

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**NOVEMBER 2002**

**GCE Advanced Subsidiary Level**

**MARK SCHEME**

**MAXIMUM MARK : 25**

**SYLLABUS/COMPONENT :9701 /3**

**CHEMISTRY  
(PRACTICAL (AS))**



UNIVERSITY of CAMBRIDGE  
Local Examinations Syndicate

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N.B. Boxed references within this marking scheme relate to the accompanying booklet of Standing Instructions

**1 Tables 1.1 and 1.2**

Give **one mark** if all weighings are to 2 decimal places or better.

Give **one mark** if the mass of **FA 1** recorded in Table 1.1 is between 2.00g and 2.50g inclusive.

Give **one mark** if there is evidence of reheating and reweighing the tube.

Give **one mark** if two masses of tube + **FA 1** after heating are within 0.05 g.

**Withhold one of these marks if**

**there is an error in subtraction**

**the mass of empty tube differs between the two tables**

**the smallest mass of tube + FA 1 after heating was not used in calculating the residual mass of FA 1.**

**Accuracy**

**Supervisor's Script**

Check and correct any errors in subtraction

Calculate  $\frac{\text{mass lost on heating}}{\text{mass of FA 1 after heating}}$  correct to 2 decimal places.

Record this as a ringed total on the front of the Supervisor's script. The value of this ratio  $\approx 1.05$

If there is a significant difference in the value obtained for the Supervisor it may suggest an impure sample of  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  has been used or the wrong salt distributed.

**Candidate Scripts**

Check and correct any errors in subtraction

Calculate  $\frac{\text{mass lost on heating}}{\text{mass of FA 1 after heating}}$  correct to 2 decimal places.

Record this ratio, correct to 2 decimal places, below Table 1.2.

**Compare the ratio obtained from the candidate's results (corrected where necessary) with the theoretical value of 1.05.**

Accuracy marks are awarded for differences between the ratios as follows:

Mark	Difference in Ratio
6	Up to 0.03
5	0.03+ to 0.04
4	0.04+ to 0.05
3	0.05+ to 0.07
2	0.07+ to 0.10
1	0.10+ to 0.15
0	Greater than 0.15

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In all calculations, ignore evaluation errors if working is shown

- (d) Ignore (i) Calculated mass of anhydrous magnesium sulphate  
and  
Give one mark for (ii) Correctly calculated mass of water 1
- (e) Give one mark for  $\text{moles of water} = \frac{\text{mass of water}}{18}$   
(If an incorrect  $M_r$  is used this mark is not awarded but subsequent marks may be given) 1
- (f) Give one mark for  $\text{moles of XSO}_4 = \frac{\text{Answer to (e)}}{7}$  1
- (g) Give one mark for  $M_r \text{ of XSO}_4 = \frac{\text{Answer to (d)(i)}}{\text{Answer to (f)}}$  No Units 1
- (h) Give one mark for answer to (g) - 96 No Units  
(Do not penalise twice) 1
- Total for Question 1 15**

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FA 2 is a solution containing  $Mn^{2+}$ ,  $Zn^{2+}$ ,  $SO_4^{2-}$ ,  $NO_3^-$

Test	Observations	Deductions	
(a) To 3 cm depth of FA 2 in a boiling-tube, add an equal depth of dilute aqueous sodium hydroxide.  Cautiously warm the tube.	Off-white, buff or light brown precipitate. (Not dirty brown, brown or any yellow or red in the colour) [1]  No ammonia, no alkaline gas, no gas turning litmus or UI paper blue.....	Manganese or $Mn^{2+}$ [1]  No ammonium salt, no $NH_4^+$ [1] for observation and deduction	3
(b) Filter the mixture from (a) and collect the filtrate.  Leave the residue in the filter paper and observe again after several minutes.	Allow precipitate colour here if not given in (a). Deduction in (a) can be given from observation here.  Precipitate turns brown or darkens (No red or yellow in colour) [1]	Manganese or $Mn^{2+}$ (one mark if not already given in (a))	1
(c) Place 2 cm depth of the filtrate from (b) in a test-tube and add dilute nitric acid, drop by drop, until no further change is seen.	White precipitate forms and re-dissolves .....	$Pb^{2+}$ , $Al^{3+}$ or $Zn^{2+}$ (any one) [1] for observation and deduction	1
(d) Place the remainder of the filtrate from (b) in a boiling-tube. Add a piece of aluminium foil.  Cautiously warm the tube.	Gas turns red litmus blue or gives white smoke with HCl or Ammonia gas [1]	Nitrate or nitrite $NO_3^-$ or $NO_2^-$ [1]	2
(e) To 3 cm depth of FA 2 in a test-tube, add an equal depth of dilute aqueous ammonia.  Filter the mixture and add dilute nitric acid, drop by drop, until no further change is seen.	The observation marks from (a) or (b) can be given here.  White precipitate forms and re-dissolves.....	Manganese or $Mn^{2+}$ (one mark if not already given in (a) or (b))  $Zn^{2+}$ [1] for observation and deduction Take care that deduction mark is not given for a ppt formed on adding ammonia	1
(f) To 2 cm depth of FA 2 in a test-tube, add dilute hydrochloric acid followed by aqueous barium chloride.	No brown gas.....  White precipitate.....	No nitrite [1] for observation and deduction  Sulphate [1] for observation and deduction	2
(g) To 2 cm depth of FA 2 in a test-tube, add dilute nitric acid followed by aqueous silver nitrate.	No brown gas .....	No nitrite [1] for observation and deduction if not already given in (f)  No halide or No chloride, bromide, iodide (any one) [1] for observation and deduction	1

**Summary** (Only award these marks if there is supporting evidence in the individual tests)

FA 3 contains the cations  $Mn^{2+}$  and  $Zn^{2+}$   
and the anions  $SO_4^{2-}$  and  $NO_3^-$

1

**Total of 12 scoring points**

If the mark is in excess of 10 cross through the mark and record 10 max.

**Total for Question 2 is 10 and for the Paper 25.**