



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2015**

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination

Practical Booklet B

[AC134]

WEDNESDAY 27 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.
- 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

- 1 (a) (i) to speed up the reaction [1]
(ii) fizzing stops [1]
- (b) (i) $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ [2]
(ii) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ [1]
- (c) methyl orange [1] pink/red [1] to orange/yellow [1]
or phenolphthalein [1] colourless [1] to pink [1] [3]
- (d) Number of moles of hydrochloric acid added to the toothpaste
 $(40 \times 0.5)/1000 = 0.02$
Number of moles of sodium hydroxide required for neutralisation
 $(12 \times 0.1)/1000 = 0.0012$
Number of moles of hydrochloric acid in the 25.0 cm^3 portion
0.0012
Number of moles of hydrochloric acid in the 250 cm^3 mixture
 $0.0012 \times 10 = 0.012$
Number of moles of hydrochloric acid reacting with calcium carbonate
in the toothpaste
 $0.02 - 0.012 = 0.008$
Number of moles of calcium carbonate present in the 2.0 g sample of
toothpaste
(1:2) 0.004
Mass of calcium carbonate present in the 2.0 g sample of toothpaste
 $0.004 \times 100 = 0.4 \text{ g}$
The percentage calcium carbonate in the toothpaste
 $(0.4/2) \times 100\% = 20\%$ [6]
error [-1]

AVAILABLE
MARKS

14

2 Observation and deduction

(a)

Test	Observations	Deductions
1 Add a spatula measure of X to a boiling tube half filled with deionised water. Retain for Tests 2 , 3 and 5 .	Colourless solution [1]	
2 Pour 1 cm ³ of the solution from Test 1 into a test tube. (a) Add 5 drops of silver nitrate solution. (b) Add 4 cm ³ dilute ammonia solution.	white precipitate [2] precipitate disappears/ colourless solution [1]	<i>Chloride ions present</i> <i>Chloride ions confirmed</i>
3 Pour 1 cm ³ of the solution from Test 1 into a test tube. (a) Add 5 drops of potassium chromate solution. (b) Add 5 cm ³ of dilute hydrochloric acid.	yellow precipitate [2] yellow solution [1]	<i>Barium ions present</i>
4 Dip a nichrome wire loop in concentrated hydrochloric acid, touch sample X with the wire, then hold it in a blue Bunsen flame.	green flame [1]	<i>Confirms barium ions present</i>
5 Place 1 cm ³ of magnesium sulfate solution in a test tube and add 5 drops of the solution from Test 1 .	white precipitate [2]	

AVAILABLE
MARKS

(b)

Test	Observations	Deductions
1 To 10 drops of Y in a test tube add 1 cm ³ of water.	<i>Two layers formed</i>	immiscible/no OH group/not soluble in water [1]
2 Place 10 drops of Y on a watch glass on a heatproof mat and ignite it using a burning splint.	<i>Burns with a yellow, smoky flame</i>	High carbon content [1]
3 Add approximately 10 drops of Y to a test tube quarter full of bromine water and mix well.	<i>Orange bromine water is decolourised</i>	contains C=C [1]
4 Add 10 drops of Y to 2 cm ³ of acidified potassium dichromate solution in a test tube and warm gently.	<i>Orange colour remains</i>	not a primary or secondary alcohol or an aldehyde [1]

From Test 3 what functional group is present in **Y**?

C = C [1]

From Test 4 what functional group may be absent from **Y**?

—OH/—CHO [1]

Section A

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MARKS

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Section B

- 3 (a) (i)** RFM $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} = 250 \therefore$ mass required = $250/4 = 62.5\text{g}$ [2]
- (ii)** Weigh out calculated mass of hydrated copper sulfate into a beaker [1]
 Dissolve in (stated volume of) deionised water [1]
 Pour into 250 cm^3 volumetric flask with washings [1]
 Make up to the mark with deionised water and shake [1]
- (b)** measuring cylinder [1]
- (c)** cup has good insulation [1]
- (d)** solution turns from blue to colourless [1] red brown solid [1] [2]
- (e) (i)** number of moles of magnesium = $2/24 = 0.08$ [1]
 number of moles of copper sulfate = $(50 \times 1.0)/1000 = 0.05$ [1]
- (ii)** magnesium is in excess [1]
- (f) (i)** $\Delta H = mc\Delta T = 50 \times 4.2 \times 35 = 7350\text{ J [1]} = 7.35\text{ kJ}$ [2]
- (ii)** $\Delta H = 7.35/0.05 = -147\text{ kJ mol}^{-1}$ [1]
- (g)** insulating the polystyrene cup further with, e.g. cotton wool/cover with lid [1]
- (h)** add drops of dilute ammonia solution [1]; blue precipitate [1]
 dark/deep blue solution formed on addition of excess dilute ammonia solution [1] [3]
- 4 (a)** bromine is toxic [1]
- (b)** the reaction is very vigorous [1]
- (c)** repeated boiling and condensing of the reaction mixture [1]
- (d)** to dry the product [1]
- (e) (i)** add (drops of) deionised water and observe which layer increases [1]
- (ii)** filter/decant [1]
- (f)** number of moles of 2-methylbut-2-ene = $10/70 = 0.143$
 number of moles of 2,3-dibromo-2-methylbutane expected = 0.143
 mass of 2,3-dibromo-2-methylbutane expected = $0.143 \times 230 = 32.89\text{g}$
 percentage yield = $26.3/32.89 \times 100\% = 80\%$ [4]

AVAILABLE
MARKS

20

10

5 Ammonium ion: warm with sodium hydroxide (solution) [1] gas given off produces white fumes [1] with a glass rod dipped in concentrated hydrochloric acid [1]

Magnesium ion: make a solution of the salt [1] white precipitate formed with drops of sodium hydroxide (solution) [1] precipitate remains on addition of excess sodium hydroxide [1] [6]

Section B

Total

**AVAILABLE
MARKS**

6

36

66