



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2012

Centre Number

71

Candidate Number

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination 2

[AC132]

TUESDAY 22 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 five** questions.

Write your answers in the spaces provided.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

Section A

Question 1 is a practical exercise worth 25 marks.

Question 2 is a practical exercise worth 29 marks.

Section B

Question 3 is a planning exercise worth 20 marks.

Questions 4 and 5 are written questions worth a total of 16 marks, testing aspects of experimental chemistry.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question. A Periodic Table of Elements (including some data) is provided.

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

Question Number	Marks	
	Teacher Mark	Examiner Check
1		
2		
3		
4		
5		

Total Marks		
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(b) Carry out the titration as follows:

- Rinse out a burette with 0.10 mol dm^{-3} sodium hydroxide solution.
- Fill the burette with 0.10 mol dm^{-3} sodium hydroxide solution.
- Rinse out the pipette with the organic acid solution.
- Using the pipette and pipette filler, place 25.0 cm^3 of the organic acid solution into the conical flask.
- Add three drops of phenolphthalein indicator to the conical flask and titrate with 0.10 mol dm^{-3} sodium hydroxide solution until the end point is reached.

Present your results in a suitable table and calculate the average titre.

[12]

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

_____ to _____ [1]

(d) Write the equation for the reaction of the organic acid, RCOOH , with the sodium hydroxide.

_____ [1]

Teacher Mark	Examiner Check	Remark

(e) Calculate the molarity of the organic acid solution used in the titration.

 [2]

(f) (i) Calculate the relative molecular mass of the acid.

 [1]

(ii) Deduce the relative formula mass of the alkyl group, R.

 [1]

(iii) Write the formula of the acid, RCOOH.

 [1]

Teacher Mark	Examiner Check	Remark

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(Questions continue overleaf)

2 Observation/deduction

Safety goggles must be worn at all times and care should be taken during this practical examination.

- (a) You are provided with a mixture of two salts labelled **X** containing different cations and different anions. One of the salts is soluble in water and the other is insoluble.

Carry out the following tests. Record your observations and deductions in the spaces below and identify the two salts.

Teacher Mark	Examiner Check	Remark

Test	Observations	Deductions
1 Describe the appearance of each salt in the mixture.	[2]	[2]
2 (a) Add two spatula measures of X to 30 cm ³ of distilled water and stir. Filter.	[2]	
(b) Add five drops of dilute nitric acid to 2 cm ³ of the filtrate.		
(i) Add 1 cm ³ of silver nitrate solution to the acidified filtrate.	[1]	[1]
(ii) In a fume cupboard add 10 cm ³ of concentrated ammonia solution.	[1]	[1]
(c) Dip a clean nichrome wire into concentrated hydrochloric acid and use it to place some of the filtrate into a blue Bunsen flame.	[1]	[1]

3	(a) Add three spatula measures of mixture X to a boiling tube. Slowly add 4 cm ³ of dilute nitric acid.	[2]	
	(b) Test any gas given off with limewater.	[1]	[2]
	(c) To the acidified solution of X slowly add dilute ammonia solution dropwise. Continue to add dilute ammonia solution until no further change occurs.	[3]	[1]

Name the soluble salt in **X**.

_____ [1]

Name the insoluble salt in **X**.

_____ [1]

Teacher Mark	Examiner Check	Remark

(b) You are provided with a sample of an organic liquid, labelled **Y**. Carry out the following tests. Record your observations and deductions in the spaces provided.

Test	Observations	Deductions
1 Add 5 cm ³ of Y to 5 cm ³ of water in a test tube. Stopper the test tube and gently shake the contents. Allow the mixture to settle.	[1]	[1]
2 Add equal amounts of Y and potassium dichromate solution to a test tube. Acidify with dilute sulfuric acid and warm the mixture in a water bath.	[2]	[1]
3 Place ten drops of Y on a watch-glass placed on a heatproof mat and ignite using a burning splint.	[1]	[1]

What is the functional group present in liquid **Y**?

_____ [1]

max [29]

Teacher Mark	Examiner Check	Remark

Section B

3 Planning

The nitrates of the Group II metals are prepared by neutralising dilute nitric acid, HNO_3 , with an excess of the corresponding solid hydroxide or carbonate, except for magnesium nitrate which is made from the oxide or the metal.

- (a) (i) Write the equation for the reaction of magnesium oxide with nitric acid.

_____ [2]

- (ii) State how you would know that the reaction was complete.

_____ [1]

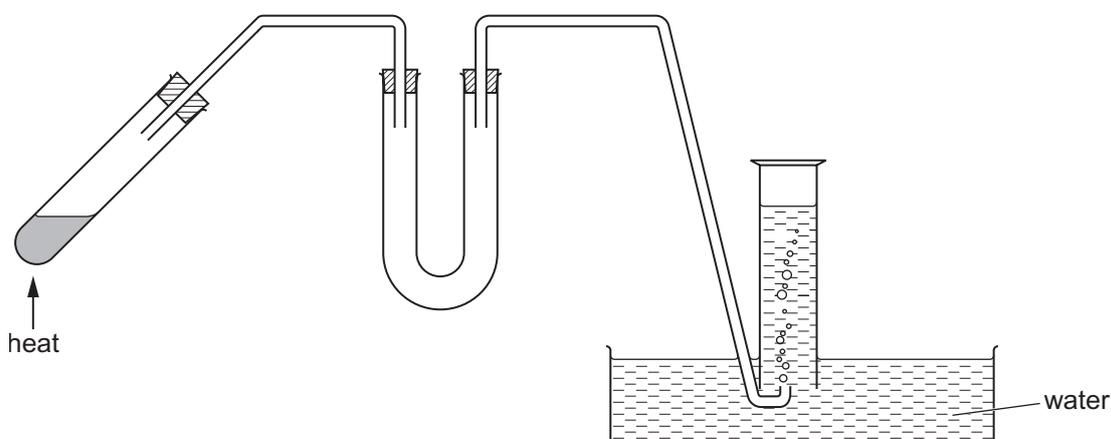
- (iii) How would you remove the excess magnesium oxide used?

_____ [1]

- (b) Group II nitrates decompose when strongly heated according to the following equation:



The action of heat on magnesium nitrate may be investigated using the following apparatus. The nitrogen(IV) oxide is collected in the U-tube. The oxygen is collected in the gas jar.



Teacher Mark	Examiner Check	Remark

(iii) How could you remove all the water of crystallisation from magnesium nitrate crystals?

_____ [2]

(d) The percentage yield of the reaction in (b) can be based on the volume of oxygen produced at 20 °C and 1 atmosphere pressure. Calculate the percentage yield if 150 cm³ of oxygen are produced from 3.5 g of magnesium nitrate crystals.

moles of oxygen produced

_____ [1]

moles of magnesium nitrate crystals used

_____ [2]

theoretical moles of oxygen

_____ [1]

% yield

_____ [2]

Teacher Mark	Examiner Check	Remark

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(Questions continue overleaf)

- 4 Halogenoalkanes may be prepared by the reaction of alcohols with solutions of hydrogen halides.

The following is a method used to prepare bromoethane.

Add 100 cm³ of concentrated sulfuric acid to a mixture of 60 g of ethanol and 50 cm³ of water in a distillation flask. Cool and add 100 g of potassium bromide. Distil and collect the bromoethane in a flask surrounded by cold water.

When the reaction is complete wash the bromoethane with water and then separate it from the water. Add anhydrous calcium chloride to the impure bromoethane in a beaker. Filter off the solid and distil the impure bromoethane, collecting the liquid which boils at 35–40 °C. The yield in this preparation is 80%.

- (a) (i) Write an equation for the reaction of ethanol with hydrogen bromide.

_____ [1]

- (ii) Calculate the number of moles of potassium bromide and ethanol used.

_____ [2]

- (iii) If the yield is 80% what mass of bromoethane is obtained?

_____ [2]

- (b) Explain how you would wash the bromoethane with water and then separate it from water.

_____ [4]

Teacher Mark	Examiner Check	Remark

(c) What was the purpose of using anhydrous calcium chloride?

_____ [1]

5 The densities and the boiling points of haloethanes are listed in the table below.

haloethane	density/g cm ⁻³	boiling point/°C
chloroethane	0.898	12
bromoethane	1.461	38
iodoethane	1.936	72

(a) Suggest why there is an increase in density from bromoethane to iodoethane.

_____ [1]

(b) Suggest why there is an increase in boiling point from chloroethane to iodoethane.

_____ [2]

(c) All three haloethanes are present in a container at room temperature. Suggest how you would separate and obtain each haloethane.

_____ [3]

THIS IS THE END OF THE QUESTION PAPER

Teacher Mark	Examiner Check	Remark

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Rewarding Learning

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

Chemistry

Assessment Unit AS 3

Internal Assessment

Practical Examinations 1 and 2

[AC131] [AC132]

MONDAY 21 MAY AND TUESDAY 22 MAY



AC131 AC132

APPARATUS AND MATERIALS LIST

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.

Practical Examination 1

Each candidate must be supplied with safety goggles or glasses.

Question No. 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 clamp;
- two beakers of 100 cm³ capacity;
- one 25 cm³ pipette of at least class B quality;
- a safety pipette filler;
- three conical flasks of 250 cm³ capacity;
- phenolphthalein indicator with dropper;
- a white tile or white paper;
- a wash bottle containing deionised/distilled water;
- 150 cm³ of 0.1 mol dm⁻³ sodium hydroxide solution labelled **sodium hydroxide solution 0.1 mol dm⁻³ and corrosive**;
- 150 cm³ of 0.1 mol dm⁻³ hydrochloric acid labelled **organic acid and corrosive**.

Question No. 2

Each candidate must be supplied with:

- eight test tubes;
- a boiling tube;
- a test tube/boiling tube holder;
- a test tube/boiling tube rack;
- a spatula;
- a glass rod;
- a heat-proof mat;
- a Bunsen burner;
- four droppers with teats;
- a filter funnel with two filter papers;
- two watch-glasses;
- a beaker of 100 cm³ capacity;
- a piece of nichrome wire;
- a rubber bung to fit a test tube;
- two wooden splints;
- distilled water;
- about 5 g of a mixture of 2.5 g of copper(II) carbonate and 2.5 g of sodium chloride crystals in a 50/100 cm³ beaker labelled **A**;
- about 10 cm³ of dilute nitric acid in a reagent bottle/beaker labelled **dilute nitric acid**. This solution should be approximately 0.5 mol dm⁻³;
- about 20 cm³ of concentrated hydrochloric acid in a stoppered reagent bottle labelled **concentrated hydrochloric acid** and **corrosive**;
- about 10 cm³ of a saturated solution of calcium hydroxide in a reagent bottle/beaker labelled **limewater**;
- about 10 cm³ of silver nitrate solution in a reagent bottle/beaker labelled **silver nitrate solution**. This solution should be approximately 0.1 mol dm⁻³ (17.0 g dm⁻³);
- about 20 cm³ of dilute ammonia solution (2 mol dm⁻³) in a reagent bottle labelled **dilute ammonia solution** and **irritant**;

- about 15 cm³ of ethanol in a stoppered reagent bottle labelled **B**;
- about 10 cm³ of potassium dichromate(VI) solution in a stoppered reagent bottle labelled **potassium dichromate(VI) solution** and **irritant**. This solution should be approximately 0.1M, made by dissolving 30 g of potassium dichromate(VI) in 100 cm³ of deionised water and made up to 1 dm³ with deionised water;
- kettle for hot water;
- about 5 cm³ of dilute sulfuric acid (2 mol dm⁻³) in a reagent bottle labelled **dilute sulfuric acid** and **corrosive**.

Practical Examination 2

Each candidate must be supplied with safety goggles or glasses.

Question No. 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 clamp;
- two beakers of 100 cm³ capacity;
- one 25 cm³ pipette of at least class B quality;
- a safety pipette filler;
- three conical flasks of 250 cm³ capacity;
- phenolphthalein indicator with dropper;
- a white tile or white paper;
- a wash bottle containing deionised/distilled water;
- 150 cm³ of 0.1 mol dm⁻³ sodium hydroxide solution labelled **sodium hydroxide solution 0.1 mol dm⁻³** and **corrosive**;
- 150 cm³ of 0.1 mol dm⁻³ hydrochloric acid labelled **organic acid** and **corrosive**.

Question No. 2

Candidates should not be supplied with “blue glass” but it should be available if asked for.

Each candidate must be supplied with:

- eight test tubes;
- a boiling tube;
- a test tube/boiling tube holder;
- a test tube/boiling tube rack;
- a spatula;
- a glass rod;
- a heat-proof mat;
- a Bunsen burner;
- four droppers with teats;
- a filter funnel with two filter papers;
- two watch-glasses;
- a beaker of 100 cm³ capacity;
- a piece of nichrome wire;
- a rubber bung to fit a test tube;
- two wooden splints;
- distilled water
- about 5 g of a mixture of 2.5 g of copper(II) carbonate and 2.5 g of sodium iodide crystals in a 50/100 cm³ beaker labelled **X**;
- about 10 cm³ of dilute nitric acid in a reagent bottle/beaker labelled **dilute nitric acid**. This solution should be approximately 2 mol dm⁻³;
- about 20 cm³ of concentrated hydrochloric acid in a stoppered reagent bottle labelled **concentrated hydrochloric acid** and **corrosive**;
- about 10 cm³ of a saturated solution of calcium hydroxide in a reagent bottle/beaker labelled **limewater**;
- about 10 cm³ of dilute ammonia solution (2 mol dm⁻³) in a reagent bottle labelled **dilute ammonia solution** and **irritant**;

- about 10 cm³ of concentrated ammonia solution (8 mol dm⁻³) in a reagent bottle labelled **concentrated ammonia solution** and **corrosive**;
- about 10 cm³ of silver nitrate solution in a reagent bottle/beaker labelled **silver nitrate solution**. This solution should be approximately 0.1 mol dm⁻³ (17.0 g dm⁻³);
- about 15 cm³ of ethanol in a stoppered reagent bottle labelled **Y**;
- about 10 cm³ of potassium dichromate(VI) solution in a stoppered reagent bottle labelled **potassium dichromate(VI) solution** and **irritant**. This solution should be approximately 0.1M, made by dissolving 30 g of potassium dichromate(VI) in 100 cm³ of deionised water and made up to 1 dm³ with deionised water;
- kettle for hot water;
- about 5 cm³ of dilute sulfuric acid (2 mol dm⁻³) in a reagent bottle labelled **dilute sulfuric acid** and **corrosive**.



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

Chemistry

Assessment Unit AS 3

Internal Assessment

Practical Examinations 1 and 2

[AC131] [AC132]

MONDAY 21 AND TUESDAY 22 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 Wednesday 16 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 16 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 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. 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 Subsidiary

Chemistry

Practical Examination 1

Monday 21 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

