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

AVAILABLE MARKS

1 **(a)** **(i)** to speed up the reaction [1]

(ii) fizzing stops [1]

(b) **(i)** $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$ [2]

(ii) $NaOH + HCl \rightarrow NaCl + H_2O$ [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 × 0.5)/1000 = 0.02

Number of moles of sodium hydroxide required for neutralisation
(12 × 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 × 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 × 100 = 0.4 g

The percentage calcium carbonate in the toothpaste
(0.4/2) × 100% = 20% [6] 14

error [–1]

2 Observation and deduction

AVAILABLE MARKS

(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]	*Chloride ions present* *Chloride ions confirmed*
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]	 *Barium ions present*
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]	*Confirms barium ions present*
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]	

(b)

AVAILABLE MARKS

	Test	Observations	Deductions
1	To 10 drops of **Y** in a test tube add 1 cm^3 of water.	*Two layers formed*	**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.	*Burns with a yellow, smoky flame*	**High carbon content** [1]
3	Add approximately 10 drops of **Y** to a test tube quarter full of bromine water and mix well.	*Orange bromine water is decolourised*	**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.	*Orange colour remains*	**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]

16

Section A **30**

Section B

AVAILABLE MARKS

3 **(a)** **(i)** RFM $CuSO_4.5H_2O$ = 250 ∴ mass required = 250/4 = 62.5 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 × 1.0)/1000 = 0.05 [1]

(ii) magnesium is in excess [1]

(f) **(i)** $\Delta H = mc\Delta T = 50 \times 4.2 \times 35 = 7350$ J [1] = 7.35 kJ [2]

(ii) $\Delta H = 7.35/0.05 = -147$ 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] 20

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 × 230 = 32.89 g
percentage yield = 26.3/32.89 × 100% = 80% [4] 10

		AVAILABLE MARKS
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]	6
	Section B	**36**
	Total	**66**