Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination
Practical Booklet B

[AC134]

FRIDAY 9 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

	Rough	Accurate 1	Accurate 2
Final burette reading	20.5	40.6	19.9
Initial burette reading	0.0	20.5	0.0
Titre/cm^3	**20.5**	**20.1**	**19.9**

(a) **(i)** 20.5, 20.1 and 19.9 [1]

(ii) 20.0 cm^3 [1] [2]

(b) Methyl orange [1]
Yellow to red [2] [3]

(c) $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$ [2]

(d) moles of hydrochloric acid used in the titration
0.002

moles of sodium carbonate in 25.0 cm^3
0.001

moles of sodium carbonate in 500 cm^3
0.02

mass of sodium carbonate in 500 cm^3
2.12 g

mass of water in the sample
3.60 g/3.6 g

percentage of water of crystallisation in the sample
$\frac{3.60}{5.72} \times 100 = 62.9/62.94$ [6]

(e) Heat to constant mass [1]

14

AVAILABLE MARKS

2 **(a)** A mixture of two salts, labelled **A**, have a common cation. The following tests were carried out on **A**. Complete both columns in the table and identify the two salts.

	Test	Observations	Deductions
1	Describe the appearance of **A**.	White solid	**Does not contain a transition metal ion** [1]
2	Dip a nichrome wire into concentrated hydrochloric acid, touch sample **A** with the wire, then hold it in a blue Bunsen flame.	Lilac flame	**Contains K^+/ potassium ions** [1]
3	Add concentrated sulfuric acid to a spatula measure of **A** in a boiling tube. Heat the boiling tube.	A grey-black solid forms A purple vapour forms Smell of rotten eggs	**Iodine/iodide** [1] **Hydrogen sulfide** [1] [2]
4	Add a spatula measure of **A** to a test tube half filled with dilute nitric acid. Add a few drops of silver nitrate solution.	A colourless solution forms with no effervescence A yellow precipitate forms	**Not a carbonate or a hydrogencarbonate** [1] **Iodide ions/ silver iodide [1]** [2]
5	Add a spatula measure of **A** to a test tube half filled with deionised water. Add chlorine water.	A colourless solution forms **Solution turns yellow/brown** [1]	[redacted]

Name the **two** salts present in **A**.

Potassium iodide [1]

Potassium sulfate [1]

(b) The following tests were carried out on an organic liquid **B**. Complete the table, giving observations and deductions.

AVAILABLE MARKS

	Test	Observations	Deductions
1	Add 1 cm^3 of **B** to 1 cm^3 of water in a test tube.	A single layer forms	**Soluble** [1]
2	Add a spatula measure of phosphorus(V) chloride to 4 cm^3 of **B** in a boiling tube.	Solid disappears Steamy fumes produced Hissing sound	**–OH present** [1]
	Test any gas produced using damp blue litmus paper.	Paper turns red	**Gas is acidic** [1]
	Test any gas produced using a glass rod which has been dipped in concentrated ammonia solution.	**White smoke** [1]	**Hydrogen chloride** [1]
3	Add 1 cm^3 of **B** to 2 cm^3 of acidified potassium dichromate in a test tube. Warm the mixture gently in a water bath.	The solution remains orange	**Is not oxidised** [1]

$(CH_3)_3COH$ or $CH_3CH_2CH_2COOH$ (or isomer of carboxylic acid) [1] 16

Section A **30**

Section B

AVAILABLE MARKS

3 **(a)** Minimises heat **gain** from surroundings [1]

(b) Improves insulation/increases stability [1]

(c) Burette/pipette [1] thermometer [1] balance [1] [3]

(d) $2KHCO_3 + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O + 2CO_2$ [2]

(e) To ensure that all $KHCO_3$ reacts [1]

(f) Weigh 5.0 g of potassium hydrogencarbonate using a balance [1]
Add/Transfer 50.0 cm^3 of (2.0 mol dm^{-3}) sulfuric acid into a polystyrene cup using a burette/pipette [1]
Measure the initial temperature of the acid using a thermometer [1]
Add/Transfer the potassium hydrogencarbonate into the acid [1]
Stir (the contents with the thermometer) [1]
Measure the final temperature/lowest temperature reached [1] [6]

(g) Number of moles in 5.0 g of potassium hydrogencarbonate
0.05 $\left(\frac{5.0}{100} = 0.05\right)$ [1]

Heat energy (in kJ) absorbed from the solution
1.5 (30 × 0.05) [1]

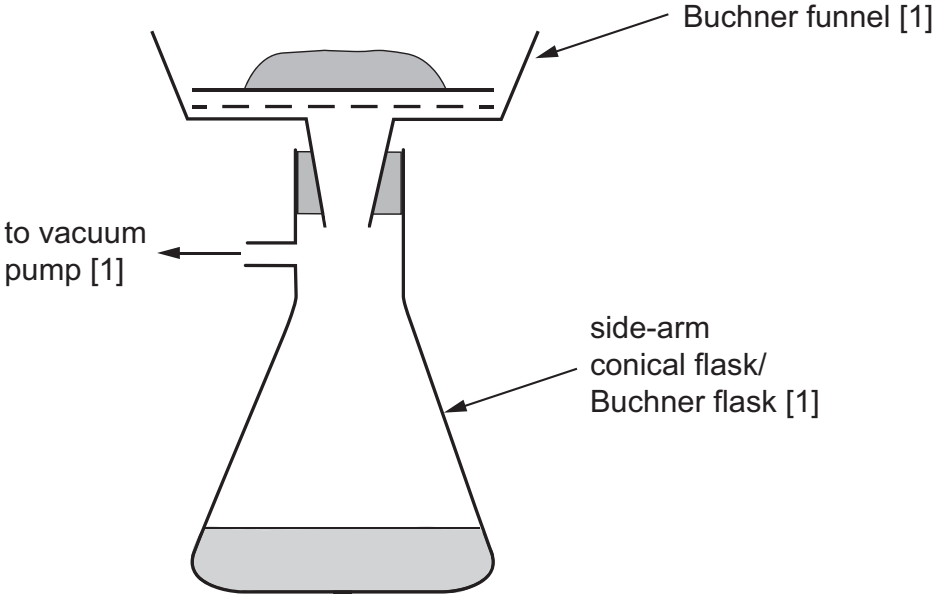
Heat energy (in J) absorbed from the solution
1500 (1.5 × 1000)1 [1]

Temperature change (ΔT)
7.2/7.18 $\left(\frac{1500}{4.1 \times 50}\right)$ [1]

Final temperature of solution (°C)
10.82/10.8 (18 – 7.2) [1] [5]

(h) Effervescence/colourless solution forms/solid disappears [1]

20

			AVAILABLE MARKS
4	**(a)** **(i)** $KBr + H_2SO_4 \rightarrow KHSO_4 + HBr$ [1]		
	(ii)  [3]		
	(iii) Goggles and gloves [1]		
	(b) Propan-2-ol [1]		
	(c) Anti-bumping granules [1]		
	(d) Isopropyl alcohol unlikely to ignite/easier to control [1]		
	(e) Hydrobromic acid/hydrogen bromide [1]		
	(f) Add water [1] organic layer stays the same/does not increase [1] [2]		
	(g) Drying agent [1]		
	(h) 2-bromopropane RMM = 123 Theoretical yield 13.3 g Theoretical yield 0.108 moles Moles isopropyl alcohol = 0.108 Mass of isopropyl alcohol (RMM = 60) = 6.48/6.5 g [4]		16
		Section B	**36**
		Total	**66**