

Mark Scheme (Results)
January 2012

GCE Chemistry (6CH08) Paper 01
Chemistry Laboratory Skills II (WA)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. Questions labelled with an **asterix (*)** are ones where the quality of your written communication will be assessed.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

() means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Acceptable Answers	Reject	Mark
1 (a)(i)	<p>A</p> <pre> H H-C-H C=O H-C-H H </pre> <p style="text-align: right;">(1)</p> <p>B</p> <pre> H H-C-H H-C-H C=O H </pre> <p style="text-align: right;">(1)</p> <p>ALLOW non-displayed alkyl groups, CH₃, C₂H₅. ALLOW skeletal formulae. A & B wrong way round – scores (1)</p>		2

Question Number	Acceptable Answers	Reject	Mark
1 (a)(ii)	<p>Either B because three (sets of) peaks/ three (proton) environments OR B because of 5:3:3 splitting pattern OR Only the aldehyde has a peak greater than 9 ppm (1)</p> <p>Either A would have only one peak/ one (proton) environment OR A would have singlet (1)</p> <p>ALLOW ECF on carbonyls only</p>		2

Question Number	Acceptable Answers	Reject	Mark
1 (b)(i)	Alkene /carbon-carbon double bond /C=C (1) (primary or secondary) alcohol ALLOW hydroxyl/hydroxyl (1)	Tertiary alcohol/ hydroxide/O-H alone	2

Question Number	Acceptable Answers	Reject	Mark
1 (b)(ii)	Any two from: Fizzing/bubbling/effervescence (1) Sodium dissolves/disappears / decreases in size (1) White solid/precipitate formed (1)	Gas/hydrogen given off Hisses Sodium sinks Reacts vigorously Exothermic/gets hot	2

Question Number	Acceptable Answers	Reject	Mark
1 (b)(iii)	Any two from: $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}=\text{C}-\text{C}-\text{O}-\text{H} \\ \\ \text{H} \end{array}$ <p style="text-align: right;">(1)</p> $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}=\text{C}-\text{C}-\text{H} \\ \quad \\ \text{O} \quad \text{H} \\ \\ \text{H} \end{array}$ <p style="text-align: right;">(1)</p> $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{O}-\text{C}=\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$ <p style="text-align: right;">(1)</p> $\begin{array}{c} \text{H} \quad \text{OH} \quad \text{H} \\ \quad \quad \\ \text{C}=\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$ <p style="text-align: right;">(1)</p> ALLOW non-displayed CH ₃ and/or OH ALLOW skeletal formulae		2

Question Number	Acceptable Answers	Reject	Mark
2 (a)	Iron(II) hydroxide/Fe(OH) ₂ / Fe(H ₂ O) ₄ (OH) ₂ / [Fe(H ₂ O) ₄ (OH) ₂] /Fe(OH) ₂ (H ₂ O) ₄ / [Fe(OH) ₂ (H ₂ O) ₄] /Fe(OH) ₂ xH ₂ O	[Fe(H ₂ O) ₄ (OH) ₂] ²⁺ [Fe(H ₂ O) ₆ (OH) ₂]	1

Question Number	Acceptable Answers	Reject	Mark
2 (b)	Ammonia (gas)/NH ₃ / NH _{3(g)}	Ammonium (gas) NH ₄ ⁽⁺⁾	1

Question Number	Acceptable Answers	Reject	Mark
2 (c)	Barium sulfate/Barium sulphate / BaSO ₄		1

Question Number	Acceptable Answers	Reject	Mark
2 (d)	Fe^{2+} (1) NH_4^+ (1) SO_4^{2-} (1) ALLOW: $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot (x\text{H}_2\text{O})$ (2) $\text{Fe}(\text{NH}_4)_2 (\text{SO}_4)_2$ (2) ALLOW a formula containing all three ions without charges and unbalanced (1)	$\text{NH}_3 / \text{NH}_3^+ / \text{NH}_4$ If the formula of D is given rather than the ions, the presence of NH_3 scores (0).	3

Question Number	Acceptable Answers	Reject	Mark
3 (a)(i)	$\frac{50 \times 0.02}{1000} = 0.001 \text{ mol I}_2$ $\frac{25 \times 2}{1000} = 0.05 \text{ mol } (\text{CH}_3)_2\text{CO}$ Both quantities correct and propanone in excess (2) Both quantities correct but incorrect or missing excess (1) One quantity correct (1)		2

Question Number	Acceptable Answers	Reject	Mark
3 (a)(ii)	(Graduated) Pipette (+ filler) Accept recognisable spelling e.g pipet	Burette Measuring cylinder	1

Question Number	Acceptable Answers	Reject	Mark
3 (a)(iii)	Measuring cylinder Ignore volumes e.g. 25cm^3 measuring cylinder	Burette/pipette	1

Question Number	Acceptable Answers	Reject	Mark
3 (a)(iv)	To quench /slow /stop the reaction (1) By reacting with the sulfuric acid / neutralize (the acid) / remove the H ⁺ ions (1) Mark independently		2

Question Number	Acceptable Answers	Reject	Mark
3 (b)(i)	From yellow/orange/red-brown /brown (1) To colourless / pale yellow (1) Second mark is dependent on the first	... to clear /yellow	2

Question Number	Acceptable Answers	Reject	Mark
3 (b)(ii)	Starch (1) From blue / blue-black / black To colourless (1) Mark independently	From Purple.... ...to clear	2

Question Number	Acceptable Answers	Reject	Mark
3 (b)(iii)	As the colour of the iodine solution begins to fade/turns pale yellow/straw coloured/just before the end point (1)	When colourless / yellow/brown	1

Question Number	Acceptable Answers	Reject	Mark
3 (c)(i)	Iodine concentration is proportional to the volume of sodium thiosulfate solution		1

Question Number	Acceptable Answers	Reject	Mark
3 (c)(ii)	<p>Axes correctly labelled including units with sensible scales (more than half graph paper used in each direction) (1)</p> <p>Points correctly plotted and best fitting straight line drawn (1)</p> <p>Allow - completely correct but axes wrong way round (1)</p>	<p>Absence of units</p> <p>Dots joined with straight lines</p>	2

Question Number	Acceptable Answers	Reject	Mark
3 (c)(iii)	<p>reaction is order zero (1)</p> <p>rate is constant/gradient is constant/[iodine] does not affect rate (1)</p> <p>Mark independently</p>		2

Question Number	Acceptable Answers	Reject	Mark
3 (d)	<p>Iodine is not involved in the rate determining step, (because order is zero with respect to iodine)</p> <p>If 3ciii is not zero order, the mark is only awarded if the candidate states that the order is inconsistent.</p>		1

Question Number	Acceptable Answers	Reject	Mark
4 (a)	<p>As liquid(s) vaporise/boil they are cooled and condense back to liquid(s) (1)</p> <p>Any two from: Used to heat volatile liquids (1)</p> <p>Prevents escape of flammable vapours (1)</p> <p>Prevents escape of reactants/products/solvents (1)</p> <p>Allows time to react/Allows complete reaction/Allows faster reaction/increases yield (1)</p>	Overcomes activation energy	3

Question Number	Acceptable Answers	Reject	Mark
4 (b)(i)	<p>To react with/remove (excess) ethanoyl chloride</p> <p>IGNORE references to product(s) dissolving</p>	Dissolve unreacted reagents/excess acid/HCl	1

Question Number	Acceptable Answers	Reject	Mark
4 (b)(ii)	<p>Reaction (with water) is exothermic /gives out heat/violent/vigorous</p> <p>Note that the answer may be given in b(i)</p>	<p>Reaction explosive</p> <p>Prevent flask cracking</p>	1

Question Number	Acceptable Answers	Reject	Mark
4 (c)(i)	<p>Buchner/side armed flask (1)</p> <p>Side arm connected to pump (1)</p> <p>Buchner funnel with flat filter paper The filter paper must be labelled or clearly shown above the pores of the funnel (1)</p>	<p>Large gap between funnel and flask</p> <p>Blocked outlet to pump</p>	3

Question Number	Acceptable Answers	Reject	Mark
4 (c)(ii)	<p>Faster (1)</p> <p>Dries solid/precipitate/crystals OR removes maximum amount of solution (1)</p>	<p>Reduces transfer losses</p> <p>Less product lost /higher yield</p>	2

Question Number	Acceptable Answers	Reject	Mark
4 (d)(i)	<p>A variety of methods may be used.</p> <p>Either</p> <p>Crystals in (sealed) capillary tube (1)</p> <p>Thermometer and capillary in (heated) oil/water bath or in 'melting temperature apparatus' heater (1)</p> <p>Or</p> <p>Crystals balanced on thermometer (1)</p> <p>Clamped horizontally in horizontal double glass skinned test tube (1)</p> <div style="text-align: center;"> </div> <p>Note – crystals in a test or boiling tube with a thermometer in the tube (1)</p>		2

Question Number	Acceptable Answers	Reject	Mark
4 (d)(ii)	<p>Melting temperature should be 'sharp'/over a 1-2 °C range/narrow temperature range (1)</p> <p>And at correct value/consistent with literature (1)</p>		2

Question Number	Acceptable Answers	Reject	Mark
4 (e)	<p>Number of moles of reactant $= \frac{3.5}{137} (1) = 0.02555$</p> <p>Either Number of moles of product $= \frac{2.35}{179} (1) = 0.01313$</p> <p>Percentage yield $= \frac{0.01313}{0.02555} \times 100$ $= 51.4/51 \% (1)$ ACCEPT 51.5%</p> <p>Or Mass of product = 0.02555×179 (1) $= 4.573 \text{ g}$</p> <p>Percentage yield = $\frac{2.35 \times 100}{4.573}$ $= 51.4\%/51\% (1)$ ACCEPT 51.5%</p> <p>ACCEPT answers to 4 or more sf provided they round to 51.4 or 51.5</p> <p>Correct answer with no working scores (3)</p> <p>ALLOW internal TE</p>	Answers to 1 sf	3

TOTAL FOR PAPER = 50 MARKS

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