

# Mark Scheme Summer 2009

GCE

## GCE Chemistry (8CH07) International Supplement 2

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## 6CH07/01

Question Number	Correct Answer	Reject	Mark
1 (a)(i)	No (colour) change (to flame) OR no flame colour <b>Accept</b> No colour	White flame	1

Question Number	Correct Answer	Reject	Mark
1 (a)(ii)	Effervescence / bubbling / fizzing <i>IGNORE</i> hissing		1

Question Number	Correct Answer	Reject	Mark
1 (a)(iii)	<b>Observation:</b> (Lime water) turns milky / cloudy or white precipitate (formed) (1) <b>Accept</b> White solid (formed) / chalky  <b>Inference:</b> carbon dioxide / CO <sub>2</sub> (1)	Turns white	2

Question Number	Correct Answer	Reject	Mark
1 (a)(iv)	<b>Observation:</b> White precipitate (formed) (1) <b>Accept</b> White solid / crystal (formed) <i>IGNORE</i> references to heat given out and to precipitate insoluble in excess <b>Inference:</b> Magnesium hydroxide / Mg(OH) <sub>2</sub> (1)	White substance  Confirms magnesium present	2

Question Number	Correct Answer	Reject	Mark
1 (b)(i)	Lithium / Li <sup>+</sup> (1) Strontium / Sr <sup>2+</sup> (1) <b>Accept</b> Calcium / Ca <sup>2+</sup> (1)	Rubidium Li, Sr, Ca (penalise use of element symbol once only)	2

Question Number	Correct Answer	Reject	Mark
1 (b)(ii)	Dissolves (in the ammonia) (to form a colourless solution) <b>Accept</b> Soluble <i>IGNORE</i> references to dilute ammonia	Partially dissolves	1

Question Number	Correct Answer	Reject	Mark
1 (b)(iii)	<b>Observation:</b> Brown or red-brown or orange (1) <b>Inference:</b> Bromine / Br <sub>2</sub> (1)	Red  Bromide (for bromine)	2

Question Number	Correct Answer	Reject	Mark
1 (b)(iv)	<b>From:</b> Orange or yellow <b>To:</b> blue or green or blue-green		1

Question Number	Correct Answer	Reject	Mark
1 (b)(v)	<b>Mark two points independently</b> (Hydrogen) bromide oxidized / bromine oxidation number increased (from -1 to 0) / changes from -1 to 0 / Bromide loses an electron / (hydrogen) bromide is a reducing agent (1)  sulfuric acid reduced / sulfur oxidation number decreases (from (+)6 to (+)4) / changes from (+)6 to (+)4 / sulfate gains electrons / sulfuric acid is an oxidizing agent (1) <b>Accept</b> (+)VI to (+)IV sulfate reduced		2

Question Number	Correct Answer	Reject	Mark
2 (a)(i)	<b>Vertical</b> line at 3.5 minutes intersects extrapolated top line (1) <b>Horizontal</b> extrapolated lower line and 66-69 minus 20-22 = $\Delta T$ (1)	incorrect or no extrapolation line joining points at 3 & 4 minutes & extrapolated to intersect top line (0)	2

Question Number	Correct Answer	Reject	Mark
2 (a)(ii)	$(1 \times 50 \times 10^{-3}) = 0.0500$ <i>IGNORE sf</i>		1

Question Number	Correct Answer	Reject	Mark
2 (a)(iii)	$65.4 \times 0.05 = 3.27$ (g) / 3.3 (g) <b>Accept</b> $65 \times 0.05 = 3.25$ (g) / 3.3 (g)		1

Question Number	Correct Answer	Reject	Mark
2 (a)(iv)	Heat capacity negligible <b>Accept:</b> low specific heat capacity or zinc absorbs less heat than solution	Mass negligible No heat absorbed by zinc All heat absorbed by solution	1

Question Number	Correct Answer	Reject	Mark														
2 (a)(v)	<p>50 x 4.18 x <math>\Delta T</math> (1) (<math>\Delta T</math> CQ on (a)(i)) Penalise use of incorrect mass here only. <b>IGNORE</b> <math>c = 4.2 \text{ Jg}^{-1}\text{C}^{-1}</math></p> <table border="1"> <thead> <tr> <th><math>\Delta T</math></th> <th>Heat energy (kJ)</th> </tr> </thead> <tbody> <tr><td>44</td><td>9.20</td></tr> <tr><td>45</td><td>9.41</td></tr> <tr><td>46</td><td>9.61</td></tr> <tr><td>47</td><td>9.82</td></tr> <tr><td>48</td><td>10.0(3)</td></tr> <tr><td>49</td><td>10.2(4)</td></tr> </tbody> </table> <p>(units if given must be consistent) (1) <b>IGNORE</b> sf except 1 sf</p>	$\Delta T$	Heat energy (kJ)	44	9.20	45	9.41	46	9.61	47	9.82	48	10.0(3)	49	10.2(4)		2
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Question Number	Correct Answer	Reject	Mark																					
2 (a)(vi)	<p>= – answer to (a)(v) <math>\div</math> answer to (a)(ii) (1) For 0.05 mol:</p> <table border="1"> <thead> <tr> <th><math>\Delta T</math></th> <th>Heat energy (kJ)</th> <th><math>\Delta H / \text{kJ mol}^{-1}</math></th> </tr> </thead> <tbody> <tr><td>44</td><td>9.20</td><td>-180</td></tr> <tr><td>45</td><td>9.41</td><td>-190</td></tr> <tr><td>46</td><td>9.61</td><td>-190</td></tr> <tr><td>47</td><td>9.82</td><td>-200</td></tr> <tr><td>48</td><td>10.0(3)</td><td>-200</td></tr> <tr><td>49</td><td>10.2(4)</td><td>-200</td></tr> </tbody> </table> <p>CQ on moles from 2 (a)(ii) Sign and 2 sf (1) [this mark may be awarded for any <b>calculated</b> value]</p>	$\Delta T$	Heat energy (kJ)	$\Delta H / \text{kJ mol}^{-1}$	44	9.20	-180	45	9.41	-190	46	9.61	-190	47	9.82	-200	48	10.0(3)	-200	49	10.2(4)	-200		2
$\Delta T$	Heat energy (kJ)	$\Delta H / \text{kJ mol}^{-1}$																						
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Question Number	Correct Answer	Reject	Mark
2 (b)(i)	Ensure equilibration or steady temperature or same temperature (as surroundings)	More accurate temperature	1

Question Number	Correct Answer	Reject	Mark
2 (b)(ii)	To allow for cooling / a cooling correction / to compensate for heat loss	Temperature correction To determine maximum temperature change More accurate temperature / $\Delta T$	1

Question Number	Correct Answer	Reject	Mark
2 (b)(iii)	Low heat capacity Good insulator Poor heat conductor Low mass Absorbs less heat	Low <b>specific</b> heat capacity	1

Question Number	Correct Answer	Reject	Mark
2 (b)(iv)	Ensure uniform temperature <b>Accept</b> to spread out heat (uniformly) <i>IGNORE</i> references to mixing reagents, increasing reaction rate, enabling reactants to react and temperature accuracy.		1

Question Number	Correct Answer	Reject	Mark
2 (b)(v)	Burette / pipette / measuring cylinder / volumetric or graduated flask	Beaker / conical flask	1

Question Number	Correct Answer	Reject	Mark
2 (b)(vi)	Lid on polystyrene cup/ Increase insulation <b>Accept</b> Put cup in a beaker	Magnetic stirrer	1

Question Number	Correct Answer	Reject	Mark
2 (c)	Zn>Pb>Cu OR Zinc <b>displaces</b> both so is most reactive (1) The more exothermic / negative ( <b>accept</b> 'the larger') the $\Delta H$ the greater the difference in reactivity (so lead more reactive than copper) (1) If the order of reactivity is reversed maximum 1	Answers in <b>just</b> terms of reactivity or electrochemical series Generalised answers References to energy or enthalpy <b>required</b> for the reaction	2



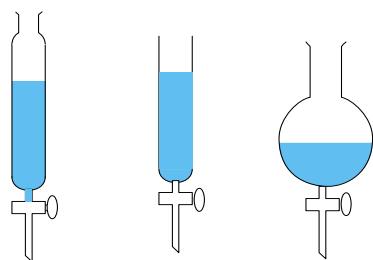
Question Number	Correct Answer	Reject	Mark
3 (a)(i)	<b>Observation:</b> Steamy/misty /white fumes (1) <b>Explanation:</b> Hydrogen chloride / HCl formed OR chloroalkene / chloro- compound formed OR Substitution reaction with OH (1)	Smoke or solid  Hydrochloric acid  Chloroalkane  Just OH / alcohol group reacts (with $\text{PCl}_5$ )	2

Question Number	Correct Answer	Reject	Mark
3 (a)(ii)	<b>Observation:</b> Purple to colourless or brown (1)  <b>Explanation:</b> Addition to $\text{C}=\text{C}$ /alkene OR oxidation of $\text{C}=\text{C}$ /alkene OR OH / alcohol group oxidised (1) <b>Accept</b> Reacts with $\text{C}=\text{C}$ to form diol or with OH to form an aldehyde or a carboxylic acid OR manganate(VII) / permanganate / $\text{MnO}_4^-$ to $\text{MnO}_2$ (if brown) or $\text{Mn(II)}$ / $\text{Mn}^{2+}$ (if decolourized)	Just 'decolourized'  'Reacts' alone instead of addition or oxidation 'Due to the presence of $\text{C}=\text{C}$ /alkene / OH' A oxidised	2

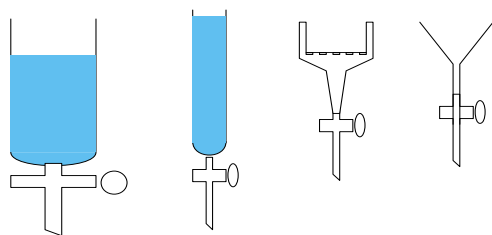
Question Number	Correct Answer	Reject	Mark
3 (a)(iii)	<b>Observation:</b> Orange or yellow or brown ( <b>accept</b> red-brown) to colourless (1) <b>Explanation:</b> (Bromine) addition to $\text{C}=\text{C}$ /alkene (Bromine) reacts with $\text{C}=\text{C}$ /alkene to form dibromoalkanol / dibromo compound (1)	'pink' instead of purple 'clear' instead of colourless Just 'decolourized' Reaction alone instead of addition  dibromoalkane	2

Question Number	Correct Answer	Reject	Mark
3 (b)	$  \begin{array}{cccc}  \text{H} & \text{H} & \text{H} & \text{H} \\    &   &   &   \\  \text{H}-\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{O}-\text{H} \\    &   &   &   \\  \text{Br} & \text{Br} & \text{H} & \text{H}  \end{array}  $ <p>OR</p> $  \begin{array}{cccc}  \text{H} & \text{H} & \text{H} & \text{H} \\    &   &   &   \\  \text{H}-\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{O}-\text{H} \\    &   &   &   \\  \text{Br} & \text{O} & \text{H} & \text{H} \\  &   & & \\  & \text{H} & &   \end{array}  $ <p>Accept</p> $  \begin{array}{cccc}  \text{H} & \text{H} & \text{H} & \text{H} \\    &   &   &   \\  \text{H}-\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{O}-\text{H} \\    &   &   &   \\  \text{O} & \text{Br} & \text{H} & \text{H} \\    & & & \\  \text{H} & & &   \end{array}  $ <p>Accept OH for O—H</p>		1

Question Number	Correct Answer	Reject	Mark
4 (a)	Funnel with neck & tap (1) <i>IGNORE</i> stopper Organic layer above aqueous layer (1) Stand alone See diagrams	Conical / filter / Buchner funnel with tap Funnel too full to be stoppered	2



YES



NO

Question Number	Correct Answer	Reject	Mark
4 (b)(i)	(Organic & aqueous) layers are immiscible <b>OR</b> consequence of not shaking e.g. layers form <b>Accept</b> 'to ensure layers mix <i>IGNORE</i> references to rate	Just 'to mix reagents' Explanations in terms of density differences	1

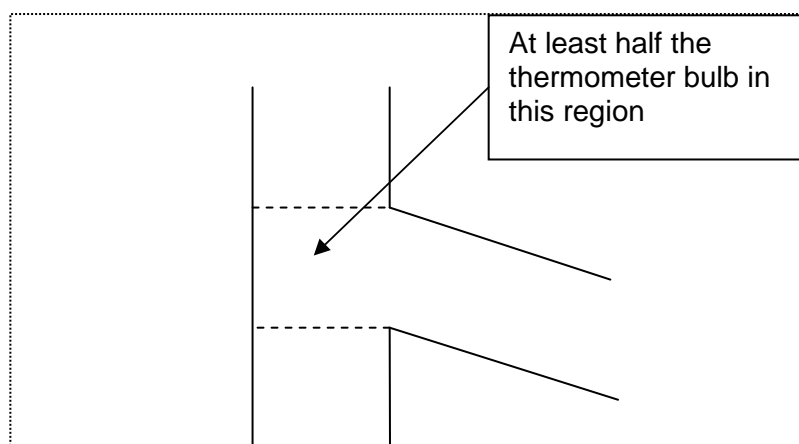
Question Number	Correct Answer	Reject	Mark
4 (b)(ii)	Neutralize (excess) acid / $H^+$ <b>Accept</b> remove acid / $H^+$ React with acid <i>IGNORE</i> Use of HCl for hydrochloric acid release of $CO_2$	Just 'neutralize / neutralization	1

Question Number	Correct Answer	Reject	Mark
4 (b)(iii)	Carbon dioxide / $CO_2$ / gas is formed (1) Release pressure / pressure builds up (1)		2

Question Number	Correct Answer	Reject	Mark
4 (b)(iv)	Drying agent or to remove water	Dehydrating agent	1

Question Number	Correct Answer	Reject	Mark
4 (b)(v)	To pour off the liquid leaving the solid behind	Pour / pour carefully / transfer	1

Question Number	Correct Answer	Reject	Mark
4 (c)(i)	Bulk of the thermometer bulb adjacent to the outlet leading to the condenser (see diagram)		1



Question Number	Correct Answer	Reject	Mark
4 (c)(ii)	Water in through the lower tube and out through the upper If words are used (water in & water out) ignore the direction of any arrows		1

Question Number	Correct Answer	Reject	Mark
4 (d)	<p>Mass of alcohol = <math>5 \times 0.805 = 4.025</math> (g) (1)</p> <p>Moles of alcohol = <math>4.025 \div 88 = 0.0457</math></p> <p>= moles of 2-chloro-2-methylbutane</p> <p>Mass 2-chloro-2-methylbutane (100% yield) = <math>0.0457 \times 106.5 = 4.87</math></p> <p>70% yield = <math>4.87 \times \frac{70}{100} = 3.41</math> g (1)</p> <p>ignore sf except for 1 sf</p> <p>If the molar masses are transposed penalise once (answer = 2.32 g)</p> <p>Correct answer and some working (2)</p>		2



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