



*Rewarding Learning*

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

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## **Chemistry**

**Assessment Unit AS 3**

*assessing*

**Module 3: Practical Examination**

**Practical Booklet B**

**[AC134]**

**WEDNESDAY 8 JUNE, AFTERNOON**

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**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<sup>3</sup>) [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)**  $9.4 \times 10^{-4}$
- (iii)**  $9.4 \times 10^{-3}$
- (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  
 $960 \text{ cm}^3$  [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.

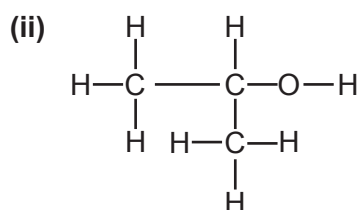
Test	Observations	Deductions
<p><b>1</b> Add a spatula measure of <b>Y</b> to a test tube one third full of sodium hydroxide solution and warm gently. Carefully smell any gas given off and test it with moist Universal Indicator paper.</p>	<p>Pungent/choking smell</p> <p>Universal Indicator turns blue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

(ii)  $\text{NH}_4^+$ ,  $\text{Fe}^{3+}$ ,  $\text{SO}_4^{2-}$  [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 <b>Z</b> on a watch glass placed on a heatproof mat. Ignite it using a burning splint.	Burns with a non-smoky flame	<b>Low carbon content/saturated (hydrocarbon)</b>  [1]
2 Place 1 cm <sup>3</sup> of <b>Z</b> in a test tube and add 1 cm <sup>3</sup> of water. Add a bung and shake the test tube.	One layer forms	<b>Miscible/can H-bond/ not a hydrocarbon/ contains an –OH</b>  [1]
3 Place 1 cm <sup>3</sup> of <b>Z</b> in a test tube. Add 2 cm <sup>3</sup> of acidified potassium dichromate solution. Warm the mixture gently and leave to stand for 5 minutes.	Orange solution turns green	<b>Primary, Secondary alcohol or aldehyde/ Not a tertiary alcohol.</b>  <b>Oxidation has occurred</b>  [1]
4 Add 4 cm <sup>3</sup> of <b>Z</b> to half a spatula of iodine in a test tube. Add 4 cm <sup>3</sup> of 10% aqueous sodium hydroxide. Shake the test tube vigorously.	Yellow precipitate forms, with antiseptic smell.	<b>Iodoform produced</b>  [1]



[2]

(iii) propan –2–ol

[1]

Section A

AVAILABLE  
MARKS

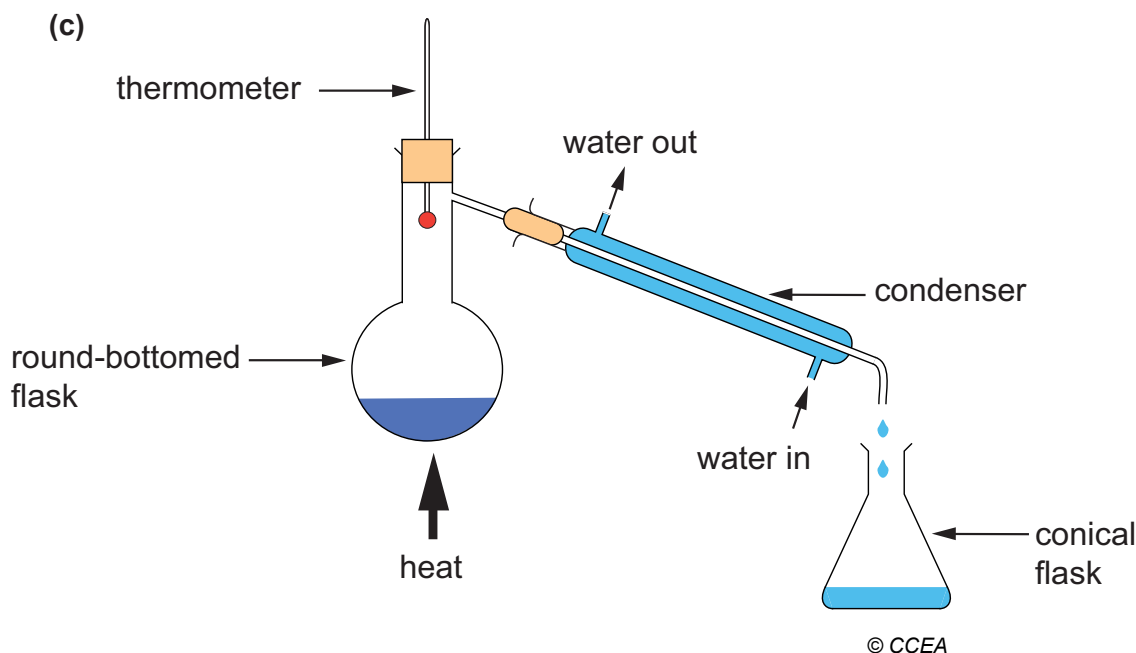
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Section B

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
<b>4</b>	<b>(a)</b> $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightleftharpoons \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$	[2]	
	<b>(b) (i)</b> 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]	
	<b>(ii)</b> The acid removes water.	[1]	
<b>(c)</b>	<b>(i)</b> $10.5/60 = 0.175$ moles	[1]	
	<b>(ii)</b> $0.175 \times 88 = 15.4\text{g}$	[1]	
	<b>(iii)</b> $5/15.4 \times 100 = 32.47$ (32.5)%	[1]	7
<b>5</b>	<b>(a)</b> place in e.g. a test tube and measure mass heat and reweigh until the mass does not change } <b>or</b> heat and weigh to constant mass	[2]	
	<b>(b)</b> use an insulated container/plastic beaker/glass beaker measure initial and final temperatures of water to find $\Delta T$ add (5.0g) of solid to (100 $\text{cm}^3$ ) of water and stir use $\Delta H = mc\Delta T$ to determine $\Delta H$	[4]	
	<b>(c)</b> 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
<b>Section B</b>			<b>36</b>
<b>Total</b>			<b>66</b>