Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2013

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination 1

[AC131]

MONDAY 20 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 (✓) = 1 mark, e.g. if you have awarded 4 marks for part of a question then 4 ticks (✓) should be on the 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).

Section A

1 **(a)** Weigh out 2.90 g of washing soda (**essential**) [1]
Dissolve in (approximately 100 cm^3 of) deionised water (not in a volumetric flask) [1]
Transfer solution to 250 cm^3 volumetric flask [1]
Add washings to flask [1]
Make up to mark **and** invert flask to mix contents [1]
(4 out of 5) max [4]

(b) Table [3]
Decimal places [2]
Average titre [2]
Titration consistency [1] [8]

NOTES

Table [3]
The Table should be drawn **as a table**. It should be labelled with the following: initial burette reading, final burette reading and the titre. It is not necessary to use exactly these words but there should be appropriate columns and rows. The recorded readings should be checked for mathematical accuracy. [1]

The rough titration value should be **greater** than the accurate values (no more than 2.0 cm^3 greater) [1].
Units, i.e. cm^3, should be stated [1].

Use of decimal places [2]
All burette readings should be to at least one decimal place – each mistake is penalised by one mark.
(However initial burette readings of 0 are penalised once only.)

If used, the second decimal place position should be 0 or 5 only – other values will be penalised by one mark each time used.

Average titre [2]
Accurate titrations only should be used. The use of a rough value is [–1].
The average value can be calculated to two decimal places or more, e.g. 25.15 and 25.20 average to 25.175.
If three accurate titres are recorded, then the average titre must be calculated using all three accurate titres.

Any error is [–1]. This might be an incorrect calculation or the omission of units.
If the average titre is included in the table then the units indicated on the table apply.

Titration consistency [1]
This is the difference within the accurate titrations. If three accurate values are given then the difference between the highest and lowest is used.

Difference	Mark
±0.2	[1]
>0.2	[0]

(c) Yellow [1] to orange/red/pink [1] [2]

(d) $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$ [2]
(Correct formulae [1]/correct balancing [1])

(e) **(i)** Correct calculation using average titre [1]

(ii) Use of 2 : 1 ratio [1]

(iii) Answer to **(ii)** × 40 [1]

(iv) Answer to **(iii)** × 106 [1]

(v) 11.60 – answer to **(iv)** [1]

(vi) Moles H_2O = answer to **(v)**/18 [1]
Ratio moles Na_2CO_3 : moles H_2O [1] [2]

(f) Colourless liquid on walls of test tube/condensation [1]
change from crystals to powder [1] [2] 25

2 Observation and deduction

Safety glasses should be worn at all times and care should be taken during this practical examination.

(a) You are provided with a mixture of two salts, labelled **A**, which have a common anion. Carry out the following experiments on the mixture. Record your observations and deductions in the spaces below and identify the two salts.

	Experiment	Observations	Deductions
1	Describe **A**.	*White solid/crystals/ powder* [1]	*Not a transition metal compound or ion/Group I or II metal compound or ion/ammonium ion* [1]
2	Make a solution of **A** by dissolving half a spatula-measure of **A** in a test tube half-full of water. Put 1 cm^3 of the solution into each of two separate test tubes.		
	(a) Add three drops of sodium hydroxide solution to the first test tube. Then add a further 2 cm^3 of the sodium hydroxide solution to the test tube.	*White precipitate* [1] *Soluble/dissolves* [1] [2]	Al^{3+}, Mg^{2+} & Zn^{2+} *ions* [1] Al^{3+} *or* Zn^{2+} *ions* [1] [2]
	(b) Add three drops of dilute ammonia solution to the second test tube. Then add a further 2 cm^3 of the ammonia solution to the test tube.	*White precipitate* [1] *Insoluble/does not dissolve* [1] [2]	Al^{3+} *or* Zn^{2+} *ions* [1] Al^{3+} *ions* [1] [2]
3	Make a solution of **A** by dissolving a half spatula-measure of **A** in a test tube one third full of dilute hydrochloric acid.	*No fizzing/ effervescence* [1]	*Not a carbonate/ hydrogen carbonate* [1]
	Add 1 cm^3 of barium chloride solution to the test tube.	*White precipitate* [1]	*Sulfate ion* [1]
4	Add a spatula-measure of **A** 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.	*UI paper turns blue* [1] *Pungent/choking smell* [1] [2]	*Alkaline gas/pH 8–11* [1] *Ammonia gas* [1] *Ammonium ions* [1] [3]

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

aluminium sulfate [1] and ammonium sulfate [1] [2]

(b) You are provided with an organic liquid labelled **B**. Carry out the following experiments on the liquid. Record your observations and deductions in the spaces below.

	Experiment	Observations	Deductions
1	Place 1 cm^3 of **B** in a test tube and add 1 cm^3 of water. Stopper and shake the mixture.	*Two layers formed* [1]	*Immiscible with water/ Does not H bond with water* [1]
2	Place 10 drops of **B** on a watch glass placed on a heat proof mat and ignite it using a splint.	*Yellow flame* [1]	*High carbon content/ Does not contain C═C* [1]
3	In a fume cupboard add approximately 1 cm^3 of **B** to a test tube one quarter full of bromine water and mix well.	*Two layers/some of the orange/brown/ yellow colour moves to the upper layer/No decolorisation* [1]	*Not an alkene* [1]
4	Add six drops of **B** to 1 cm^3 of potassium dichromate solution in a test tube and acidify by adding 1 cm^3 of dilute sulfuric acid. Warm the mixture gently.	*Changes colour from orange to green* [1] *Change in smell* [1] [2]	*Primary/secondary alcohol/not a tertiary alcohol* [1] *Aldehyde formed/B oxidised/Dichromate reduced* [1] [2]

Based on the experiments above, suggest:

a functional group which may be present in **B**.

–OH [1]

a functional group which may be absent from **B**.

C═C [1]

Mark to a maximum of [29] for question 2 29

Section A **54**

Section B

3 **(a)** **(i)** 5/254 = 0.0197 [1]

(ii) (0.0197/3) × 2 = 0.0131 [1]

(iii) 5 x 0.8 = 4.0 g (units needed) [1]

(iv) 4.0/46 = 0.08696 or 0.087 [1]

(v) 0.0131 × 3 = 0.0393 [1]

(vi) 0.0393 × 156 = 6.13 g (units needed) [1]

(vii) (4.85/6.13) × 100 = 79.1% [1]

(b) **(i)** Repeated boiling [1] and condensing of a reaction mixture [1] [2]

(ii) To remove heat from the reaction mixture/The reaction is vigorous/violent/exothermic [1]

(iii) Phosphorus [1] phosphoric(III) acid [1] [2]

(iv) Place distillate in the separating funnel and add sodium carbonate/ hydrogen carbonate (solution) [1]
Shake [1] and release pressure [1] [3]

(v) Anhydrous sodium sulfate [1]/$CaCl_2$/$MgSO_4$
Filter/decant [1] [2]

(vi) Iodoethane boils below 100 °C/Safety if qualified [1]

(vii) Iodoethane boils within this temperature range [1]
Ethanol does not boil in this range [1]
To collect as much distillate as possible [1]
(Any **two**) [2] 20

4	**(a)**	Add dilute hydrochloric acid [1] Bubble the gas given off through limewater [1] Limewater goes cloudy/milky [1]	[3]	
	(b)	Dip a nichrome wire in conc. hydrochloric acid/silica rod in water [1] Dip in solid and heat in a blue Bunsen flame [1] Brick red flame [1]	[3]	
	(c)	Make a solution by dissolving dolomite in hydrochloric acid [1] Add dilute sodium hydroxide/ammonia solution [1] White precipitate [1] Insoluble in excess sodium hydroxide/ammonia solution [1]	[4]	10
5	**(a)**	Relights [1] a glowing splint [1]	[2]	
	(b)	365/24000 = 0.0152 [1] (0.0152/3) × 2 = 0.0101 [1] 0.0101 × 122.5 = 1.237 g [1]/1.242 4.0 – 1.237 = 2.763 g [1]/2.758 } calculator values carried through	[4]	6
			Section B	**36**
			Total	**90**