



Rewarding Learning

ADVANCED
General Certificate of Education
2015

Chemistry

Assessment Unit A2 3

assessing

Module 3: Practical Examination

Practical Booklet B

[AC234]

MONDAY 11 MAY, MORNING

**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.
- Any number of decimal places may be used provided the 'rounding' is correct.
- 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).

- 1 (a) (i) $5\text{Fe}^{2+} + \text{MnO}_4^- + 8\text{H}^+ \rightarrow 4\text{H}_2\text{O} + 5\text{Fe}^{3+} + \text{Mn}^{2+}$ [2]
- (ii) pink [1]
- (iii) MnO_4^- [1]
- (iv) Performing a rough titration [1]
 adding dropwise before the endpoint [1]
 repeat for values within $\pm 0.1 \text{ cm}^3$ [1]
 Any 2 from 3 [2]
- (b) Weigh (6.0g of) tablets on a balance
 In a beaker add (50 cm^3) of deionised water to the tablets }
 Stir to dissolve }
 Transfer with washings into a 250 cm^3 volumetric flask }
 Make up to the mark with deionised water/bottom of meniscus on line }
 (Stopper) and invert max [4]
- (c) $22.4/1000 \times 0.02 = 0.000448$
 Moles $\text{Fe}^{2+} = 0.000448 \times 5 = 0.00224$ in 25 cm^3
 $= 0.0224$ in 250 cm^3
 RFM $\text{FeSO}_4 \cdot 6\text{H}_2\text{O} = 260$
 Mass $\text{FeSO}_4 = 0.0224 \times 260 = 5.824 \text{ g}$
 $\% = 5.824/6.00 \times 100 = 97.07\%$ [4]
- (d) (i) blood red (solution) [1]
- (ii) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+} + \text{SCN}^- \rightarrow [\text{Fe}(\text{H}_2\text{O})_5(\text{SCN})]^{2+} + \text{H}_2\text{O}$ [2]

AVAILABLE
MARKS

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2 (a) (i) Based on the following observations, make deductions for salt **A**.

Test	Deductions
1 Dissolve A in 20 cm ³ of water	
2 Add a few drops of concentrated ammonia solution to 2 cm ³ of the solution of A in a test tube.	Confirms Fe ³⁺ /iron(III) hydroxide formed [1]/Fe(III)
3 Add 1 cm ³ of barium chloride solution to 2 cm ³ of the solution of A in a test tube, allow the mixture to settle.	Sulfate (ions) present [1]

(ii) Fe₂(SO₄)₃

[1]

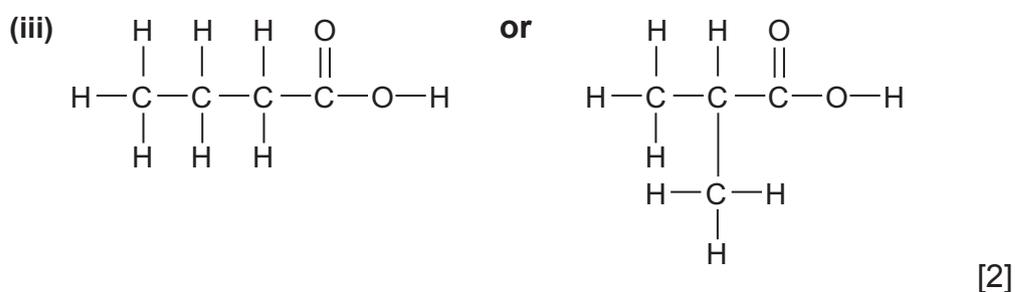
AVAILABLE
MARKS

- (b) (i) Interpret the following data and identify the structural formula of the organic compound **B**, which has the *empirical* formula C_2H_4O .

AVAILABLE
MARKS

Test	Observations	Deductions
1 Describe the appearance of B .	<i>Colourless liquid.</i> <i>Pungent smell</i>	
2 Add 2 cm ³ of deionised water to 2 cm ³ of B in a test tube	<i>One layer forms.</i>	B is miscible with water/ completely soluble/ –OH group present/can hydrogen bond (with water). [1]
3 Add 10 drops of B to 2 cm ³ of acidified potassium dichromate solution in a test tube. Place the test tube in a hot water bath.	<i>Solution stays orange.</i>	Not an aldehyde or primary or secondary alcohol/ Possibly a tertiary alcohol/ketone/ carboxylic acid. [1]
4 Place 2 cm ³ of B into a test tube. In a fume cupboard cautiously add a very small spatula measure of phosphorus(V) chloride to the test tube.	<i>Fizzing.</i> <i>Solid dissolves.</i> <i>White fumes.</i>	–OH present. –COOH present. [1]
5 Place 5 cm ³ of B in a boiling tube. Add 5 cm ³ of ethanol, and then 1 cm ³ of concentrated sulfuric acid. Heat the boiling tube in a water bath. Cautiously smell the contents of the boiling tube.	<i>Sweet smell</i>	Ester (produced). –COOH present. [1]
6 Add a spatula measure of sodium carbonate to 2 cm ³ of B in a test tube.	<i>Fizzing.</i> <i>Solid dissolves.</i>	CO ₂ released. B is a carboxylic acid. [2]

(ii) Carboxylic acid(s) [1]



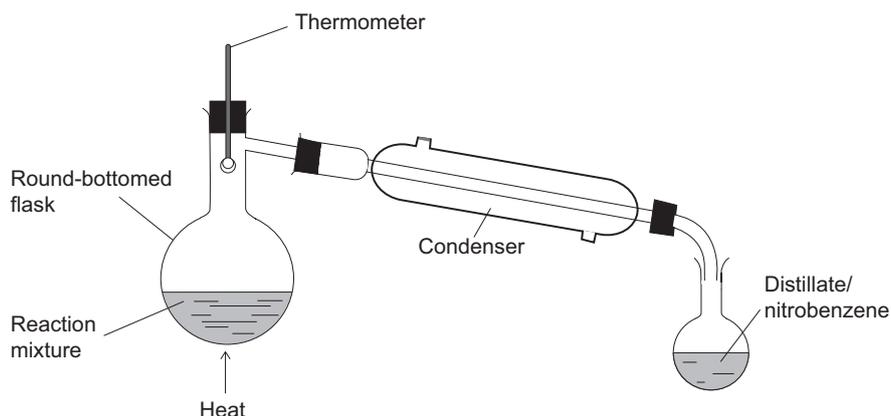
(iv) $^+\text{CH}_2\text{COOH}/\text{CH}_2\text{COOH}^+/\text{C}_2\text{H}_3\text{O}_2^+$ [1]

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3 (a) Ammonia is a nucleophile [1]

(b) (i) Repeated boiling and condensing of a reaction mixture. [1]

(ii)

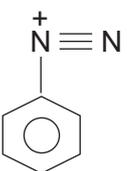


no heat source [-1]
no double jacket on condenser [-1] distillation flask open at top [-1]
thermometer missing [-1], bulb not opposite side arm [-1]
no labels [-1]
If water in and out IS shown [-1]
sealed apparatus [-1]
continuous connection to and from condenser [-1] – penalise once [4]

(c) moles nitrobenzene = $7/123 = 0.057$ moles (90%)
100% = 0.063 moles
Moles benzene = 0.063
Mass benzene = $0.063 \times 78 = 4.91$ g
Vol = mass/density = $4.91/0.88 = 5.58$ cm³ [4]

(d) Place in separating funnel [1]
Add sodium carbonate/hydrogencarbonate solution [1]
Stopper, invert (and shake)
Open tap (to release pressure) } [1]
Run off (lower) layer [1] [4]

Quality of written communication [2]

(e) (i)  [2]

(ii) potassium iodide, aqueous [1] allow to warm up/heat/reflux [1] [2]

Total

20

50