OCR
RECOGNISING ACHIEVEMENT

SPECIMEN

Advanced GCE

CHEMISTRY A

Unit F326: Practical Skills in Chemistry 2:
Quantitative Task

Specimen Task

Candidates answer on the task sheet.

F326 (2)

All items required by teachers and candidates for this task are included in this pack.

INFORMATION FOR CANDIDATES

- Quantitative Task: Determination of the formula of hydrated iron(II) sulfate

INFORMATION FOR TEACHERS

- Mark scheme
- Instructions for Teachers and Technicians.

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CHEMISTRY A

Unit F326: Practical Skills in Chemistry 2:
Quantitative Task

Specimen Task

F326 (2)

For use from September 2008 to June 2009.
Candidates answer on this task sheet.

INSTRUCTIONS TO CANDIDATES

- Answer **all** parts of the task.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each part of the task.
- The total number of marks for this task is **15.**

ADVICE TO CANDIDATES

- Read each part carefully and make sure you know what you have to do before starting your answer.

FOR TEACHER'S USE		
Part	**Max.**	**Mark**
A2	**5**	
B2	**5**	
C2	**5**	
TOTAL	**15**	

This task consists of **6** printed pages.

  [Turn over

Determination of the formula of hydrated iron(II) sulfate

Introduction

In **Part 1**, you will carry out a titration using aqueous potassium manganate(VII) to determine the value of *x* in hydrated iron(II) sulfate, $FeSO_4 \cdot xH_2O$.

You are given full instructions for the practical procedure, which must be followed carefully.

It is your responsibility to work safely and to organise your time efficiently.

You will also be assessed on the:

- consistency of your titration results A2 **[2]**
- the accuracy of your final answer. A2 **[2]**

In **Part 2**, you will calculate the value of *x*.

Part 1 Titration of $KMnO_4$(aq) with acidified $FeSO_4$(aq)

Three chemicals are supplied.

• Hydrated iron(II) sulfate, $FeSO_4 \cdot xH_2O$ in a weighing bottle.	Harmful	
• 0.0100 mol dm^{-3} potassium manganate(VII), $KMnO_4$(aq)		
• 1 mol dm^{-3} sulfuric acid, H_2SO_4(aq).	Irritant	

Record all your readings on page 3.

1 Weigh the bottle provided containing $FeSO_4 \cdot xH_2O$.

Record the mass on page 3.

Transfer all of $FeSO_4 \cdot xH_2O$ into a 250 cm^3 beaker.

Weigh the empty bottle.

Calculate the mass of $FeSO_4 \cdot xH_2O$ used.

2 Dissolve the $FeSO_4 \cdot xH_2O$ in 50 cm^3 of H_2SO_4(aq).

Transfer this solution carefully to a 250 cm^3 volumetric flask.

Add distilled (or deionised) water to make up the solution to exactly 250 cm^3.

Mix this solution thoroughly before using it for your titrations.

3 Using a pipette and filler, transfer 25.0 cm^3 of your solution of $FeSO_4 \cdot xH_2O$ into a 250 cm^3 conical flask.

Using a measuring cylinder, add to the conical flask about 20 cm^3 of H_2SO_4(aq).

4 Fill the burette with 0.0100 mol dm^{-3} $KMnO_4$(aq).

Record all burette readings to 0.05 cm^3 in a table on page 3.

Carry out a rough/trial titration.

The colour change at the end point is from colourless to pink.

5 Now carry out the titration accurately and obtain two consistent values for the titre, recording all your results on page 3.

6 In each case, add 20 cm^3 of $H_2SO_4(aq)$ to the 25.0 cm^3 solution of $FeSO_4 \bullet xH_2O$ in the conical flask.

Readings

Mass measurements

mass of $FeSO_4 \bullet xH_2O$ used = ...B2 **[1]**

Record your titration results in a suitable format below and calculate your mean titre.

mean titre = ... B2 **[4]**

Safety

Identify the most significant hazard in your procedure and any precautions taken to minimise the hazard.

hazard .....

precaution taken.....

..... A2 **[1]**

Part 2 Calculating *x* in the formula $FeSO_4 \cdot xH_2O$

In all questions show your working and express your answers to an appropriate number of significant figures.

The following equation should be used in order to complete your analysis.

$$5Fe^{2+} + 8H^+ + MnO_4^- \rightarrow 5Fe^{3+} + Mn^{2+} + H_2O$$

(a) Calculate the amount, in moles, of MnO_4^-, used in your mean titre.

moles MnO_4^- = ... mol C2 **[1]**

(b) Calculate the moles of Fe^{2+} in your original 250 cm^3 solution.

moles Fe^{2+} in 250 cm^3 = ... mol C2 **[1]**

(c) Calculate the relative formula mass of $FeSO_4 \cdot xH_2O$ and the value of *x*.

x = ... C2 **[1]**

(d) At **Stage 3**, you used a measuring cylinder to measure the sulfuric acid. Explain, with a reason, whether the experiment would have given a more accurate result if volumetric apparatus had been used.

.....

.....

.....

.....

..... C2 **[2]**

A2: 5; B2: 5; C2: 5 **[Total: 15]**

END OF TASK

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

CHEMISTRY A F326 (2)

Unit F326: Practical Skills in Chemistry 2:

Quantitative Task

Specimen Mark Scheme

The maximum mark for this task is **15**.

For use from September 2008 to June 2009.

Quality A2	**Max Mark**
obtains consistent titres within 0.2 cm^3	**[1]**
obtains consistent titres within 0.1 cm^3	**[1]**
calculates '*x*' correctly to give a value within 10% of centre value	**[1]**
calculates '*x*' correctly to give a value within 5% of centre value	**[1]**
states one relevant safety point, and a precaution	**[1]**
Quality B2	
records mass results correctly, with units	**[1]**
records titration results correctly to a consistent number of decimal places	**[1]**
uses a clear table for titration results with initial and final burette readings, and titre	**[1]**
uses appropriate units for volume in titration table	**[1]**
obtains correct average titre by selecting most appropriate titres	**[1]**
Quality C2	
(a) calculates correctly the number of moles of $KMnO_4$ a = vol × 10^{-5} mol	**[1]**
(b) calculates correctly the number of moles of Fe^{2+} in 250 cm^3 solution b = 50 × a mol	**[1]**
(c) calculates correctly relative formula mass of $FeSO_4 \cdot xH_2O$ M = mass/b	**[1]**
(c) calculates correctly the value of '*x*' and uses appropriate number of significant figures throughout $x = (M - 151.9)/18$	**[1]**
(d) It would make no difference as the sulfuric acid is in excess	**[1]**
Total:	**[15]**

Oxford Cambridge and RSA Examinations

Advanced GCE

CHEMISTRY A F326 (2)

Unit F326: Practical Skills in Chemistry 2:

Quantitative Task

Instructions for Teachers and Technicians

For use from September 2008 to June 2009.

This is a Quantitative task. There is no time limit but it is expected that it can be completed within one hour.

Candidates may attempt more than one quantitative task with the best mark from this type of task being used to make up the overall mark for Unit F326.

Preparing for the assessment

It is expected that before candidates attempt Practical Skills in Chemistry 2 (Unit F326) they will have had some general preparation in their lessons. They will be assessed on a number of qualities such as demonstration of skilful and safe practical techniques using suitable qualitative methods, the ability to make and record valid observations, and the ability to organise results suitably. It is therefore essential that they should have some advance practice in these areas so that they can maximise their attainment.

Preparing candidates

At the start of the task the candidates should be given the task sheet.

Candidates must work on the task individually under controlled conditions with the completed task being submitted to the teacher at the end of the lesson. Completed tasks should be kept under secure conditions until results are issued by OCR.

Candidates should not be given the opportunity to redraft their work, as this is likely to require an input of specific advice. If a teacher feels that a candidate has under-performed, the candidate may be given an **alternative** task. In such cases it is essential that the candidate be given detailed feedback on the completed assessment before undertaking another Quantitative Task. Candidates are permitted to take each task **once** only.

Assessing the candidate's work

The mark scheme supplied with this pack should be used to determine a candidate's mark out of a total of 15 marks. The cover sheet for the task contains a grid for ease of recording marks. To aid moderators it is preferable that teachers mark work using red ink, including any appropriate annotations to support the award of marks.

Notes to assist teachers with this task

Teachers must trial the task before candidates are given it, to ensure that the apparatus, materials, chemicals etc provided by the centre are appropriate. The teacher carrying out the trial must complete a candidate's task sheet showing the results attained, and retain this, clearly labelled, so that it can be provided to the moderator when requested.

Health and Safety

Attention is drawn to Appendix G of the specification.

Apparatus list

Students must not be told any information about these materials apart from what is given on the assessment sheets.

Materials

Each student will require the following materials, labelled by the indicated name only and the hazard warning symbol.

name		hazard	
'hydrated iron(II) sulfate'	Between 2.9–3.1 g of hydrated iron(II) sulfate, $FeSO_4 \cdot 7H_2O$ in a stoppered weighing bottle. A freshly-opened stock bottle of solid should be used.	Harmful	
$KMnO_4(aq)$	A solution of 0.0100 mol dm^{-3} potassium manganate(VII), $KMnO_4$ containing 5.00 g dm^{-3} of $KMnO_4$. Each student will require about 100 cm^3 of solution in a suitable bottle.		
H_2SO_4	Aqueous (dilute) sulfuric acid of concentration 1.0 mol dm^{-3}. Each student will require about 100 cm^3 in a suitable bottle.	Irritant	

Apparatus

Each student will require:

- Safety spectacles
- Burette and white tile
- Pipette (25.0 cm^3) and filler
- Clamp stand, with boss and clamp (for supporting the burette)
- Filter funnel
- Measuring cylinder (25 cm^3)
- Glass rod
- Spatula
- Dropping pipette
- Volumetric flask (250 cm^3)
- Wash bottle containing distilled (or deionised water) (about 300 cm^3 will be required)
- Two conical flasks or conical beakers (250 cm^3)
- Glass beaker (250 cm^3)

Each candidate will also need access to a top pan balance weighing to 0.01 g.

Note: The quantities of chemicals required are approximate and due allowance should be made for wastage.

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