



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2011**

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination 2

[AC132]

WEDNESDAY 11 MAY, MORNING

MARK SCHEME

Annotation

1. Please do all marking in red ink.
2. All scripts are 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. As candidates have access to scripts please do not write any inappropriate comments on their scripts.

Section A

- 1 (a) Table [1]
 Significant figures [2]
 Calculation of the average titre [2]
 Titration consistency [3]
 Agreement with supervisor's titre [4] [12]

NOTES

Table:

Table should include initial burette reading, final burette reading and volume delivered.

The average titre should be calculated and the units included.

Units missing [-1].

Significant figures:

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 1 mark for each.

Average titre:

Accurate titrations only should be used.

The use of a rough value is [-1].

The average value can be two decimal places, e.g. 25.37

An incorrect calculation is 0.

Mark denied if:

- (i) only one accurate titration done
- (ii) if titre not calculated correctly

Titration consistency:

This is the difference between the first and second accurate readings

Difference	Mark
0.1	[3]
0.2	[2]
0.3	[1]
0.4	[0]

Titration agreement with the supervisor – using candidate’s average titre:

Difference	Mark
0.1	[4]
0.2	[3]
0.3	[2]
0.4	[1]
0.5	[0]

Please note that the supervisor’s titre should be recorded at the bottom of page 3 in the candidate’s script in RED INK.

The marks for table, significant figures etc. should be recorded on the left-hand side of the candidate’s table of results.

(b) colourless to pink/red [1]

(c) $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$ [2]
 Unbalanced with correct formula [1]
 Incorrect formula/missing reactant or product [0]

(d) (i) Average titre $\times 0.05/1000$ [1]

(ii) Same as number of moles NaOH above [1]

(iii) Answer to (ii) $\times 40$ [2]

(iv) Answer to part (iii) $\times 60$ [1]

(v) Answer to part (iv) expressed as a percentage [1]

In part (d), carry error through (c.e.t.) if appropriate.

(e) measure out 1 cm^3 [1] using ...
 transfer to 250 cm^3 volumetric flask [1]
 add water up to the mark [1]
 Mix/invert flask [1]
 Drop by drop to mark [1] Max [3]
 Pipette [1]
 Safety filler [1] Max [2] [4]

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2 (a) Observation and deduction

Experiment	Observations	Deductions
1 Describe A.	<i>(pale) blue/blue-green/green solid [1]</i>	<i>Possibly copper salt/ions present or transition metal salt/ions [1]</i>
2 (a) Make a solution of A by dissolving a spatula measure of A in a test tube half full of water. (b) Acidify 2 cm ³ of this solution with 1 cm ³ of dilute nitric acid and then add 1 cm ³ of silver nitrate solution. (c) Add 5 cm ³ of dilute ammonia solution to the test tube.	<i>No fizzing [1] (accept no effervescence or bubbles given off) can be credited in 3b or 5a if not here White precipitate [1] Precipitate/solid dissolves/blue solution [1]</i>	<i>Not a carbonate/hydrogen-carbonate [1] can be credited in 3b or 5a if not here Possibly chloride ions [1] Possibly copper(II) ions/confirms Cl⁻ [1]</i>
3 (a) Add 1 cm ³ of the solution formed in part 2(a) above to another test tube. (b) Acidify with 3 drops of dilute nitric acid and then add 3 drops of barium chloride solution.	<i>White precipitate/solid [1]</i>	<i>Sulfate ions present [1]</i>
4 (a) Make a solution of A by dissolving half a spatula measure of A in a test tube one third full of water. (b) Add 3 drops of dilute ammonia solution to the test tube. (c) Add excess dilute ammonia solution to the same test tube.	<i>Blue precipitate/solid [1] Precipitate/solid dissolves [1] Deep blue solution [1]</i>	<i>Copper(II) ions present [1] Confirms copper(II) ions [1] or copper(II) ammonium complex or [Cu(NH₃)₄(H₂O)₂]²⁺</i>

Experiment	Observations	Deductions
<p>5 (a) Place a spatula measure of A on a watch glass and add a few drops of concentrated hydrochloric acid.</p> <p>(b) Use a clean loop of nichrome wire to place a small amount of this acidified sample of A in a blue Bunsen flame.</p>	<p><i>No fizzing [1]</i> <i>(accept no effervescence or no bubbles given off)</i></p> <p><i>Blue–green flame [1]</i></p>	<p><i>Not carbonate or hydrogen-carbonate [1]</i></p> <p><i>Copper(II) ions present [1]</i></p>
<p>6 Place a spatula measure of the mixture in a dry test tube and heat gently.</p>	<p><i>Colourless liquid forms on walls [1]</i></p>	<p><i>Hydrated/ contains water of crystallisation [1]</i></p>

Two salts present in A are:

Copper chloride [1]

Copper sulfate [1]

An incorrect deduction can be carried through to naming the salts.

A deduction based on an incorrect observation can be credited on the basis of carry error through (c.e.t.).

(b)

Experiment	Observations	Deductions
Place 1 cm ³ of X, Y and Z separately into three test tubes. Label the test tubes with their contents. Add 1 cm ³ of ethanol and 1 cm ³ of silver nitrate solution to each test tube. Place the three test tubes in a beaker of water heated to 50–60 °C. Leave for 5 minutes noting the relative rate of reaction.	X <i>Yellow precipitate/ Fast/first to change [1]</i>	X <i>Iodine present/ Iodide iodobutane [1]</i>
	Y <i>No precipitate/white precipitate/ Slow/no change/ last [1] Accept solid for precipitate</i>	Y <i>Chlorine present/ Chloride chlorobutane [1]</i>
	Z <i>Cream precipitate/ solid/2nd to change [1]</i>	Z <i>Bromine present/ Bromide bromobutane [1]</i>

Penalise in deductions column the use of iodide/chloride/bromide once i.e. carry error through

X is 1-iodobutane

Y is 1-chlorobutane

Z is 1-bromobutane [3]

Order of reactivity for X, Y and Z with NaOH(aq) = X, Z, Y [1]

Parts (a) and (b) to a maximum of [29]

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Section B

- 3 (a) (i) Water chemically bonded/bonded into the structure (N.B. bonded means joined **not** trapped) [1]
- (ii) Solid changes colour/crystals turn to powder (accept turns white)/vapour produced/condensation [1]
- (iii) Heat (and weigh) [1]
To constant mass [1] [2]
- (b) (i) $\text{Ni}(\text{NO}_3)_2 \cdot x\text{H}_2\text{O} \rightarrow \text{Ni}(\text{NO}_3)_2 + x\text{H}_2\text{O}$ [1]
Accept $x = 6$
- (ii) $3.22 - 2.02 = 1.2\text{g}$ [1]
- (iii) $1.2 \div 18 = 0.066$ [1]
- (iv) $2.02 \div 183 = 0.011$ [1]
- (v) $0.066 \div 0.011 = 6$ [1]
- (vi) not all water removed [1]
- (vii) salt may decompose [1]
- (c) (i) fizzing/effervescence [1] (accept bubbles)
solid disappears/dissolves (accept gets smaller)/colourless
solution forms [1]
heat given off [1]
Any two [2]
- (ii) heat solution until concentrated/reduce volume [1]
cool/allow to crystallise [1]
filter [1]
wash with a little cold water [1]
*dry by stated method (desiccator/between filter papers) [1] } any 3 [4]
- (iii) moles of Mg = $2.34 \div 24 = 0.0975$
RFM hydrated salt = 246
mass of hydrated salt for 100% = $246 \times 0.0975 = 23.985\text{g}$
percentage yield = $16.35 \times 100 \div 23.985 = 68.18\%$
Award three for correct answer.
Each error [-1], carry error through [3]

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		MARKS	TOTAL MARKS
4	(a) low boiling point/evaporates easily/changes to gas easily	[1]	
	(b) (i) oxidising agent	[1]	
	(ii) orange [1] to green [1]	[2]	
	(c) (i) prevent (further) oxidation/formation of ethanoic acid	[1]	
	(ii) ethanol [1] ethanoic acid [1] ethyl ethanoate [1] Any 2	[2]	
	(iii) loss in transfer (allow once only) [1] not all distilled [1] incomplete reaction [1] side reactions [1] loss due to evaporation [1] To a maximum of [2]	[2]	9
5	(a) Both produce a white precipitate [1] (accept white solid) Excess: Zinc: precipitate dissolves (to give a colourless solution) [1] (accept solid dissolves) Aluminium: no change [1]	[3]	
	(b) Flame test [1] Lilac flame (visible through blue glass) [1] Add iron(III) salt solution/iron(III) ions [1] Blood red solution (penalise solid or precipitate) [1]	[4]	7
Total			90