Rewarding Learning

Centre Number

71	

Candidate Number

ADVANCED
General Certificate of Education
2014

Chemistry

Assessment Unit A2 3
Internal Assessment
Practical Examination 2

[AC232]

FRIDAY 16 MAY, MORNING

AC232

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(b)**.
You may not have access to notes, textbooks and other material to assist you.
A Periodic Table of the Elements, containing some data, is included in this question paper.

For Examiner's use only		
Question Number	Examiner Mark	Remark
1		
2		
3		
Total Marks		

Examiner Only	
Marks	Remark

1 Titration exercise

You are required to dissolve a weighed sample of ammonium iron(II) sulfate in dilute sulfuric acid and make the solution up to 250 cm^3 in a volumetric flask. You will then titrate 25.0 cm^3 portions of this solution with acidified potassium manganate(VII). You will then use your results to calculate the concentration of the acidified potassium manganate(VII) solution.

You are provided with:

- Hydrated ammonium iron(II) sulfate, $(NH_4)_2Fe(SO_4)_2.6H_2O$
- Dilute sulfuric acid
- Deionised water
- A 250 cm^3 volumetric flask
- An acidified solution of potassium manganate(VII)

(a) (i) Weigh out between 8.80 and 8.90 g of ammonium iron(II) sulfate. Record the mass to **two** decimal places.

Mass of $(NH_4)_2Fe(SO_4)_2.6H_2O$ _____ [2]

(ii) Dissolve the weighed sample in approximately 100 cm^3 of dilute sulfuric acid and make the solution up to 250 cm^3 in the volumetric flask using deionised water. Calculate the concentration of the solution in mol dm^{-3}.

_____

_____

_____

_____ [3]

(b) Titrate 25.0 cm^3 portions of your solution with acidified potassium manganate(VII). Record your results in a suitable table in the space below. Calculate the average titre.

[8]

(c) **(i)** Describe how you ensured the end point of your titration was accurate.

_____

_____

_____

_____ [2]

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

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(d) **(i)** Write the half-equation for the reduction of acidified manganate(VII) ions to form manganese(II) ions.

_____ [2]

(ii) Write the half-equation for the oxidation of iron(II) ions to form iron(III) ions.

_____ [1]

(iii) Write the ionic equation for the reaction.

_____ [2]

(iv) Calculate the concentration of the acidified potassium manganate(VII) solution in g dm^{-3}.

_____

_____

_____

_____

_____

_____ [4]

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

2 Observation/deduction

Safety glasses must be worn at all times and care should be exercised during this practical examination.

(a) (i) You are provided with a solid, labelled X. Carry out the following tests. Record your observations in the spaces below.

Test	Observations
1 Describe the appearance of X.	[1]
2 Dissolve two spatula measures of X in approximately 50 cm^3 of water. Keep this solution for use in further tests.	[1]
3 Place 4 cm^3 of the solution from test 2 in a test tube. Add an equal volume of concentrated hydrochloric acid.	[1]
4 Place 4 cm^3 of the solution from test 2 in a test tube. Add an equal volume of 1,2-diaminoethane solution.	[1]
5 (a) Place 4 cm^3 of the solution from test 2 in a test tube. Slowly add an equal volume of sodium hydroxide solution. **(b)** Add a further 5 cm^3 of sodium hydroxide solution.	[2]
6 Place 4 cm^3 of the solution from test 2 in a test tube. In a fume cupboard, add an equal volume of concentrated ammonia solution.	[1]
7 Place 4 cm^3 of the solution from test 2 in a test tube. Add 1 cm^3 of barium chloride solution dropwise.	[1]

(ii) Identify X.

_____ [2]

(iii) Write the formula of the complex ion formed in test 2.

_____ [1]

(iv) Write the formula of the complex ion formed in test 3.

_____ [1]

(v) Write an ionic equation for the reaction occurring in test 4.

_____ [2]

(vi) Write an ionic equation for the reaction occurring in test 6.

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(b) (i) You are provided with an aqueous solution of an organic compound Y. Carry out the following tests. Record your observations in the spaces below.

Test	Observations
1 Describe the solution. Include a description of its smell.	[1]
2 Place 4 cm^3 of the solution in a test tube. Add an equal volume of potassium dichromate solution and acidify with 1 cm^3 of dilute sulfuric acid. Heat in a water bath for five minutes.	[1]
3 Place 4 cm^3 of the solution in a test tube. Add half a spatula measure of sodium hydrogencarbonate.	[2]

(ii) Identify the functional group present in Y.

_____ [1]

(iii) Suggest how the infrared spectrum of Y could confirm the presence of this functional group.

_____

_____ [2]

(iv) Suggest how the mass spectrum of Y could confirm its identity.

_____

_____ [2]

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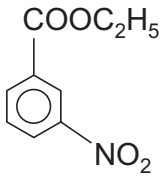
(Questions continue overleaf)

Examiner Only	
Marks	Remark

3 Planning exercise

Ethyl 3-nitrobenzoate exists as a solid at room temperature and pressure. Its melting point is 42 °C.



(a) (i) Write the equation for the formation of ethyl 3-nitrobenzoate from ethyl benzoate.

[1]

(ii) Assuming a 60% yield, calculate the minimum mass of the organic reactant required to produce 5.85 g of ethyl 3-nitrobenzoate.

[2]

(b) Describe the laboratory preparation of ethyl 3-nitrobenzoate up to and including the removal of the crude product from the reaction mixture.

[5]

Quality of written communication [2]

Examiner Only	
Marks	Remark

(c) (i) The crude product is recrystallised before its melting point is determined. Explain why recrystallisation is carried out and, giving experimental details, describe the process of recrystallisation.

_____

_____

_____

_____

_____

_____ [4]

(ii) How would the crystals be dried before the melting point is determined?

_____

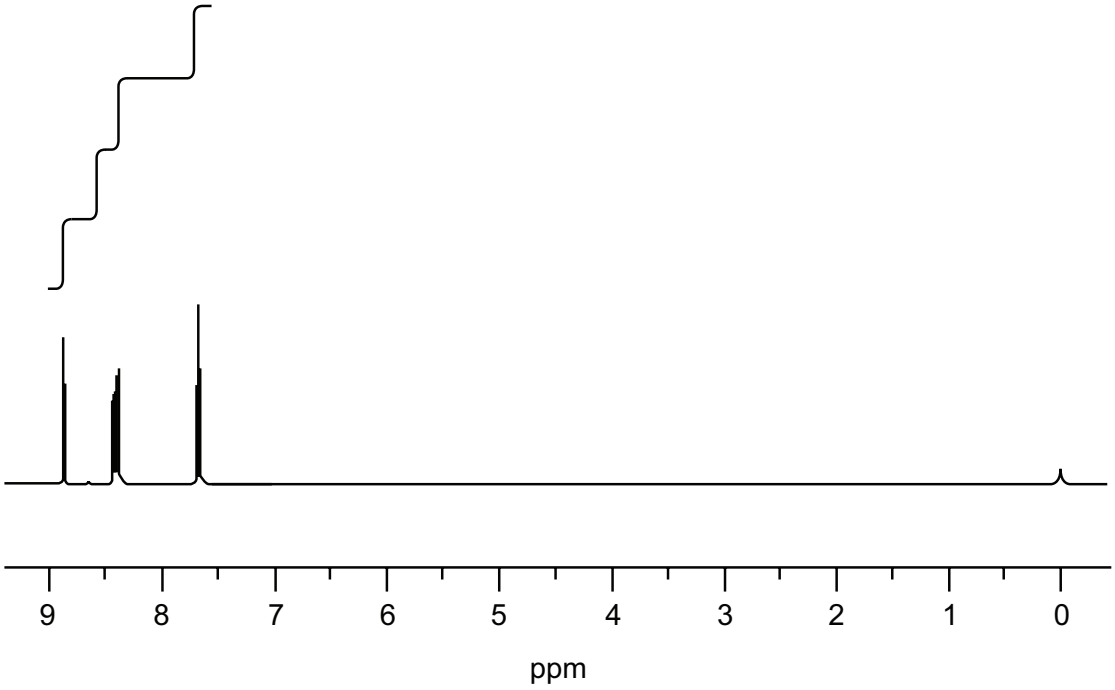
_____ [1]

(iii) How would you use the melting point to determine whether the crystals are pure ethyl 3-nitrobenzoate?

_____

_____ [2]

(d) Part of the nmr spectrum for ethyl 3-nitrobenzoate is shown below. The aromatic protons are shown.
Complete the nmr spectrum in terms of integration and splitting pattern.



[3]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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ADVANCED
General Certificate of Education
2014

Chemistry

Assessment Unit A2 3
Internal Assessment
Practical Examination 2

[AC232]

FRIDAY 16 MAY

AC232

APPARATUS AND MATERIALS LIST

Updated version for Practical Examination 2

Advice for centres

- All chemicals used should be at least laboratory reagent specification and labelled with appropriate safety symbols, e.g. irritant.

- For centres running multiple sessions – candidates for the later session should be supplied with clean, dry glassware. If it is not feasible then glassware from the first session should be thoroughly washed, rinsed with deionised water and allowed to drain.

- **Ensure all chemicals are in date otherwise expected observations may not be seen.**

Practical Examination 2

Each candidate must be supplied with safety goggles or glasses.

Question 1

Each candidate must be supplied with:

- one 50 cm^3 burette of at least class B quality
- one 25 cm^3 pipette of at least class B quality
- one 250 cm^3 volumetric flask
- a safety pipette filler
- three conical flasks of 250 cm^3 capacity
- a funnel for filling the burette (optional)
- a white tile or white paper
- one beaker of 250 cm^3 capacity
- a wash bottle containing deionised/distilled water
- a retort stand and clamp
- weighing bottle (or equivalent)
- approximately 9.0 g of ammonium iron(II) sulfate labelled as **ammonium iron(II) sulfate** and **HARMFUL**
- access to an accurate balance (reading to 2 decimal places)
- glass rod
- spatula
- 250 cm^3 of dilute sulfuric acid (approximately 1.0 mol dm^{-3}) labelled **dilute sulfuric acid** and **CAUTION** and **IRRITANT**
- 150 cm^3 of 0.02 mol dm^{-3} acidified potassium manganate(VII) labelled **potassium manganate(VII) solution** and **HARMFUL**.

Practical Examination 2

Question 2

Each candidate must be supplied with:

- a small beaker
- five test tubes
- a boiling tube
- a test tube holder
- a test tube rack
- a spatula
- a stirring rod
- a heat-proof mat
- a Bunsen burner
- several plastic droppers
- deionised water
- kettle to supply hot water (optional)
- hydrated copper(II) sulfate (approximately 3.0 g) labelled **X** and **HARMFUL**
- about 10 cm^3 of concentrated hydrochloric acid in a stoppered reagent bottle labelled **concentrated hydrochloric acid** and **CORROSIVE**
- about 10 cm^3 of an aqueous solution of 1,2-diaminoethane (approximately 0.2M) labelled **1,2-diaminoethane** and **IRRITANT**
- about 10 cm^3 of an aqueous solution of sodium hydroxide (approximately 2.0M) labelled **sodium hydroxide** and **CORROSIVE**
- a reagent bottle containing concentrated ammonia labelled **concentrated ammonia** and **CORROSIVE** (available in the fume cupboard(s)). Each candidate will only need about 10 cm^3
- about 10 cm^3 of aqueous solution of barium chloride (approximately 0.1M) labelled **barium chloride solution** and **HARMFUL**
- about 10 cm^3 of aqueous ethanoic acid (approximately 25% glacial 75% water) labelled **Y and IRRITANT**
- about 10 cm^3 of aqueous potassium dichromate (approximately 0.1M) labelled **potassium dichromate** and **TOXIC**
- 2M sulfuric acid labelled **dilute sulfuric acid** and **CORROSIVE**
- 2–3 g of sodium hydrogencarbonate labelled **sodium hydrogencarbonate**.

Rewarding Learning

ADVANCED
General Certificate of Education
2014

Chemistry

Assessment Unit A2 3

Internal Assessment

Practical Examinations 1 and 2

[AC231] [AC232]

THURSDAY 15 AND FRIDAY 16 MAY

Confidential Instructions to the Supervisor of the Practical Examination

INSTRUCTIONS TO THE SUPERVISOR OF THE PRACTICAL EXAMINATION

General

1. The instructions contained in this document are for the use of the Supervisor **and are strictly confidential**. Under no circumstances may information concerning apparatus or materials be given before the examination to a candidate or other unauthorised person.

2. In a centre with a large number of candidates it may be necessary for two or more examination sessions to be organised. **It is the responsibility of the schools to ensure that there should be no contact between candidates taking each session.**

3. A suitable laboratory must be reserved for the examination and kept locked throughout the period of preparation. Unauthorised persons not involved in the preparation for the examination must not be allowed to enter. Candidates must not be admitted until the specified time for commencement of the examination.

4. The Supervisor must ensure that the solutions provided for the candidates are of the nature and concentrations specified in the Apparatus and Materials List.

5. **The Supervisor is to be granted access to the Teacher's Copy of the Question Paper, showing parts of questions 1 and 2 only, on Monday 12 May 2014.** The Supervisor is asked to check, at the earliest opportunity, that the experiments and tests in the question paper may be completed satisfactorily using the apparatus, materials and solutions that have been assembled. **This question paper must then be returned to safe custody** at the earliest possible moment after the Supervisor has ensured that all is in order. **No access to the question paper should be allowed before 12 May 2014.**

6. In the case of centres who have candidates entered for both practical examinations, the Supervisor must **return all unused scripts of Practical Examination 1** to the Examinations Officer immediately on completion of the examination. **The contents of this examination must be kept confidential until the completion of Practical Examination 2**.

7. Pipettes and burettes should be checked before the examination, and there should be an adequate supply of spare apparatus in case of breakages. The Apparatus and Materials List should be regarded as a minimum and there should be no objection to candidates being supplied with more than the minimum amount of apparatus and materials.

8. **Candidates may not use text books and laboratory notes for reference during the examination, and must be informed of this beforehand.**

9. Clear instructions must be given by the Supervisor to all candidates at the beginning of the examination concerning appropriate safety procedures and precautions. Supervisors are also advised to remind candidates that all substances in the examination must be treated with caution. **Only those tests specified in the question paper should be attempted. Candidates must not attempt any additional confirmatory tests**. Anything spilled on the skin should be washed off immediately with plenty of water. The use of appropriate eye protection is essential.

10. Supervisors are reminded that they may not assist candidates during the examination. However, if in the opinion of the Supervisor, a candidate is about to do something which may endanger him/herself or others, the Supervisor should intervene. A full written report must be sent to CCEA at once.

11. Upon request, a candidate may be given additional quantities of materials (answer paper, reagents and unknowns) without penalty. No notification need be sent to CCEA.

12. The examination room must be cleared of candidates immediately after the examination.

13. No materials will be supplied by CCEA.

Northern Ireland Council for the Curriculum, Examinations and Assessment

General Certificate of Education

Advanced

Chemistry

Practical Examination 1

Thursday 15 May 2014

Centre Number
71

Candidate Number

This report must be completed by the Supervisor during the examination. The complete report should include all candidates taking this Practical Examination. This Supervisor's Report should be copied and attached to **Each Advice Note** bundle and returned to CCEA in the normal way.

Comments:

Supervisor's Signature . . . . . Date . . . . . .

Northern Ireland Council for the Curriculum, Examinations and Assessment

General Certificate of Education

Advanced

Chemistry

Practical Examination 2

Friday 16 May 2014

Centre Number
71

Candidate Number

This report must be completed by the Supervisor during the examination. The complete report should include all candidates taking this Practical Examination. This Supervisor's Report should be copied and attached to **Each Advice Note** bundle and returned to CCEA in the normal way.

Comments:

Supervisor's Signature . . . . . Date . . . . . .