Assessment Schedule – 2007

Chemistry: Describe chemical reactions (90171)

Evidence Statement

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
1 (a)	(i) silver chloride (ii) no precipitate (iii) calcium sulfate	TWO correct answers. Names or formulae.		
1 (b)	$2AgNO_3(aq) + CaCl_2(aq) \rightarrow 2AgCl(s) + Ca(NO_3)_2(aq)$ **OR** $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ $Ca(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow CaSO_4(s) + 2NaNO_3(aq)$ **OR** $Ca^{2+}(aq) + SO_4^{2-}(aq) \rightarrow CaSO_4(s)$	All formulae correct.	Correctly balanced equation. Precipitate must be correctly identified in (a) or (b). States are not required.	
2(a)	(i) magnesium oxide (ii) calcium oxide; carbon dioxide (iii) lead chloride and potassium nitrate	TWO correct.		
2 (b)	(i) $2I^-(aq) + Cl_2(aq) \rightarrow 2Cl^-(aq) + I_2$ (ii) $Zn(s) + 2AgNO_3(aq) \rightarrow 2Ag + Zn(NO_3)_2(aq)$	ONE unbalanced equation	ONE correctly balanced equation. States are not required.	
3 (a)	Thermal decomposition	Correct.		
3 (b)	The zinc hydroxide is a white powder. When heated, the white powder turns yellow and as it cools turns white, this is zinc oxide. Condensation (a colourless liquid) may form on the side of the test tube/steam forms (not gas or water vapour). A loss in the mass of the solid may be noticed.	TWO correct observations. (All observations must be correct)	TWO observations noted and linked to correct chemical species.	
4	(a) 81.4 (b) 159.7 (c) 331.0	TWO correct. (allow rounding to nearest whole number)		

5(a)	Molar mass of $Zn(OH)_2 = 65.4 + 16 \times 2 + 1 \times 2$ $= 99.4$ Molar mass of $H_2O = 1 \times 2 + 16$ $= 18$ If mass of $Zn(OH)_2 = x$, then $\frac{x}{99.4} = \frac{1}{18}$ $x = \frac{99.4}{18}$ $x = 5.52$ g	(Evidence of correct calculation of Molar mass (both) could be used here if needed for overall achievement – assuming not achieved in Q.4.)	Correct answer **with working.** Units are required.	
5(b)	Molar mass of $NaHCO_3 = 23 + 1 + 12 + 16 \times 3$ $= 84$ Molar mass of $CO_2 = 12 + 16 \times 2$ $= 44$ If mass of $NaHCO_3 = x$, then $\frac{x}{84 \times 2} = \frac{5.40}{44}$ $\frac{x}{168} = \frac{5.40}{44}$ $x = \frac{5.4}{44} \times 168$ $x = 20.6$ g	(Evidence of correct calculation of Molar mass (both) could be used here if needed for overall achievement – assuming not achieved in Q.4. or 5(a)).	Evidence of correct use of ratio of molar masses. (Both molar mass calculations must be correct). (Need to **show working** for calculation of molar mass if this is the evidence to be used for use of ratio).	Correct answer and working. (Accept 2–4 sf.) Units are required. No errors allowed. (If running arithmetic is used and this leads to an incorrect statement, E can NOT be achieved.)
6 Part A (a)	(Bright) white precipitate forms. Pale green solution remains.	Identifies both observations correctly. (An incorrect observation negates).		
(b)	Precipitation. (do not accept the abbreviation ppt)	Correct		

(c)	Each solution contains 2 aqueous ions. Barium nitrate contains Ba^{2+} and NO_3^-, which are both colourless in solution. Iron(II) sulfate contains Fe^{2+}, which is green in solution and SO_4^{2-}, which is colourless in solution. Ba^{2+} and SO_4^{2-} react to form an insoluble compound, barium sulfate, $BaSO_4$. This forms a white deposit (precipitate) at the bottom of the beaker. $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$ Or $Ba(NO_3)_{2\,(aq)} + FeSO_{4\,(aq)} \rightarrow BaSO_{4\,(s)} + Fe(NO_3)_{2\,(aq)}$ Fe^{2+} and NO_3^- remain in solution. They do not react. The Fe^{2+} ions give the solution its pale green colour.	Correctly identifies the precipitate that forms as barium sulfate. AND Describes barium sulfate as insoluble	Correctly links the precipitate to the species concerned. AND Correctly identifies the species responsible for the pale green colour of the solution as $Fe(NO_3)_2/Fe^{2+}$ as appropriate.	Correctly discusses the observations and the species in the chemical reaction, including Fe^{2+} as giving the green colour in the solution, and writes a correct balanced equation. States are not required.
6 Part B	(Magnesium reacts with oxygen in the air. This is an oxidation-reduction reaction.) Oxygen gas donates oxygen to magnesium to form magnesium oxide. Oxygen accepts electrons from the magnesium atoms to form oxide ions. This is the reduction process. $O_2 + 4e^- \rightarrow 2O^{2-}$ Magnesium donates electrons to the oxygen atoms to form magnesium ions. This is the oxidation process. $Mg \rightarrow Mg^{2+} + 2e^-$ Overall equation: $2Mg + O_2 \rightarrow 2MgO$	Describes the chemistry of this reaction in terms of simple oxygen transfer correctly. OR Identifies Magnesium loses electrons **and** Oxygen gains electrons. OR Identifies magnesium as oxidised **and** oxygen as reduced.	Explains the chemistry of this reaction in terms of electron transfer correctly. i.e. states how many electrons are gained or lost. (Could be in half equations.)	Discusses the chemistry of this reaction in terms of electron transfer correctly. Identifies which process is oxidation and which reduction correctly. Includes correct balanced half equations to demonstrate electron transfer. An overall equation is correctly written. States are not required. No incorrect statements are made.

<table>
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<td>7</td>
<td>In a 100 gram sample: P = 20.2 g; O = 10.4 g; Cl = 69.4 g

<table>
<tr><th></th><th>P</th><th>O</th><th>Cl</th></tr>
<tr><td>Mass</td><td>20.2</td><td>10.4</td><td>69.4</td></tr>
<tr><td></td><td>$\frac{20.2}{31}$
= 0.65</td><td>$\frac{10.4}{16}$
= 0.65</td><td>$\frac{69.4}{35.5}$
= 1.95</td></tr>
<tr><td>Ratio</td><td>$\frac{0.65}{0.65}$
= 1</td><td>$\frac{0.65}{0.65}$
= 1</td><td>$\frac{1.95}{0.65}$
=3</td></tr>
</table>

Formula = $POCl_3$

Molecular mass = $31 + 16 + 35.5 \times 3$
= 153.5

Molecular Formula = $POCl_3$</td>
<td>ONE calculation process correct

OR

molar masses used to calculate formula.</td>
<td>1P:1O:3Cl ratio calculated correctly.

TWO calculation processes must be correct.</td>
<td>Correct answer and working.

Working must be complete with no errors.

(If running arithmetic is used and this leads to an incorrect statement, E can NOT be achieved.)</td>
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Judgement Statement — 2007

Achievement	Achievement with Merit	Achievement with Excellence
NINE opportunities answered at Achievement level (or higher). Minimum of $9 \times A$	NINE opportunities answered including at least FIVE at Merit level (or higher) and FOUR at Achievement level (or higher). Minimum $5 \times M + 4 \times A$	ELEVEN opportunities answered including at least TWO at Excellence level (including ONE calculation Q5(b) or Q7 and ONE explanation Q6 Part A (c) or Q6 Part B) plus THREE at Merit level (or higher) and SIX at Achievement level (or higher). Minimum $2 \times E + 3 \times M + 6 \times A$