100 = 62.07%</p> <p>%H = 18/174 × 100 = 10.34%</p> <p>%O = 48/174 × 100 = 27.59%</p> <p>C = 116 × 0.6207 = 72/12 = 6 H = 116 × 0.1034 = 12/1 = 12 O = 116 × 0.2759 = 32/16 = 2</p> <p>C₆H₁₂O₂</p>		C	H	O	Mass	108	18	48	Mass / molar mass	$\frac{108}{12} = 9$	$\frac{18}{1} = 18$	$\frac{48}{16} = 3$	Ratio (divide by smallest number)	$\frac{9}{3} = 3$	$\frac{18}{3} = 6$	$\frac{3}{3} = 1$	<p>OR</p> <p>Molar Masses used to calculate molecular formula.</p>	<p>AND</p> <p>3C:6H:1O ratio calculated correctly.</p>
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Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
<p>Total of FOUR opportunities answered at Achievement level or higher</p> <p>OR</p> <p>THREE Merit opportunities.</p> <p>4 × A or 3 × M</p>	<p>Total of at least FOUR opportunities answered with THREE at Merit level or higher.</p> <p>3 × M + 1 × A</p>	<p>Total of at least FOUR opportunities answered with TWO at Excellence level and TWO at Merit level or higher.</p> <p>2 × E + 2 × M</p>