



Rewarding Learning

ADVANCED
General Certificate of Education
2012

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Centre Number
71
Candidate Number

Chemistry

Assessment Unit A2 3
Internal Assessment
Practical Examination 2

[AC232]



THURSDAY 10 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 **Questions 3(d) and (e)**.
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	Moderation Mark
1		
2		
3		
Total Marks		

Tea	Remark

1 1.2 g of an impure sample of potassium iodate(V), KIO_3 , is to be analysed for percentage purity. A 250 cm^3 solution of the sample was prepared in a volumetric flask.

(a) Describe how the 250 cm^3 solution of potassium iodate(V) was prepared.

[6]

You are provided with:

- a sample of the solution of potassium iodate(V)
- four 10 cm^3 portions of dilute sulfuric acid
- four 1.0g portions of potassium iodide
- 0.1 mol dm^{-3} sodium thiosulfate solution
- starch indicator

Assuming that all the apparatus is clean and dry, you are required to carry out a titration to determine the percentage purity of the sample of potassium iodate(V) using the method given below.

- Pipette 25.0 cm^3 of the potassium iodate(V) solution into a conical flask.
- Add 10 cm^3 of dilute sulfuric acid to the conical flask.
- Add 1.0g of potassium iodide to the conical flask and swirl the flask to ensure it dissolves.
- Titrate, using the 0.1 mol dm^{-3} sodium thiosulfate solution, until the solution is straw coloured.
- Add starch indicator to the conical flask and titrate until the indicator changes from blue-black to colourless.

(b) Carry out the titration and record your results in a suitable table in the space below. Calculate the average titre.

Te. Mar.	Remark

[10]

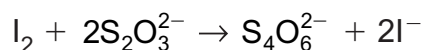
(c) (i) Write the equation for the reaction between potassium iodate(V) and potassium iodide in the presence of dilute sulfuric acid.

_____ [2]

(ii) Write an ionic equation for this reaction.

_____ [1]

(d) (i) Iodine reacts with sodium thiosulfate according to the equation:



Calculate the mass of KIO₃ in the sample.

 _____ [5]

(ii) Calculate the percentage purity of the KIO₃ sample.

 _____ [1]

Te.	Mar.	Remark

2 Observation/deduction

Safety goggles must be worn at all times and care should be exercised during this investigation.

- (a) You are provided with a sample of an inorganic compound labelled B.
- (i) You are required to carry out the following tests on the compound and record your observations in the table.

Test	Observations
1 Describe the appearance of B.	[2]
2 Dissolve 3 spatula measures of B in 15 cm ³ of deionised water. Keep this solution for tests 3(a), 4(a), 5(a) and 6.	[1]
3 (a) Place 3 cm ³ of the solution from test 2 in a test tube and add 5 drops of sodium hydroxide solution. (b) Add a further 5 cm ³ of sodium hydroxide solution to the test tube.	[3]
4 (a) In a fume cupboard place 2 cm ³ of the solution from test 2 in a test tube and add 3 drops of concentrated ammonia solution. (b) Add a further 5 cm ³ of concentrated ammonia solution to the test tube.	[2]
5 (a) Place 3 cm ³ of the solution from test 2 in a test tube and in a fume cupboard, add 5 cm ³ of concentrated hydrochloric acid. (b) Place 3 cm ³ of the solution from test 5(a) in another test tube and add 5 cm ³ of edta solution.	[2]
6 Place 3 cm ³ of the solution from test 2 in another test tube and add 3 cm ³ of barium chloride solution.	[2]

Test	Mark	Remark

(ii) Identify compound B.

_____ [2]

(iii) Complex ions are formed in tests 4(b), 5(a) and 5(b). Write the formulae of the complex ions formed in these tests.

Test 4(b): _____

Test 5(a): _____

Test 5(b): _____ [3]

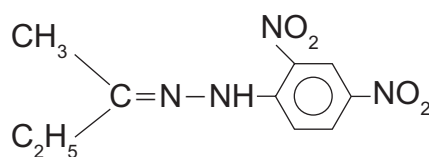
(iv) Explain why a reaction occurs in test 5(b).

_____ [2]

Test	Mark	Remark

3 Planning Exercise

Preparation and purification of the 2,4-dinitrophenylhydrazone derivative obtained from the reaction of butanone with 2,4-dinitrophenylhydrazine.



The hydrazone may be prepared by reacting excess aqueous 2,4-dinitrophenylhydrazine with butanone.

Butanone is a liquid at room temperature with a density of 0.80 g cm^{-3} .

- (a) Write the equation for the formation of the 2,4-dinitrophenylhydrazone.

[2]

- (b) Calculate the volume of butanone needed to form 5.4 g of the 2,4-dinitrophenylhydrazone assuming a 90% yield.

[4]

- (c) Butanone causes irritation of the eyes and nose. What safety precaution needs to be carried out during the preparation?

[1]

Quality of written communication is assessed in parts (d) and (e).

(d) The 2,4-dinitrophenylhydrazone is formed as an orange precipitate which is collected by suction filtration using a Buchner flask.

(i) Explain how "Buchner filtration" is carried out.

[3]

(ii) State why it is used in preference to normal filtration.

[2]

(e) The solvent used to recrystallise the 2,4-dinitrophenylhydrazone is methanol.

(i) Explain why the 2,4-dinitrophenylhydrazone is soluble in methanol and not in octane.

[2]

(ii) Describe how you would recrystallise the 2,4-dinitrophenylhydrazone.

[4]

Quality of written communication [2]

Te. Mar.	emark

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2012**

Chemistry

Assessment Unit A2 3

Internal Assessment

Practical Examinations 1 and 2

[AC231] [AC232]

WEDNESDAY 9 and THURSDAY 10 MAY



AC231 AC232

APPARATUS AND MATERIALS LIST

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Advice for centres

- All chemicals used should be at least laboratory reagent specification and labelled with 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.

Apparatus and Materials List

Practical 1 Question 1

Each candidate must be supplied with:

One 50 cm³ burette of at least class B quality

A funnel for filling the burette

A retort stand and burette clamp

Two 100 cm³ beakers

One 25 cm³ pipette of at least class B quality

A safety pipette filler

Three 250 cm³ conical flasks

A white tile or white paper

A wash bottle containing deionised water

150 cm³ of 0.1 M sodium thiosulfate solution labelled **0.1 M sodium thiosulfate solution**.

150 cm³ of potassium iodate(V) solution of concentration 3.36 g/dm³ labelled **potassium iodate(V) solution** and **oxidising**.

4 × 10 cm³ portions of sulfuric acid solution labelled **dilute sulfuric acid** and **irritant**. This solution should be of approximate concentration 1 M.

(Centres may choose to leave out a reagent bottle containing approximately 50 cm³ of 1 M sulfuric acid labelled **dilute sulfuric acid** and **irritant** and a 10 cm³ measuring cylinder and give candidates adequate instruction in this part.)

4 × 1 g portions of solid potassium iodide labelled **potassium iodide**.

A dropper bottle containing starch solution labelled **starch solution**.

Appropriate amounts should be prepared for the total number of candidates taking the examination.

Practical 1 Question 2

Each candidate must be supplied with:

10 test tubes (18 × 150 or 18 × 125 mm preferred)

Two stoppers to fit test tubes (Size 15 fits 18 × 150 or 125)

A suitable test tube rack

A spatula

A minimum of 15 disposable pipettes/droppers

A wash bottle of deionised water

3 g of hydrated nickel sulfate, $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$, labelled **A**

About 10 cm³ of a mixture of propanal, glacial ethanoic acid and deionised water. This should be prepared by placing approximately 60 cm³ of deionised water in a 100 cm³ volumetric flask and adding 20 cm³ of glacial ethanoic acid slowly. 20 cm³ of propanal should **also** be added to the flask. Mix thoroughly. The volumes do not need to be exact. This should be labelled **Y** and **irritant**.

About 20 cm³ of sodium hydroxide solution in a stoppered reagent bottle labelled **sodium hydroxide solution** and **irritant**. This solution should be approximately just less than 0.5 M.

About 20 cm³ of ammonia solution in a stoppered reagent bottle labelled **ammonia solution** and **irritant**. This solution should be approximately 2 M.

About 10 cm³ of 1,2-diaminoethane solution in a reagent bottle/beaker labelled **1,2-diaminoethane solution** and **irritant**. This solution should be approximately 1 M (prepared by dissolving 67 cm³ of 1,2-diaminoethane in deionised water and making up the volume to 1 dm³).

About 10 cm³ of edta solution in a reagent bottle/beaker labelled **edta solution**. This solution should be approximately 0.1 M (38 g dm⁻³ for tetrasodium edta).

About 10 cm³ of barium chloride solution in a reagent bottle/beaker labelled **barium chloride solution**. This solution should be approximately 0.1 M (20.8 g dm⁻³ for BaCl_2 or 24.4 g dm⁻³ for $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$).

About 10 cm³ of potassium dichromate solution in a stoppered reagent bottle labelled **acidified potassium dichromate solution** and **irritant**. This solution should be made up by dissolving 30 g of potassium dichromate in 100 cm³ of 2.0 M sulfuric acid and made up to 1 dm³ using deionised water.

About 1 g of solid sodium hydrogencarbonate labelled **sodium hydrogencarbonate**.

Candidates should have access to a beaker of warm water (from a kettle) during these exercises.

Practical 2 Question 1

Each candidate must be supplied with:

One 50 cm³ burette of at least class B quality

A funnel for filling the burette

A retort stand and burette clamp

Two 100 cm³ beakers

One 25 cm³ pipette of at least class B quality

A safety pipette filler

Three 250 cm³ conical flasks

A white tile or white paper

A wash bottle containing deionised water

150 cm³ of 0.1 M sodium thiosulfate solution labelled **0.1 M sodium thiosulfate solution**.

150 cm³ of potassium iodate(V) solution of concentration 2.88 g/dm³ labelled **potassium iodate(V) solution** and **oxidising**.

4 × 10 cm³ portions of sulfuric acid solution labelled **dilute sulfuric acid** and **irritant**. This solution should be of approximate concentration 1 M.

(Centres may choose to leave out a reagent bottle containing approximately 50 cm³ of 1 M sulfuric acid labelled **dilute sulfuric acid** and **irritant** and a 10 cm³ measuring cylinder and give candidates adequate instruction in this part.)

4 × 1 g portions of solid potassium iodide labelled **potassium iodide**.

A dropper bottle containing starch solution labelled **starch solution**.

Appropriate amounts should be prepared for the total number of candidates taking the examination.

Practical 2 Question 2

Each candidate must be supplied with:

10 test tubes (18 × 150 or 18 × 125 mm preferred)

Two stoppers to fit test tubes (Size 15 fits 18 × 150 or 125)

A suitable test tube rack

A spatula

A minimum of 15 disposable pipettes/droppers

A wash bottle of deionised water

3 g of hydrated cobalt(II) sulfate, $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$, labelled **B**

About 10 cm³ of a mixture of propanone, glacial ethanoic acid and deionised water. This should be prepared by placing approximately 60 cm³ of deionised water in a 100 cm³ volumetric flask and adding 20 cm³ of glacial ethanoic acid slowly. 20 cm³ of propanone should **also** be added to the flask. Mix thoroughly. The volumes do not need to be exact. This should be labelled **Z** and **irritant**.

About 20 cm³ of sodium hydroxide solution in a stoppered reagent bottle labelled **sodium hydroxide solution** and **irritant**. This solution should be approximately just less than 0.5 M.

About 20 cm³ of concentrated ammonia solution in a stoppered reagent bottle labelled **concentrated ammonia solution** and **corrosive**. This should be placed in a fume cupboard.

About 20 cm³ of concentrated hydrochloric acid in a reagent bottle. This should be labelled **concentrated hydrochloric acid** and **corrosive**.

About 10 cm³ of edta solution in a reagent bottle/beaker labelled **edta solution**. This solution should be approximately 0.1 M (38 g dm⁻³ for tetrasodium edta).

About 10 cm³ of barium chloride solution in a reagent bottle/beaker labelled **barium chloride solution**. This solution should be approximately 0.1 M (20.8 g dm⁻³ for BaCl_2 or 24.4 g dm⁻³ for $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$).

About 10 cm³ of potassium dichromate solution in a stoppered reagent bottle labelled **acidified potassium dichromate solution** and **irritant**. This solution should be made up by dissolving 30 g of potassium dichromate in 100 cm³ of 2.0 M sulfuric acid and made up to 1 dm³ using deionised water.

About 1 g of solid sodium hydrogencarbonate labelled **sodium hydrogencarbonate**.

Candidates should have access to a beaker of warm water (from a kettle) during these exercises.



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ADVANCED
General Certificate of Education
2012

Chemistry

Assessment Unit A2 3

Internal Assessment

Practical Examinations 1 and 2

[AC231] [AC232]

WEDNESDAY 9 AND THURSDAY 10 MAY

Confidential Instructions to the Supervisor of the Practical Examination

INSTRUCTIONS TO THE SUPERVISOR OF THE PRACTICAL EXAMINATION

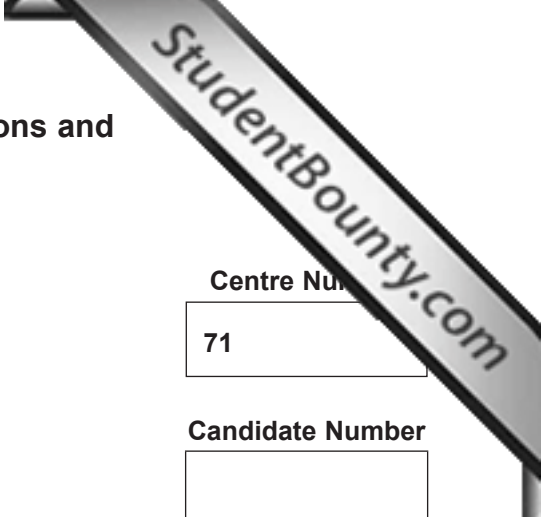
General

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 questions 1 and 2 only, on Thursday 3 May 2012.** 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 3 May 2012.**
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 start 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.** Anytime spilled on the skin should be washed off immediately with plenty of water. The use of appropriate eye protection is essential.
10. The Supervisor **must** perform the experiments detailed in the titration exercise, using the solutions provided for the candidates, at approximately the same time as they are being used by the candidates. The supervisor's results must be reported to CCEA on the Supervisor's Report located at the end of this document. **The Supervisor's Report must be copied and attached to each advice note bundle, before despatch to CCEA.**

The importance of accuracy in completing the *Supervisor's Report* is emphasised. It represents the only means available to CCEA of assessing the accuracy of a candidate's work. Details must be given if the apparatus or materials provided differ from that detailed in this document.

11. 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.
12. 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.
13. The examination room must be cleared of candidates immediately after the examination.
14. 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

Wednesday 9 May 2012

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. The Report should be copied and attached to **Each Advice Note** bundle and returned to CCEA in the normal way.

The Supervisor is asked to work through the **practical aspects** of Exercise 1 and to record the results in the table below.

Burette Readings

Record your readings to 0.05 cm³

	Initial burette reading/cm³	Final burette reading/cm³	Titre/cm³
Rough			
1st accurate			
2nd accurate			

Average titre _____ cm³

This Supervisor's Report must be copied and attached to each advice note bundle, before despatch to CCEA.

Comments:

Supervisor's Signature Date

Northern Ireland Council for the Curriculum, Examinations and Assessment

General Certificate of Education

Advanced

Chemistry

Practical Examination 2

Thursday 10 May 2012

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. The Report should be copied and attached to **Each Advice Note** bundle and returned to CCEA in the normal way.

The Supervisor is asked to work through the **practical aspects** of Exercise 1 and to record the results in the table below.

Burette Readings

Record your readings to 0.05 cm^3

	Initial burette reading/ cm^3	Final burette reading/ cm^3	Titre/ cm^3
Rough			
1st accurate			
2nd accurate			

Average titre _____ cm^3

This Supervisor’s Report must be copied and attached to each advice note bundle, before despatch to CCEA.

Comments:

Supervisor’s Signature Date

