



Rewarding Learning

General Certificate of Education
2011

Chemistry

Assessment Unit A2 3
Internal Assessment
Practical Examination 1

[AC231]

TUESDAY 17 MAY, MORNING

MARK SCHEME

Annotation

1. Please do all marking in red ink.
2. All scripts are checked for mathematical errors. Please adopt the 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.

- 1 (a) Rinse burette and pipette with appropriate solution [1] place 25.0 cm³ (or specified volume) in conical flask using a pipette filler [1] add acid (20 cm³ of dilute sulfuric acid) [1] swirl flask during test [1] add permanganate solution quickly at first [1] then dropwise [1] do a rough titration [1] do 2(3) accurate titrations/until concordant/±0.1 cm³ until end-point/colour change [1]

maximum of [6]

(b)

Titration	Volume at start/cm ³	Volume at end/cm ³	Added volume/cm ³
1			
2			
3			

Average titre = cm³

Clearly labelled and neatly presented table, including units and the recording of the average titre. [1]

Significant figures: All accurate titration readings recorded to one decimal place (including initial burette reading a 0.0 if used). Accept, however, 0.00 and 0.05 but penalise by [-1] if other readings are given to two or more decimal places. The use of 0 is penalised by [-1] if used (only penalise once). [2]

Titration consistency: This is the difference between the accurate readings.

Difference	Mark
±0.1	2
±0.2	1
>0.3	0

[2]

Agreement with supervisor's average titre

(The supervisor's titration value should be recorded in red ink beside the candidates' average titre). If average titre calculated incorrectly the correct value should be determined and used for agreement mark.

Difference	Mark	
±0.1	3	
±0.2	2	
±0.3	1	
>0.3	0	[3]

Average titre: the inclusion of the rough titre in this calculation is penalised by [-1]. The average titre can be to two decimal places e.g. 21.33.

An incorrect calculation is 0 but this error must be carried through to other calculations, if appropriate. [2]

(c) colourless to pink [2]

(d) $5\text{Fe}^{2+} + 8\text{H}^{+} + \text{MnO}_4^{-} \rightarrow 5\text{Fe}^{3+} + 4\text{H}_2\text{O} + \text{Mn}^{2+}$ [2]

(e) Assuming a titration figure of 20.0 cm^3 and a pipette figure of 25 cm^3

volume × molarity of ammonium iron(II) sulfate = 5 × volume × molarity permanganate

$$25 \times M = 5 \times 20 \times 0.02 = 2$$

$$M = 0.08 \quad [2]$$

(f) $0.08\text{ mol} = 31.4\text{ g}$
 $1\text{ mol} = 31.4/0.08 = 392.5\text{ g}$
 $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2 \cdot n\text{H}_2\text{O} = 56 + 2 \times 18 + 2 \times 96 + 18n$
 $= 284 + 18n$
Hence $392.5 = 284 + 18n$
 $18n = 108.5$
 $n = 6.03$
 $= 6 \quad [3]$

25

2 (a)

Test	Observation	Deduction
1 Describe the appearance of A.	pink/red/maroon crystals/solid [1]	transition metal compound/cobalt ion or compound/hydrated or water of crystallisation crystals stated [1]
2 Add a spatula measure of A to approximately 50 cm ³ of water and stir.	dissolves/soluble/disappears [1] pink [1] solution [1] Max. [2]	soluble/confirms transition metal compound/cobalt ion or compound [1] award only once
3 Add 10 drops of silver nitrate solution to 2 cm ³ of the solution of A in a test tube. Allow to stand.	white [1] precipitate [1]	chloride [1]
4 Add 5 drops of sodium hydroxide solution to 2 cm ³ of the solution of A in a test tube.	(dark) blue precipitate/darkens on standing [1]	insoluble hydroxide [1] Co(OH) ₂ etc
5 In a fume cupboard, add 6 cm ³ of concentrated ammonia, slowly, to 2 cm ³ of the solution of A in a test tube.	blue ppt [1] (any) ppt dissolves [1] yellow solution [1] darkens/turns brown [1] Max. [3]	No deduction required
6 Add 4 cm ³ of concentrated hydrochloric acid to 2 cm ³ of the solution of A in a test tube.	goes blue [1]	No deduction required

A is (hydrated) cobalt chloride/cobalt(II) chloride [1]

AVAILABLE
MARKS

Test	Observation	Deduction
1 Describe the appearance of B.	white solid/crystals [1]	high RMM/long molecules strong (intermolecular forces) named white organic solid no chromophore glycine or alanine [1]
2 Heat one spatula measure of B in a test tube. Heat gently at first and then more strongly. Test any fumes with a glass rod dipped in concentrated hydrochloric acid.	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">White smoke</div>	(smoke is) NH_4Cl molecules contain N/ ammonia [1]
3 (i) Dissolve 2 spatula measures of B in approximately 20 cm^3 of water. (ii) Use Universal Indicator paper to determine the pH of the solution of B.	green colour [1]	pH 6/7 [1]
4 Add 6 drops of copper(II) sulfate solution, dropwise, to a test tube half-full of a solution of B.	blue colour [1]	contains – NH_2 /– NH /glycine/ any amino acid/correct comment on complex formed with amino acid [1]
5 To 3 cm^3 of acidified potassium dichromate solution add one spatula measure of B and warm gently.	No change/ stays orange [1]	not a primary or secondary alcohol/ could be – COOH – NH_2 – tert alcohol – ketone dichromate not reduced [1]

Identity of B: glycine [1]

Maximum [25]

AVAILABLE
MARKS

25



(b) $\text{Na}_2\text{O}_2 = 2 \times 23 + 2 \times 16 = 46 + 32 = 78$

$1.3\text{g} = \frac{1.3}{78} = 0.0167\text{mol} \left(\frac{1}{60}\right)$

46g needed for 78

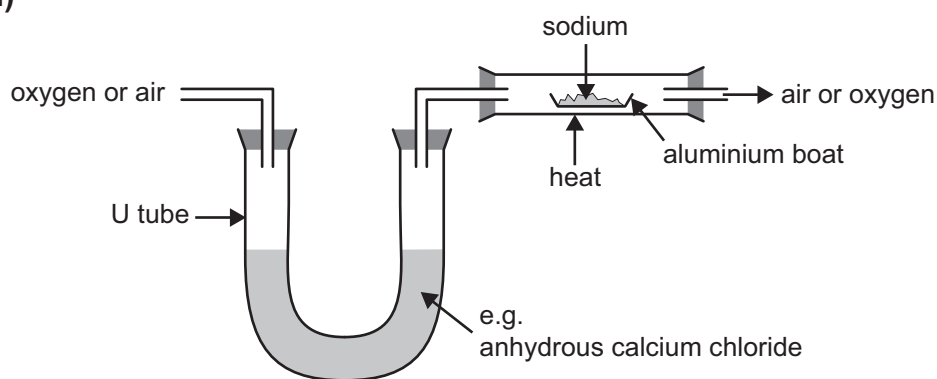
$46 \times 0.0167 = 0.768 = 0.77\text{g}$

If an 80% yield will need error [-1]

$\frac{100}{80} \times 0.77\text{g} = \mathbf{0.96\text{g}}$ [4]

(c) sodium/ Na_2O_2 reacts with water/moisture
hence less sodium to react with oxygen
yield of Na_2O_2 reduced/ NaOH or H_2O_2 /is formed [2]

(d)



[4]



(ii) The (hydrated)/salt (of $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$) [1] removes water from the solution [1] thus concentrating the solution [1]. [2]

(f) *retention time/peak [1]
compare to pure sample of oxygen [1] – *depends on 1st line [2]

Quality of written communication:

- 2 marks The candidate expresses ideas clearly and fluently through well-linked sentences and paragraphs. Arguments are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.

- 1 mark The candidate expresses ideas clearly, if not always fluently. Arguments may sometimes stray from the point. There may be some errors of grammar, punctuation and spelling, but not such as to suggest a weakness in these areas.

- 0 marks The candidate expresses ideas satisfactorily, but without precision. Arguments may be of doubtful relevance or obscurely presented. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the passage.

[2]

20

Total

70