

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) | $65.4 \times 0.05 = 3.27$ (g) / 3.3 (g) Accept $65 \times 0.05 = 3.25$ (g) / 3.3 (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) | $50 \times 4.18 \times \Delta T$ (1) (ΔT CQ on (a)(i)) Penalise use of incorrect mass here only. IGNORE $c = 4.2 \text{ Jg}^{-1}\text{C}^{-1}$ <table border="1" style="margin-top: 5px;"> <thead> <tr> <th>ΔT</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> (units if given must be consistent) (1) IGNORE 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 |
| ΔT | Heat energy (kJ) | | | | | | | | | | | | | | | | |
| 44 | 9.20 | | | | | | | | | | | | | | | | |
| 45 | 9.41 | | | | | | | | | | | | | | | | |
| 46 | 9.61 | | | | | | | | | | | | | | | | |
| 47 | 9.82 | | | | | | | | | | | | | | | | |
| 48 | 10.0(3) | | | | | | | | | | | | | | | | |
| 49 | 10.2(4) | | | | | | | | | | | | | | | | |

| Question Number | Correct Answer | Reject | Mark | | | | | | | | | | | | | | | | | | | | | |
|-----------------|---|---------------------------------|------------------|---------------------------------|----|------|------|----|------|------|----|------|------|----|------|------|----|---------|------|----|---------|------|--|---|
| 2 (a)(vi) | = – answer to (a)(v) \div answer to (a)(ii) (1) For 0.05 mol: <table border="1" style="margin-top: 5px;"> <thead> <tr> <th>ΔT</th> <th>Heat energy (kJ)</th> <th>$\Delta H / \text{kJ mol}^{-1}$</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> 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 |
| 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 | | | | | | | | | | | | | | | | | | | | | | |

| 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 |

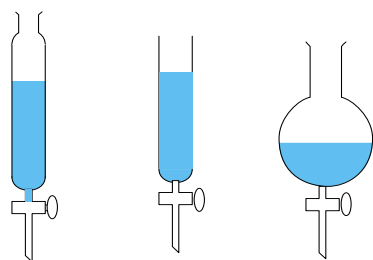
| Question Number | Correct Answer | Reject | Mark |
|-----------------|---|--|------|
| 3 (a)(i) | Observation: Steamy/misty /white fumes (1) Explanation: Hydrogen chloride / HCl formed OR chloroalkene / chloro- compound formed OR Substitution reaction with OH (1) | Smoke or solid Hydrochloric acid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

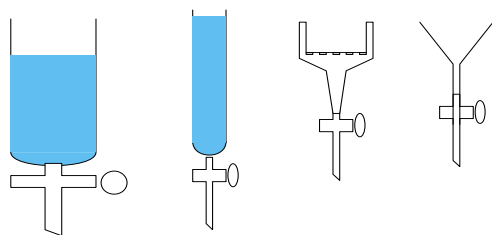
| Question Number | Correct Answer | Reject | Mark |
|-----------------|---|---|------|
| 3 (a)(iii) | Observation: Orange or yellow or brown (accept red-brown) to colourless (1) Explanation: (Bromine) addition to C=C /alkene (Bromine) reacts with C=C /alkene to form dibromoalkanol / dibromo compound (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}{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 OR consequence of not shaking e.g. layers form Accept 'to ensure layers mix <i>IGNORE</i> references to rate | Just 'to mix reagents' Explanations in terms of density differences | 1 |

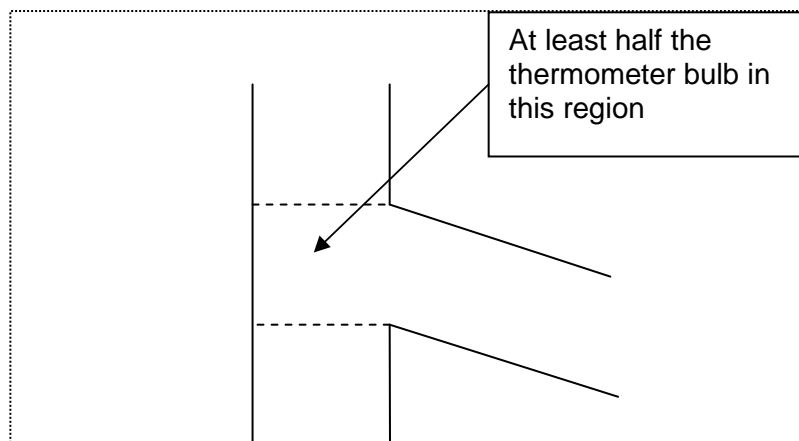
| Question Number | Correct Answer | Reject | Mark |
|-----------------|--|-----------------------------------|------|
| 4 (b)(ii) | Neutralize (excess) acid / H ⁺ Accept remove acid / H ⁺ React with acid <i>IGNORE</i> Use of HCl for hydrochloric acid release of CO ₂ | Just 'neutralize / neutralization | 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 = $5 \times 0.805 = 4.025$ (g) (1)</p> <p>Moles of alcohol = $4.025 \div 88 = 0.0457$</p> <p>= moles of 2-chloro-2-methylbutane</p> <p>Mass 2-chloro-2-methylbutane (100% yield) = $0.0457 \times 106.5 = 4.87$</p> <p>70% yield = $4.87 \times \frac{70}{100} = 3.41$ 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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