

# Mark Scheme (Results)

January 2013

GCE Chemistry (6CH07) Paper 01  
Chemistry Laboratory Skills (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. The strands are as follows:
  - i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  - ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  - iii) organise information clearly and coherently, using specialist vocabulary when appropriate

## 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
<b>1a(i)</b>	Lilac Allow mauve/purple/violet Allow a near-miss with spelling e.g. lillac/liliac. Allow pink when viewed through blue glass.  Ignore any qualification of colour e.g pale lilac.		<b>1</b>

Question Number	Acceptable answers	Reject	Mark
<b>1a(ii)</b>	Yellow (solid/precipitate)	Cream/pale yellow	<b>1</b>

Question Number	Acceptable answers	Reject	Mark
<b>1a(iii)</b>	Insoluble/does not dissolve/ precipitate remains. Allow no change Allow precipitate becomes paler  Ignore the colour of the precipitate if given.	Precipitate forms Any other observation e.g. effervescence	<b>1</b>

Question Number	Acceptable answers	Reject	Mark
<b>1a(iv)</b>	Brown/red-brown/yellow <b>(1)</b> Allow orange/orange-brown  Ignore any qualification of colour e.g dark brown  $I_2 / I_3^-$ <b>(1)</b>  Mark independently	Purple Any other colour given with acceptable answers Just red.  $I^-$	<b>2</b>

Question Number	Acceptable answers	Reject	Mark
<b>1a(v)</b>	(two) layers (1) (hydrocarbon/top layer) purple/pink/violet (1) Ignore reference to effervescence and the colour of the lower layer.  Mark independently, but if the layers mark is awarded, then for the second mark the <b>top</b> layer must be purple/pink/violet.	Three layers.	<b>2</b>

Question Number	Acceptable answers	Reject	Mark
<b>1b(i)</b>	Starch (solution/indicator)		<b>1</b>

Question Number	Acceptable answers	Reject	Mark
<b>1b(ii)</b>	blue-black OR blue OR black to <b>colourless</b> Ignore any qualification of colour e.g dark blue.	clear for colourless purple	<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>1b(iii)</b>	(amount sodium thiosulfate = $0.045 \times 0.100$ )  $= 4.5 \times 10^{-3} / 0.0045$ (mol)		<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>1b(iv)</b>	(Amount of iodine = $4.5 \times 10^{-3} \div 2$ ) $= 2.25 \times 10^{-3} / 0.00225$ (mol)  TE answer to (b)(iii) $\div 2$	$0.0025 / 2.5 \times 10^{-3}$	<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>1b(v)</b>	Amount of $H^+$ ions = $2.25 \times 10^{-3} \times 2$ $= 4.5 \times 10^{-3} / 0.0045$ (mol)  TE answer to (b)(iv) $\times 2$		<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>1b(vi)</b>	Concentration of HCl = $4.5 \times 10^{-3} \times 1000/30$ $= 0.15$ (mol $dm^{-3}$ )  TE answer to (b)(v) $\times 1000/30$		<b>1</b>

Question Number	Acceptable answers	Reject	Mark
<b>1c</b>	$IO_3^- + 6H^+ + 5e^- \rightarrow \frac{1}{2} I_2 + 3H_2O$ Ignore any other numbers written around the equation.		<b>1</b>

**Total = 14 marks**

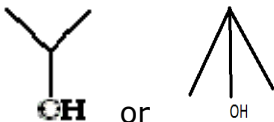
Question Number	Acceptable Answers	Reject	Mark
<b>2a(i)</b>	Quoted range <b>within</b> the appropriate range (3750-3200 $\text{cm}^{-1}$ for -OH group) Allow range the other way round e.g 3200-3750. Allow a single value <b>within</b> the appropriate range e.g 3350. Ignore units		<b>1</b>

Question Number	Acceptable answers	Reject	Mark
<b>2a(ii)</b>	Halogenoalkane/haloalkane/chloroalkane/alkyl halide/alkyl chloride	Chloropropane alone	<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>2b</b>	Not a (carboxylic) acid/ not acidic/does not contain $\text{H}^+$ ions. Ignore reference to ketone	A carboxylic acid is not formed.	<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>2c(i)</b>	Quoted range <b>within</b> the appropriate range (1720-1680 $\text{cm}^{-1}$ for C=O ketone group) Allow range the other way round e.g 1680-1720. Allow a single value <b>within</b> the appropriate range e.g 1700. Ignore units		<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>2c(ii)</b>	Ketone	Propanone alone.	<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>2c(iii)</b>	 Allow skeletal diagram rotated at any angle Ignore structural or displayed formulae.	Structural formula Displayed formula given alone	<b>1</b>

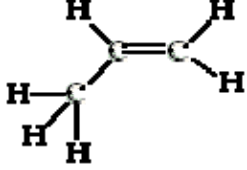
Question Number	Acceptable answers	Reject	Mark
<b>2d(i)</b>	silver chloride/AgCl  If name and formula are given, then both must be correct.		<b>1</b>

Question Number	Acceptable answers	Reject	Mark
<b>2d(ii)</b>	(precipitate) darkens OR goes grey /purple/blue/black (precipitate)	Brown	<b>1</b>

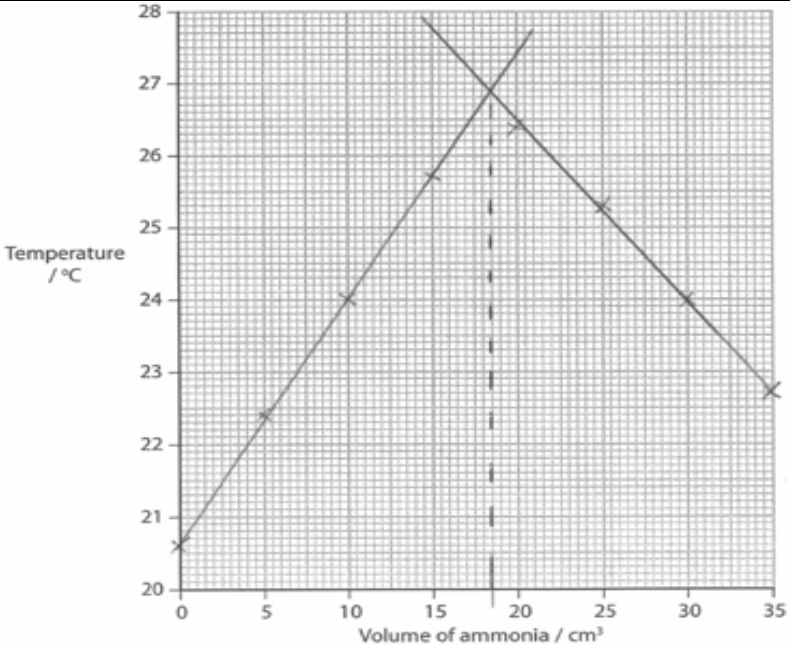
Question Number	Acceptable Answers	Reject	Mark
<b>2d(iii)</b>	Halogenoalkane <b>X</b> is more soluble in (aqueous) ethanol (than in water alone)/ethanol is a better solvent (for <b>X</b> )  OR  Ethanol dissolves ionic/polar and non-polar compounds	Just 'ethanol acts as a solvent'. Just 'ethanol will allow them to mix better'.	<b>1</b>

Question Number	Acceptable Answers	Reject	Mark
<b>2e(i)</b>	bromine (water) <b>(1)</b> turns (from orange/yellow/brown to) <b>colourless/decolorised (1)</b>  OR  (acidic) potassium manganate(VII) <b>(1)</b> turns (from purple to) colourless/brown precipitate <b>(1)</b>  OR  alkaline potassium manganate(VII) <b>(1)</b> turns (from purple to) green / brown precipitate <b>(1)</b>  Allow correct formulae for reagents Oxidation number not essential but if given then must be correct	clear for colourless	2



Question Number	Acceptable answers	Reject	Mark
2e(ii)	 <p data-bbox="279 414 829 481">Allow -CH<sub>3</sub> for the side-chain Ignore structural or skeletal formula.</p>		1

**Total = 12 Marks**

Question Number	Acceptable answers	Reject	Mark
3a(i)	 <p>All points correctly plotted, <math>\pm 1</math> small square (allow one slip) (1) two best-fit straight lines which include all points(1)</p>		2

Question Number	Acceptable Answers	Reject	Mark
3a(ii)	$18.5 \pm 0.5 \text{ (cm}^3\text{)}(2) \pm 1.5 \text{ (cm}^3\text{)}(1)$ further out scores zero		2

Question Number	Acceptable answers	Reject	Mark
3a(iii)	Reaction is exothermic  <b>OR</b> heat is given out (until reaction is complete )		1

Question Number	Acceptable Answers	Reject	Mark
3a(iv)	No further reaction occurring / no further heat produced/all the ethanoic acid is used up. (1) the ammonia solution is cool/the volume increases. (1)  Mark Independently.	Just 'there is no ethanoic acid'.  Just 'heat is lost to the surroundings'.	2

Question Number	Acceptable Answers	Reject	Mark
<b>3b(i)</b>	$q = 50 \times 4.18 \times (29.8 - 20.6) \text{ (J) (1)}$ $= 1922.8 \text{ (J) / } 1923 \text{ (J) (1)}$ Ignore SF except 1 SF  OR  1.923 kJ  Answer alone scores 2.  TE for second mark if incorrect mass or temperature change e.g Use of 25 gives 961.4 (J) and scores 1  Ignore any sign and units if given		<b>2</b>

Question Number	Acceptable Answers	Reject	Mark
<b>3b(ii)</b>	(amount = $(2.00 \times 25/1000) =$ 0.050/0.0500.		<b>1</b>

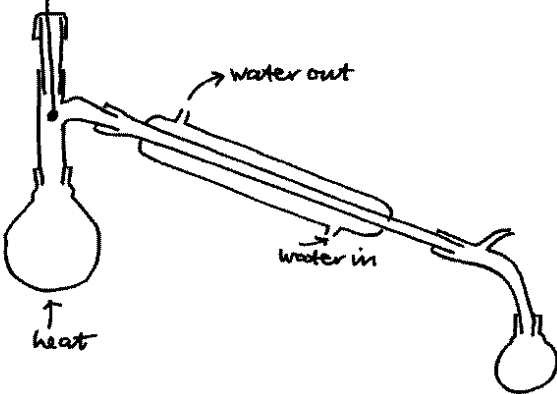
Question Number	Acceptable Answers	Reject	Mark
<b>3b(iii)</b>	$\Delta H = - 1922.8 \div 0.05 \text{ J mol}^{-1}$ $= - 38456 \text{ (J mol}^{-1}) \text{ (1)}$ $= - 38.5 \text{ (1) kJ mol}^{-1} \text{ (1)}$ OR $\Delta H = - 1923 \div 0.05 \text{ J mol}^{-1}$ $= - 38460 \text{ (J mol}^{-1}) \text{ (1)}$ $= - 38.5 \text{ (1) kJ mol}^{-1} \text{ (1)}$  If 1920 J quoted above the answer is $- 38.4$ $\text{kJ mol}^{-1}$ second mark is for number to 3 SF third mark is for sign and units		<b>3</b>

**Total = 13 Marks**

Question Number	Acceptable Answers	Reject	Mark
4a(i)	(The mixture) generates HBr (which attacks the alcohol)  OR  the alcohol must be protonated for the bromide ion to attack it successfully		1

Question Number	Acceptable Answers	Reject	Mark
4a(ii)	The yield would be lower (1) Allow no 1-bromobutane made.  Because bromine/Br <sub>2</sub> would be formed/less HBr would be formed (1)  Formation of alkene (by dehydration reaction) (1)  Any two from the above three answers.	Bromide is reduced to bromine.	2

Question Number	Acceptable answers	Reject	Mark
4b	<b><i>EITHER</i></b> Dilution of sulfuric acid is exothermic/ reaction (of sulfuric acid with water) is (very) exothermic.  <b><i>OR</i></b>  would cause loss of volatile organics. Ignore the reaction is vigorous.	Reaction is explosive.  Just 'acid is corrosive/ dangerous/causes frothing'.	1

Question Number	Acceptable answers	Reject	Mark
4c	<p><u>Simple distillation:</u></p>  <p>Round-bottomed/pear-shaped flask (and contents) and heat/mantle/water bath (1)  Still-head with stoppered thermometer opposite opening to condenser (1)  Condenser with water flowing up(1)  Collection of product from an unsealed apparatus either as shown or from a delivery tube into a flask/beaker or straight from the condenser into flask/beaker. (1)</p> <p>Allow continuous apparatus without joints.</p>		4

Question Number	Acceptable Answers	Reject	Mark
4d	<p>Removes/neutralizes acid/HBr</p> <p>Allow neutralizes sulfuric acid.</p>	<p>Just 'react with acid'</p> <p>Removes HCl</p>	1

Question Number	Acceptable Answers	Reject	Mark
4e	<p>Drying agent/To dry 1-bromobutane / Absorbs any water present/To remove water.</p>	<p>Dehydrating agent</p> <p>Removes <b>excess</b> water.</p>	1

Question Number	Acceptable answers	Reject	Mark
4f	<p>(Re-)distillation (over a narrow range either side of its boiling temperature/at its boiling temperature).</p> <p>Allow fractional distillation.</p>	<p>Stated temperature range of 95 - 105°C or all other values outside of this range.</p>	1

**Total = 11 Marks**  
**QUESTION PAPER TOTAL = 50 MARKS**

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