

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 Accept 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)	Observation: (Lime water) turns milky / cloudy or white precipitate (formed) (1) Accept White solid (formed) / chalky Inference: carbon dioxide / CO ₂ (1)	Turns white	2

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

Question Number	Correct Answer	Reject	Mark
1 (b)(i)	Lithium / Li ⁺ (1) Strontium / Sr ²⁺ (1) Accept Calcium / Ca ²⁺ (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) Accept Soluble <i>IGNORE</i> references to dilute ammonia	Partially dissolves	1

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

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

Question Number	Correct Answer	Reject	Mark
1 (b)(v)	Mark two points independently (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) Accept (+)VI to (+)IV sulfate reduced		2

Question Number	Correct Answer	Reject	Mark
2 (a)(i)	Vertical line at 3.5 minutes intersects extrapolated top line (1) Horizontal extrapolated lower line and 66-69 minus 20-22 = ΔT (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)	$65.4 \times 0.05 = 3.27 \text{ (g)} / 3.3 \text{ (g)}$ Accept $65 \times 0.05 = 3.25 \text{ (g)} / 3.3 \text{ (g)}$		1

Question Number	Correct Answer	Reject	Mark
2 (a)(iv)	Heat capacity negligible Accept: 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)	50 x 4.18 x ΔT (1) (ΔT CQ on (a)(i)) Penalise use of incorrect mass here only. <i>IGNORE</i> c = 4.2 Jg⁻¹°C⁻¹ <table><tr><th>ΔT</th><th>Heat energy (kJ)</th></tr><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></table> (units if given must be consistent) (1) <i>IGNORE</i> sf except 1 sf	ΔT	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)	= – answer to (a)(v) ÷ answer to (a)(ii) (1) For 0.05 mol: <table><tr><th>ΔT</th><th>Heat energy (kJ)</th><th>$\Delta H / \text{kJ mol}^{-1}$</th></tr><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></table> CQ on moles from 2 (a)(ii) Sign and 2 sf (1) [this mark may be awarded for any calculated value]	ΔT	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
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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 / ΔT	1

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

Question Number	Correct Answer	Reject	Mark
2 (b)(iv)	Ensure uniform temperature Accept 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 Accept Put cup in a beaker	Magnetic stirrer	1

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

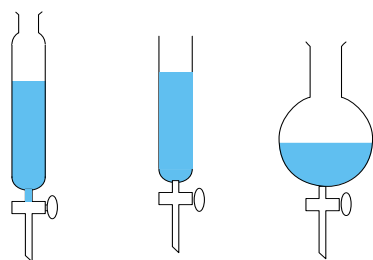
Question Number	Correct Answer	Reject	Mark
3 (a)(i)	Observation: Steamy/misty /white fumes (1) Explanation: Hydrogen chloride / HCl formed OR chloroalkene / chloro- compound formed OR Substitution reaction with OH (1)	Smoke or solid Hydrochloric acid Chloroalkane Just OH / alcohol group reacts (with PCl ₅)	2

Question Number	Correct Answer	Reject	Mark
3 (a)(ii)	Observation: Purple to colourless or brown (1) Explanation: Addition to C=C /alkene OR oxidation of C=C /alkene OR OH / alcohol group oxidised (1) Accept Reacts with C=C to form diol or with OH to form an aldehyde or a carboxylic acid OR manganate(VII) / permanganate / MnO ₄ ⁻ to MnO ₂ (if brown) or Mn(II) / Mn ²⁺ (if decolourized)	Just 'decolourized' 'Reacts' alone instead of addition or oxidation 'Due to the presence of C=C /alkene / OH' A oxidised	2

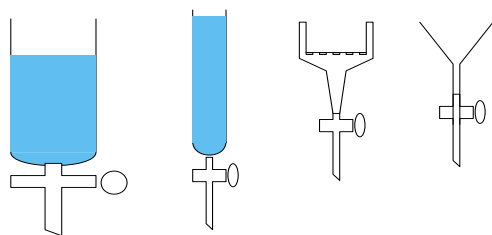
Question Number	Correct Answer	Reject	Mark
3 (a)(iii)	Observation: Orange or yellow or brown (accept red-brown) to colourless (1) Explanation: (Bromine) addition to C=C /alkene (Bromine) reacts with C=C /alkene to form dibromoalkanol / dibromo compound (1)	'pink' instead of purple 'clear' instead of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

Question Number	Correct Answer	Reject	Mark
3 (b)	$ \begin{array}{ccccccc} & \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} $ OR $ \begin{array}{ccccccc} & \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} $ Accept $ \begin{array}{ccccccc} & \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} $ Accept OH for O—H		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 OR consequence of not shaking e.g. layers form Accept 'to ensure layers mix IGNORE references to rate	Just 'to mix reagents' Explanations in terms of density differences	1

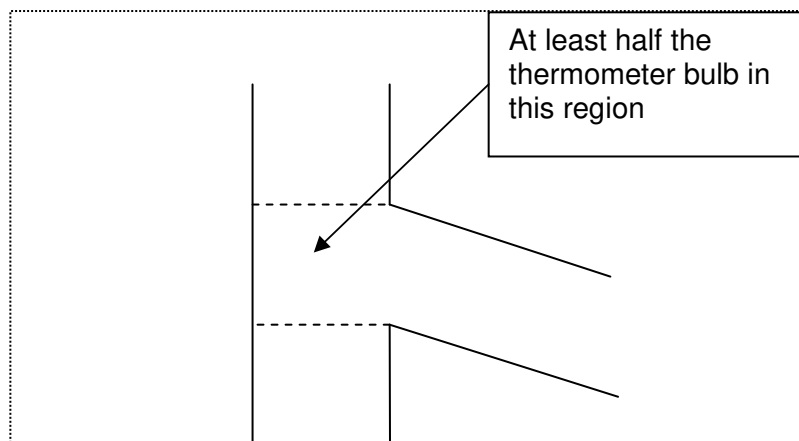
Question Number	Correct Answer	Reject	Mark
4 (b)(ii)	Neutralize (excess) acid / H^+ Accept remove acid / H^+ React with acid IGNORE Use of HCl for hydrochloric acid release of CO_2	Just 'neutralize / neutralization	1

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)	Mass of alcohol = $5 \times 0.805 = 4.025$ (g) (1) Moles of alcohol = $4.025 \div 88 = 0.0457$ = moles of 2-chloro-2-methylbutane Mass 2-chloro-2-methylbutane (100% yield) = $0.0457 \times 106.5 = 4.87$ 70% yield = $4.87 \times \frac{70}{100} = 3.41$ g (1) ignore sf except for 1 sf If the molar masses are transposed penalise once (answer = 2.32 g) Correct answer and some working (2)		2

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