



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2016**

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination

Practical Booklet B

[AC134]

WEDNESDAY 8 JUNE, AFTERNOON

**MARK
SCHEME**

Annotation

1. Please do all marking in **red** ink.
2. All scripts should be checked for mathematical errors. Please adopt a system of one tick (✓) equals 1 mark, e.g. if you have awarded 4 marks for part of a question then 4 ticks (✓) should be on this candidate's answer.
3. The total mark for each question should be recorded in a circle placed opposite the question number in the teacher mark column.
4. As candidates have access to scripts please do not write any inappropriate comments on their scripts.

General points

- All calculations are marked according to the number of errors made.
- Errors can be carried through. If the wrong calculation is carried out then the incorrect answer can be carried through. One mistake at the start of a question does not always mean that all marks are lost.
- Listing is when more than one answer is given for a question that only requires one answer, e.g. the precipitate from a chloride with silver nitrate is a white solid; if the candidate states a white or a cream solid, one answer is correct and one answer is wrong. Hence they cancel out.
- Although names might be in the mark scheme it is generally accepted that formulae can replace them. Formulae and names are often interchangeable in chemistry.
- The marking of colours is defined in the 'CCEA GCE Chemistry Acceptable Colours' document.

MARKING GUIDELINES

Interpretation of the Mark Scheme

- **Carry error through**
This is where mistakes/wrong answers are penalised when made, but if carried into further steps of the question, then no further penalty is applied. This pertains to calculations and observational/ deduction exercises. Please annotate candidates' answers by writing the letters c.e.t. on the appropriate place in the candidates' answers.
- **Oblique/forward slash**
This indicates an acceptable alternative answer(s).
- **Brackets**
Where an answer is given in the mark scheme and is followed by a word/words in brackets, this indicates that the information within the brackets is non-essential for awarding the mark(s).

Section A

**AVAILABLE
MARKS**

- 1 (a) (i)** Add dropwise at/before end point [1] swirl the flask (wash down the flask with deionised water) [1] read bottom of meniscus [1]. [2]
- (ii)** Any **two**
 Further titrations [1]
 Repeat whole experiment [1]
 Concordant results (within 0.2 cm^3) [1] [2]
- (iii)** $\text{HCl} + \text{NaOH} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$ [1]
- (b) (i)** $23.5/1000 \times 0.040 = 9.4 \times 10^{-4}$
- (ii)** 9.4×10^{-4}
- (iii)** 9.4×10^{-3}
- (iv)** $\frac{100}{1000} \times 0.1 = 0.010$
- (v)** $0.01 - 9.4 \times 10^{-3} = 6 \times 10^{-4}$
- (vi)** $6 \times 10^{-4}/2 = 3.0 \times 10^{-4}$
- (vii)** $3 \times 10^{-4} \times 132 = 3.96 \times 10^{-2} \text{ g}$
- (viii)** $3.96 \times 10^{-2}/1.00 \times 100 = 3.96\%$ [6]
- (c)** moles of $(\text{NH}_4)_2\text{SO}_4 = \frac{2.64}{132} = 0.02$
 $(\text{NH}_4)_2\text{SO}_4 : \text{NH}_3$
 $1 : 2$
 moles of $\text{NH}_3 = 0.04$
 volume of $\text{NH}_3 = 0.04 \times 24 = 0.96 \text{ dm}^3$
 or
 960 cm^3 [4]

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2 (a) Compound **Y** is an ionic salt.
The following tests were carried out on **Y** and the observations noted in the table.

(i) Complete the table by recording the deductions made from these observations.

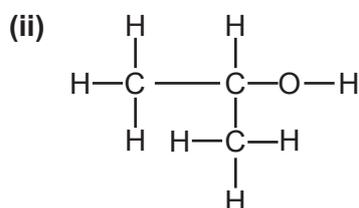
Test	Observations	Deductions
<p>1 Add a spatula measure of Y to a test tube one third full of sodium hydroxide solution and warm gently. Carefully smell any gas given off and test it with moist Universal Indicator paper.</p>	<p>Pungent/choking smell</p> <p>Universal Indicator turns blue</p>	<p>Y contains an ammonium ion/ ammonia present</p> <p>alkaline gas present</p> <p>[2]</p>
<p>2 Add a spatula measure of Y to a test tube containing 1 cm³ of dilute nitric acid. Add 4 drops of barium chloride solution.</p>	<p>No effervescence</p> <p>White precipitate forms</p>	<p>Not a carbonate/ hydrogencarbonate</p> <p>Sulfate (ion) present</p> <p>[2]</p>
<p>3 Make a solution of Y by dissolving a spatula measure of Y in a test tube half-full of water.</p> <p>Add 3 drops of sodium hydroxide solution to the first test tube. Then add a further 2 cm³ of the sodium hydroxide solution to this test tube.</p>	<p>Brown precipitate</p> <p>Precipitate does not dissolve</p>	<p>Fe³⁺ ion present</p> <p>[1]</p>

(ii) NH_4^+ , Fe^{3+} , SO_4^{2-} [3]

- (b) Compound **Z** is an organic liquid.
The following tests were carried out on **Z** and the observations noted in the table.

- (i) Complete the table by recording the deductions made from these observations.

Test	Observations	Deductions
1 Place 10 drops of Z on a watch glass placed on a heatproof mat. Ignite it using a burning splint.	Burns with a non-smoky flame	Low carbon content/saturated (hydrocarbon) [1]
2 Place 1 cm ³ of Z in a test tube and add 1 cm ³ of water. Add a bung and shake the test tube.	One layer forms	Miscible/can H-bond/ not a hydrocarbon/ contains an –OH [1]
3 Place 1 cm ³ of Z in a test tube. Add 2 cm ³ of acidified potassium dichromate solution. Warm the mixture gently and leave to stand for 5 minutes.	Orange solution turns green	Primary, Secondary alcohol or aldehyde/ Not a tertiary alcohol. Oxidation has occurred [1]
4 Add 4 cm ³ of Z to half a spatula of iodine in a test tube. Add 4 cm ³ of 10% aqueous sodium hydroxide. Shake the test tube vigorously.	Yellow precipitate forms, with antiseptic smell.	Iodoform produced [1]



[2]

(iii) propan-2-ol

[1]

Section A

AVAILABLE
MARKS

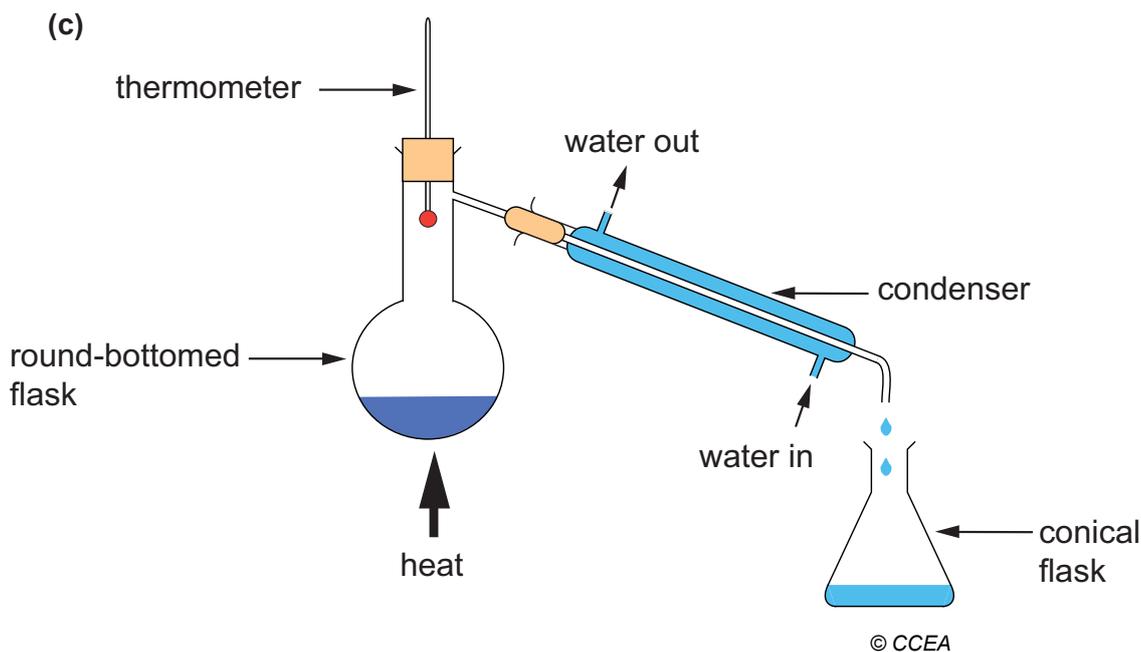
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Section B

AVAILABLE
MARKS

- 3 (a) (i) to ensure smooth boiling [1]
 (ii) dissipate/spread the heat evolved [1]
 (iii) oxidising agent [1]
 (iv) repeated boiling and condensing of a reaction mixture [1]
 (v) anhydrous magnesium sulfate/calcium chloride/sodium sulfate [1]
 removed by filtration/decant [1] [2]
 (b) (i) mass of $C_2H_5OH = 0.79 \times 15 = 11.85 \text{ g}$
 moles of $C_2H_5OH = 11.85/46 = 0.258$
 100% yield = $0.258 \times 60 = 15.48 \text{ g}$ [4]
 (ii) Any **two**
 side reactions [1]
 loss in distillation [1]
 incomplete oxidation [1] [2]
 (iii) no alcohol OH/peak at $3230\text{--}3350 \text{ cm}^{-1}$ [1]



[−1] for errors, e.g. sealed apparatus etc. [4]

- (d) The dipole–dipole forces between ethanal molecules are weaker [1]
 than the H–bonds between molecules of ethanol [1]
 Less energy needed to break the intermolecular bonds [1] [3]

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			AVAILABLE MARKS
4	(a) $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightleftharpoons \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$	[2]	
	(b) (i) Excess $\text{C}_2\text{H}_5\text{OH}$: the system will reduce concentration by reacting more ethanol with ethanoic acid and pushing the equilibrium to the RHS.	[1]	
	(ii) The acid removes water.	[1]	
	(c) (i) $10.5/60 = 0.175$ moles	[1]	
	(ii) $0.175 \times 88 = 15.4\text{g}$	[1]	
	(iii) $5/15.4 \times 100 = 32.47$ (32.5)%	[1]	7
5	(a) place in e.g. a test tube and measure mass heat and reweigh until the mass does not change } or heat and weigh to constant mass	[2]	
	(b) use an insulated container/plastic beaker/glass beaker measure initial and final temperatures of water to find ΔT add (5.0g) of solid to (100 cm^3) of water and stir use $\Delta H = mc\Delta T$ to determine ΔH	[4]	
	(c) add a few drops of (dilute) sodium hydroxide solution/(dilute) ammonia solution [1] white precipitate forms [1] and dissolves in excess sodium hydroxide/ does not dissolve or (dilute) ammonia solution [1]	[3]	9
Section B			36
Total			66