

ADVANCED
General Certificate of Education
2011

# Candidate Num

# **Chemistry**

Assessment Unit A2 3
Internal Assessment
Practical Examination 2

[AC232]

**THURSDAY 19 MAY, MORNING** 



# TIME

2 hours 30 minutes.

### **INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Answer all three questions.

Write your answers in the spaces provided.

### **INFORMATION FOR CANDIDATES**

The total mark for this paper is 70.

Questions 1 and 2 are practical exercises each worth 25 marks.

Question 3 is a planning exercise worth 20 marks.

Quality of written communication will be assessed in **Question 3**.

You may not have access to notes, textbooks and other material to assist you.

A Periodic Table of elements (including some data) is provided.

For Examiner's use only					
Question Number	Marks	Modera- tion Mark			
1					
2					
3					

Total Marks



6621.04**R** 

(a

Tec. Mar.

Crystalline ammonium iron(II) sulfate has the formula  $Fe(NH_4)_2(SO_4)_2.nH_2O$ . The symbol n represents the number of molecules of water of crystallisation.

You are provided with:

A solution of ammonium iron(II) sulfate of concentration  $15.7 \, \text{g dm}^{-3}$ .

A solution of potassium permanganate of concentration  $0.01 \, \text{mol dm}^{-3}$ .

Solutions of 2 mol dm<sup>-3</sup> sulfuric acid.

Assuming that all the apparatus is clean and dry, you are required to carry out a titration and use your results to determine the value of n.

)	Give details of the procedure you intend to use. The potassium permanganate solution should be placed in a burette.				
	[6				

**(b)** Carry out your procedure. Present your results in a suitable table and calculate the average titre.

Tea Namark

[10]

(c) State the colour change at the end point of your titration.

\_\_\_\_\_\_ to \_\_\_\_\_\_[2]

(d) Write the equation for the reaction of iron(II) ions (Fe $^{2+}$ ) with acidified permanganate ions (H $^+$ /MnO $_4^-$ ).

\_\_\_\_\_[2]

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### 2 Observation/deduction

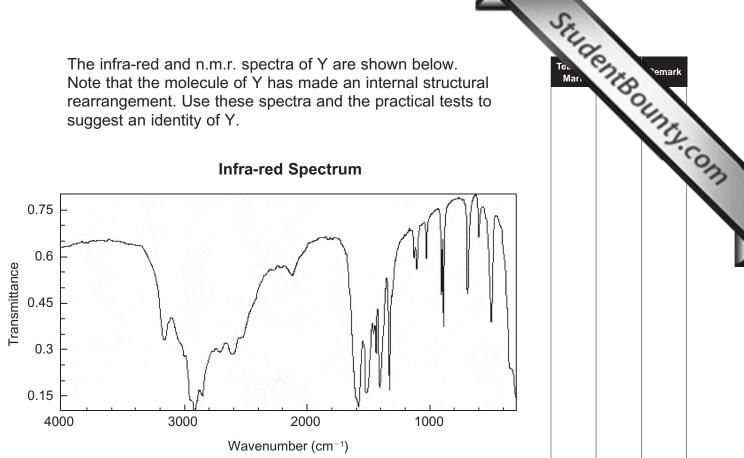
2 Observation/deduct	ion	
Safety goggles must exercised during this	be worn at all times an investigation.	d care should be
tests.	with a salt, labelled X	Carry out the following below.
Test	Observation	Deduction
1 Describe the appearance of X.		
	[1]	[1]
2 Add a spatula measure of X to approximately 50 cm <sup>3</sup> of water.		
2 Add 10 duama of	[2]	[1]
<b>3</b> Add 10 drops of silver nitrate solution to 2 cm <sup>3</sup> of the solution of X in a test tube. Allow to stand.		
	[2]	[1]
4 Add 5 drops of sodium hydroxide solution to 2 cm <sup>3</sup> of the solution of X in a test		
tube.	[2]	[1]
<b>5</b> In a fume cupboard, add 6 cm <sup>3</sup> of concentrated ammonia, slowly, to 2 cm <sup>3</sup> of the solution of X in a test tube.	[2]	No deduction required
6 Add 2 cm <sup>3</sup> of edta solution to 2 cm <sup>3</sup> of the solution of X in a test tube.		No deduction required
	[1]	

Deduce the name of compound X[1	[1]
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Test	Observation	Deduction
1 Describe the appearance of Y.		
	[1]	[1]
Below is a description of test 2. Please read this but do not carry out this test.		
2 Heat one spatula measure of Y in a test tube. Heat gently at first and then more strongly. Test any fumes with a glass rod dipped in concentrated hydrochloric acid.	White smoke	[1]
3 (i) Dissolve 2 spatula measures of Y in approximately 20 cm <sup>3</sup> of water.		
(ii) Use Universal Indicator paper to determine the pH of the solution of Y.	[1]	[1]
4 Add 6 drops of copper(II) sulfate solution, dropwise, to a test tube half-full of a solution of Y.		
	[1]	[1]
<b>5</b> Add 3 cm <sup>3</sup> of acidified potassium dichromate(VI) solution. Add one spatula measure of Y		
and warm gently.	[1]	[1]

The infra-red and n.m.r. spectra of Y are shown below. Note that the molecule of Y has made an internal structural rearrangement. Use these spectra and the practical tests to suggest an identity of Y.

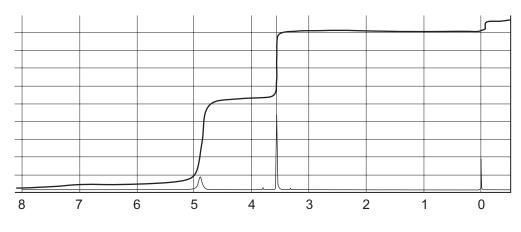
## **Infra-red Spectrum**



Hydrogen atoms attached to electronegative atoms such as N or O absorb in the region above 3000 cm<sup>-1</sup>. The actual absorption region is affected by acidity and whether the IR spectrum is obtained for the solid or a solution of the substance.

The carbonyl group in ketones absorbs at 1720 cm<sup>-1</sup>. All other compounds containing C=O groups absorb from 1580 to  $1800 \, \text{cm}^{-1}$ .

### N.m.r. spectrum



Identity of Y [1]

Maximum [25]

### Planning exercise

3 Preparation of sodium thiosulfate, Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.

Sodium thiosulfate may be prepared by boiling a mixture of powdered roll sulfur and aqueous sodium sulfate (IV) for 30–40 minutes. Excess sulfur is removed. The resulting solution is concentrated by evaporation.

The evaporated solution, on cooling, produces crystals of sodium thiosulfate pentahydrate which are removed by vacuum filtration.

The crystals are washed with ethanol and dried using filter paper.

The purity of the crystals can be measured by titration with a standard solution of iodine (in potassium iodide solution).

You are required to prepare 2.5 g of sodium thiosulfate pentahydrate crystals.

(a)	(i)	Write an equation, including state symbols, for the read of sodium sulfate (IV) solution with sulfur to produce sodium thiosulfate.	ction
			_ [2]
	(ii)	Write the formula of sodium thiosulfate pentahydrate.	_ [1]
(b)		culate the volume of 0.06 moldm <sup>-3</sup> sodium sulfate (IV) eded assuming an 80% yield.	
			[4]

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Quality of written communication

\_ [3]

[2]

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THIS IS THE END OF THE QUESTION PAPER

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