Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2014

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination
Practical Booklet B

[AC134]

THURSDAY 8 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).

1 **(a)** Colourless   to   pink/red   [2]

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

          (ii) $HCl + NaOH \rightarrow NaCl + H_2O$ [1]

    (c) **(i)**   Number of moles of sodium hydroxide = $\dfrac{23.8 \times 0.1}{1000}$

                                           = 0.00238   [1]

          (ii)   Number of moles of hydrochloric acid in 25.0 cm^3 of Solution A
               = 0.00238   [1]

          (iii) Number of moles of unreacted hydrochloric acid in 250cm^3
               of Solution A = 0.00238 × 10 = 0.0238   [1]

          (iv) Number of moles of hydrochloric acid added to the indigestion tablets
               = $\dfrac{25 \times 2.0}{1000}$ = 0.05   [1]

          (v)   Number of moles of hydrochloric acid and which reacted with the
               calcium carbonate in the indigestion tablets, i.e. **(iv)** – **(iii)**
               = 0.05 – 0.0238 = 0.0262   [1]

          (vi) Number of moles of calcium carbonate in the indigestion tablets
               = $\dfrac{0.0262}{2}$ = 0.0131   [1]

          (vii) Mass of calcium carbonate in each indigestion tablet
               = $\dfrac{0.0131 \times 100}{2}$ = 0.655 g   units needed   [1]

    (d) **(i)**   They do not react with the hydrochloric acid or sodium hydroxide   [1]

          (ii)   Any material on the sides is returned to the solution   [1]

          (iii) Add (the sodium hydroxide) drop by drop near the end point   [1]

          (iv) Further titrations [1]
               Repeat whole experiment [1]
               Concordant readings within 0.2 cm^3 of each other [1]   [2]   17

2 Observation and deduction

(a)

	Test	Observations	Deductions
1	Place a spatula measure of **Y** in a test tube and heat strongly. Bubble any gas given off through lime water.	*Colourless liquid on sides of test tube* *Lime water turns milky*	*Water formed/hydrated* [1] *Carbon dioxide given off/solid is carbonate or hydrogencarbonate* [1]
2	Make a solution of **Y** by dissolving a half spatula measure of **Y** in a test tube one third full of dilute hydrochloric acid. Add 1 cm^3 of barium chloride solution to the test tube.	*Effervescence* *No change*	*Carbonate/ Hydrogencarbonate (either or both)* [1] *Not a sulfate* [1]
3	Make a solution of **Y** by dissolving a half spatula measure of **Y** in a test tube one third full of deionised water. Add 1 cm^3 of magnesium sulfate solution.	*No change*	*Hydrogencarbonate/ Does not contain Ba^{2+} ions* [1]
4	Make a solution of **Y** by dissolving a quarter spatula measure of **Y** in a test tube one third full of dilute nitric acid. Add 1 cm^3 of silver nitrate solution and then, in a fume cupboard, 5 cm^3 of dilute ammonia solution.	*White precipitate Dissolves*	*Chloride (ion)* [1]
5	Dip a nichrome wire loop in concentrated hydrochloric acid; touch **Y** with the wire and then hold it in a blue Bunsen flame.	*Lilac flame*	*Potassium ion* [1]

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

Potassium chloride [1] and potassium hydrogencarbonate [1]　　　　[9]

(b)

	Test	Observations	Deductions
1	Place 1 cm^3 of **Z** in a test tube and add 1 cm^3 of water. Add a bung and shake the test tube	*Two layers formed*	*Immiscible/no hydrogen bonds/non polar/ insoluble* [1]
2	Place 10 drops of **Z** on a watch glass placed on a heatproof mat and ignite it using a splint.	*Yellow, smoky flame*	*High carbon content alkane or alkene (both needed)/saturated or unsaturated hydrocarbon* [1]
3	Add approximately 0.5 cm^3 of **Z** to a test tube one quarter full of bromine water and mix well in a fume cupboard.	*Orange bromine water decolourised*	*Unsaturated/C═C* [1]
4	Place 1 cm^3 of **Z** in a test tube and add 1 cm^3 of ethanol and 1 cm^3 of silver nitrate. Place the test tube in a beaker of water heated to just below boiling point. Leave for 5 minutes.	*Yellow precipitate*	*Iodo compound/iodide ions formed Contains iodine* [1]

Based on the test above, suggest:

two functional groups which may be present in **Z**.

alkene/C═C [1]
_____

and

RI/C─I/iodo-/iodoalkene [1]   [2]

Section A

15

32

Section B

3 **(a)** $CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$ [1]

(b) Water will move the equilibrium to the left [1]
reducing the yield of ethyl ethanoate [1] [2]

(c) **(i)** Gloves/fume cupboard/safety glasses
Any **two** [1] each [2]

(ii) Dissipate the heat given out [1]

(iii) Sulfuric acid/ethanol/ethanoic acid/water
Any **two** [1] each [2]

(d) **(i)** Remove any ethanoic acid/acidic impurity [1]

(ii) Reduce the pressure from the gas given off [1]

(e) **(i)** Anhydrous magnesium sulfate/calcium chloride/sodium sulfate [1]

(ii) The liquid is no longer cloudy [1]

(iii) Decanting/filtering [1]

(f) **(i)** 7.9/46 = 0.172 mole [1]

(ii) 12.60/60 = 0.210 mole [1]

(iii) 0.172 × 88 = 15.14 g [1]

(iv) 8.2 × 0.92 = 7.54 g [1]

(v) (7.54 ÷ 15.14) × 100 = 49.8% [1]

(vi) Reaction incomplete
Loss of material during distillation
Loss of material during drying
Side reactions
Any **two** [1] each [2]   20

4 **(a)** Dissolves faster [1]

(b) 100 × 4.2 × 0.2 = 84 J   unit needed [2]
(error [–1])

(c) (84 × 250)/2.07 = 10145 [1]/1000 = 10.145 kJ mol^{-1} [1] [2]

(d) Heat absorbed from the atmosphere [1] use a lid [1] [2]

(e) Copper(II) sulfate hydrates (before dissolving) [1]   8

5 (a) $2NH_4NO_3 \rightarrow 2N_2 + O_2 + 4H_2O$ [2]

(b) Relights [1]
a glowing splint [1] [2]

(c) Moles NH_4NO_3 = 1.25/80 = 0.0156
Moles of gas = 0.0156 × 3/2 = 0.0234
Volume of gas = 0.0234 × 24 = 0.562 dm^3 [2]
([–1] for each mistake)

(d) Glass rod/stopper dipped in concentrated hydrochloric acid [1]
White fumes/smoke [1] [2]   8

Section B	**36**
Total	**68**