Centre Number

71

Candidate Number

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2013

Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination 2

[AC132]

TUESDAY 21 MAY, MORNING

AC132

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 the Elements, containing some data, is included in this question paper.
You may not have access to notes, textbooks and other material to assist you.

8183

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

Section A

1 Titration exercise

Washing soda ($Na_2CO_3 \bullet xH_2O$) crystals lose water of crystallisation when left in the air.

You are required to carry out a titration to find the value of x.

You are provided with:

Hydrochloric acid of concentration 0.10 mol dm^{-3}
A solution containing 9.80 g dm^{-3} of washing soda labelled **S**
Methyl orange indicator

(a) Describe how you would prepare 250 cm^3 of a 9.80 g dm^{-3} washing soda solution from the solid.

[4]

Teacher Mark | Remark

(b) Carry out the titration by:

- rinsing out the burette with the 0.10 mol dm^{-3} hydrochloric acid
- filling the burette with the 0.10 mol dm^{-3} hydrochloric acid
- transferring 25.0 cm^3 of the washing soda solution, **S**, to the conical flask
- adding three drops of methyl orange indicator to the solution in the conical flask and titrating until the end point is reached

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

[8]

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

______________________ to ______________________ [2]

(d) Write the equation for the reaction of hydrochloric acid with anhydrous sodium carbonate.

____ [2]

Teacher Mark | Remark

(e) **(i)** Calculate the number of moles of hydrochloric acid used in the titration.

____ [1]

(ii) Calculate the number of moles of sodium carbonate in $25.0\,cm^3$ of the solution.

____ [1]

(iii) Calculate the number of moles of sodium carbonate in $1.0\,dm^3$ of the solution.

____ [1]

(iv) Calculate the mass of sodium carbonate in $1.0\,dm^3$ of the solution.

____ [1]

(v) Calculate the mass of water of crystallisation in 9.80 g of washing soda.

____ [1]

(vi) Calculate the value of x in $Na_2CO_3 \bullet xH_2O$.

____

____ [2]

(f) Describe a test which confirms the presence of carbonate ions in washing soda solution.

____

____ [2]

Teacher Mark		Remark

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(Questions continue overleaf)

Teacher Mark	Examiner Check	Remark

2 Observation and deduction

Safety glasses should 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**, which have a common anion. Carry out the following experiments on the mixture. Record your observations and deductions in the spaces below and identify the two salts.

Experiment	Observations	Deductions
1 Describe **X**.	[1]	[1]
2 Make a solution of **X** by dissolving half a spatula-measure of **X** in a test tube half-full of water. Put 1 cm^3 of the solution into each of two separate test tubes. **(a)** Add three drops of sodium hydroxide solution to the first test tube. Then add a further 2 cm^3 of sodium hydroxide solution to the test tube.	[2]	[2]
(b) Add three drops of dilute ammonia solution to the second test tube. Then add a further 2 cm^3 of the ammonia solution to the test tube.	[2]	[2]
3 Make a solution of **X** by dissolving a half spatula-measure of **X** in a test tube one third full of dilute nitric acid solution.	[1]	[1]
Add 1 cm^3 of silver nitrate solution to the test tube.	[1]	[1]
4 Add a spatula-measure of **X** to a test tube one third full of sodium hydroxide solution and warm gently. Carefully smell any gas given off and test it with moist Universal Indicator paper.	[2]	[3]

Name the two salts present in **X**:

________________________ and ________________________ [2]

Teacher Mark	Examiner Check	Remark

(b) You are provided with an organic liquid labelled **Y**. Carry out the following experiments on the liquid. Record your observations and deductions in the spaces below.

Experiment	Observations	Deductions
1 Place 1 cm^3 of **Y** in a test tube and add 1 cm^3 of water. Stopper and shake the mixture.	[1]	[1]
2 Place 5 drops of **Y** on a watch glass placed on a heatproof mat and ignite it using a burning splint.	[2]	[1]
3 In a fume cupboard, add approximately 1 cm^3 of **Y** to a test tube one quarter full of bromine water and shake the mixture.	[1]	[1]
4 Add six drops of **Y** to 1 cm^3 of potassium dichromate solution in a test tube and acidify by adding 1 cm^3 of dilute sulfuric acid. Warm the mixture gently.	[1]	[2]

Based on the experiments above, suggest:

a functional group which may be present in **Y**.

____ [1]

a functional group which may be absent from **Y**.

____ [1]

max [29]

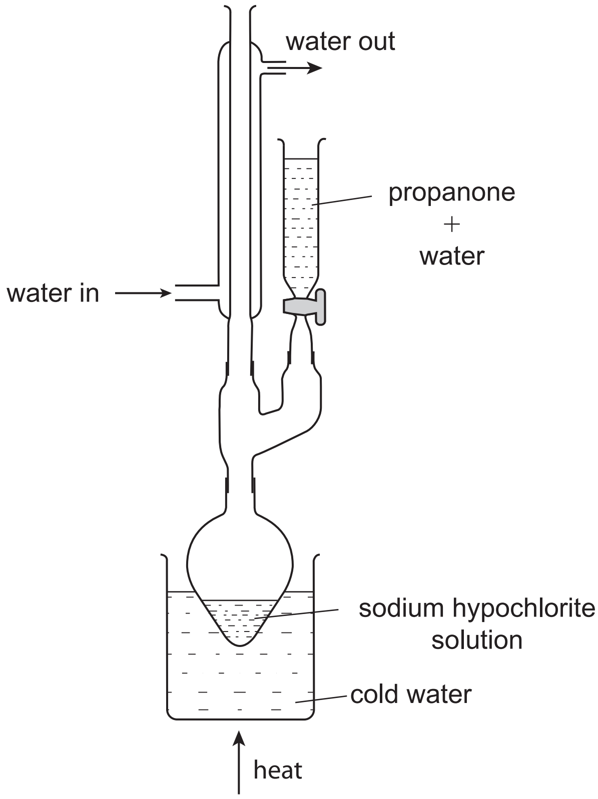
Teacher Mark	Examiner Check	Remark

Teacher Mark	Remark

Section B

3 Planning

Trichloromethane (chloroform) can be prepared in the laboratory by the following method.



$$CH_3COCH_3 + 3Cl_2 \rightarrow CCl_3COCH_3 + 3HCl$$

$$CCl_3COCH_3 + NaOH \rightarrow CHCl_3 + CH_3COONa$$

Place 30 cm^3 of sodium hypochlorite, NaClO, solution in the flask and arrange the apparatus as shown above. Cool the flask in a beaker of cold water. Carefully add, by dropping funnel, a solution of 4 cm^3 of propanone in 2 cm^3 of water. Gently swirl the contents of the flask while it is immersed in the cold water and allow to stand for about 5 minutes. Raise the temperature of the bath to 55 °C and heat the mixture under reflux for about 10 minutes to ensure that the reaction is complete.

Remove the hot water from the bath and replace with cold water in order to cool the flask. Transfer the contents of the flask to a separating funnel and remove the lower layer of impure trichloromethane.

Purify, dry and redistil the trichloromethane over a water bath, collecting the fraction distilling between 60–64 °C.

(a) The sodium hypochlorite solution used produced 12.0 g of chlorine and 5.20 g of trichloromethane.

Use the following steps to calculate the percentage yield of trichloromethane.
The density of propanone is 0.80 g cm^{-3}.

(i) Number of moles of chlorine, Cl_2, produced.

____ [1]

(ii) Mass of propanone used.

____ [1]

(iii) Number of moles of propanone used.

____ [1]

(iv) Theoretical number of moles of trichloromethane formed.

____ [1]

(v) Theoretical mass of trichloromethane formed.

____ [1]

(vi) Percentage yield of trichloromethane.

____ [1]

(vii) Suggest why the yield of trichloromethane is less than 100%.

____ [1]

Teacher Mark		Remark

(b) (i) Explain what is meant by the term **reflux**.

____

____ [2]

(ii) Suggest why the flask is kept in a beaker of cold water as the aqueous propanone is added.

____ [1]

(iii) Other than hydrochloric acid, name **two** inorganic impurities which will be present after refluxing.

____ [2]

(iv) Describe, giving practical details, how the hydrochloric acid may be removed from the impure trichloromethane using a separating funnel.

____

____

____

____ [3]

(v) Name a suitable reagent for drying the impure trichloromethane and suggest how it may be removed.

____

____ [2]

(vi) Suggest why a water bath can be used to heat the mixture during distillation.

____ [1]

(vii) State **two** reasons why the range 60–64 °C is used to collect the distillate.

____

____ [2]

Teacher Mark	Remark

4 Potassium alum, $KAl(SO_4)_2$, is a soluble double salt used in water purification.

(a) Describe how you would carry out a flame test, including expected observations, to show the presence of potassium ions in solid potassium alum.

[3]

(b) Describe how you would show, including expected observations, the presence of aluminium ions in solid potassium alum.

[4]

(c) Describe how you would show, including expected observations, the presence of sulfate ions in solid potassium alum.

[3]

Teacher Mark		Remark

5 Bleaching powder contains calcium hypochlorite, $Ca(ClO)_2$, and it reacts with hydrochloric acid to form chlorine.

$$Ca(ClO)_2 + 4HCl \rightarrow CaCl_2 + 2H_2O + 2Cl_2$$

(a) Describe a test to show the presence of chlorine gas.

____

____ [2]

(b) A 2.00 g sample of bleaching powder produced 360 cm^3 of chlorine when reacted with hydrochloric acid at room temperature and pressure.

Use the following headings to calculate the percentage of calcium hypochlorite in the bleaching powder.

Moles of chlorine

____

Moles of calcium hypochlorite

____

Mass of calcium hypochlorite

____

Percentage of calcium hypochlorite

____ [4]

THIS IS THE END OF THE QUESTION PAPER

Teacher Mark		Remark

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ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2013

Chemistry

Assessment Unit AS 3

Internal Assessment

Practical Examinations 1 and 2

[AC131] [AC132]

MONDAY 20 MAY AND TUESDAY 21 MAY

AC131 AC132

APPARATUS AND MATERIALS LIST

Advice for centres

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

- For centres running multiple sessions – candidates for the later session should be suppl 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 1

Each candidate must be supplied with safety goggles or glasses.

Question No. 1

Each candidate must be supplied with:

- one 50 cm^3 burette of at least class B quality;
- a funnel for filling the burette;
- a retort stand and clamp;
- two beakers of 100 cm^3 capacity;
- one 25 cm^3 pipette of at least class B quality;
- a safety pipette filler;
- three conical flasks of 250 cm^3 capacity;
- methyl orange indicator with dropper;
- a white tile or white paper;
- a wash bottle containing deionised/distilled water;
- 150 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution labelled **R** and **irritant**;
- 150 cm^3 of 0.1 mol dm^{-3} hydrochloric acid labelled **hydrochloric acid 0.1 mol dm^{-3}** and **irritant**.

Question No. 2

Each candidate must be supplied with:

- eight test tubes;
- 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;
- two watch-glasses;
- a beaker of 100 cm^3 capacity;
- a rubber bung to fit a test tube;
- two wooden splints;
- distilled water;
- about 5 g of a mixture of 2.5 g of aluminium sulfate and 2.5 g of ammonium sulfate crystals in a 50/100 cm^3 beaker labelled **A**;
- about 10 cm^3 of dilute sodium hydroxide in a stoppered reagent bottle/beaker labelled **dilute sodium hydroxide** and **corrosive**. This solution should be approximately 2 mol dm^{-3};
- about 10 cm^3 of dilute ammonia solution in a stoppered reagent bottle/beaker labelled **dilute ammonia solution** and **irritant**. This solution should be approximately 2 mol dm^{-3};
- about 10 cm^3 of dilute hydrochloric acid in a stoppered reagent bottle labelled **dilute hydrochloric acid** and **irritant**. This solution should be approximately 2 mol dm^{-3};
- about 10 cm^3 of barium chloride solution in a stoppered reagent bottle labelled **barium chloride solution** and **harmful**. This solution should be approximately 0.1 mol dm^{-3};
- Universal indicator paper (Johnson's pH 1–11);
- about 15 cm^3 of butan–1–ol in a stoppered reagent bottle labelled **B**;
- about 10 cm^3 of bromine water in a stoppered reagent bottle labelled **bromine water** and **harmful**. This solution should be approximately 0.02 mol dm^{-3} (i.e. 0.1% v/v);

- about 5 cm^3 of dilute sulfuric acid in a stoppered reagent bottle and labelle[illegible]**lfuric acid** and **corrosive**. This solution should be approximately 2 mol dm^{-3};

- about 10 cm^3 of potassium dichromate(VI) solution in a stoppered reagent bottle la[illegible] **potassium dichromate(VI) solution** and **irritant**. This solution should be approximat[illegible] 0.1 mol dm^{-3}, made by dissolving 30 g of potassium dichromate(VI) in 100 cm^3 of deioni[illegible] water and made up to 1 dm^3 with deionised water;

- A kettle for hot water.

Practical Examination 2

Each candidate must be supplied with safety goggles or glasses.

Question No. 1

Each candidate must be supplied with:

- one 50 cm^3 burette of at least class B quality;
- a funnel for filling the burette;
- a retort stand and clamp;
- two beakers of 100 cm^3 capacity;
- one 25 cm^3 pipette of at least class B quality;
- a safety pipette filler;
- three conical flasks of 250 cm^3 capacity;
- methyl orange indicator with dropper;
- a white tile or white paper;
- a wash bottle containing deionised/distilled water;
- 150 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution labelled **S** and **irritant**;
- 150 cm^3 of 0.1 mol dm^{-3} hydrochloric acid labelled **hydrochloric acid 0.1 mol dm^{-3}** and **irritant**.

Question No. 2

Each candidate must be supplied with:

- eight test tubes;
- 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;
- two watch-glasses;
- a beaker of 100 cm^3 capacity;
- a rubber bung to fit a test tube;
- two wooden splints;
- distilled water;
- about 5 g of a mixture of 2.5 g of zinc chloride and 2.5 g of ammonium chloride crystals in a 50/100 cm^3 beaker labelled **X**;
- about 10 cm^3 of dilute sodium hydroxide in a stoppered reagent bottle/beaker labelled **dilute sodium hydroxide** and **corrosive**. This solution should be approximately 2 mol dm^{-3};
- about 10 cm^3 of dilute ammonia solution in a stoppered reagent bottle/beaker labelled **dilute ammonia solution** and **irritant**. This solution should be approximately 2 mol dm^{-3};
- about 10 cm^3 of dilute nitric acid in a stoppered reagent bottle labelled **dilute nitric acid**. This solution should be approximately 0.5 mol dm^{-3};
- about 10 cm^3 of silver nitrate solution in a stoppered reagent bottle labelled **silver nitrate solution**. This solution should be approximately 0.1 mol dm^{-3} (17.0 g dm^{-3});
- Universal indicator paper (Johnson's pH 1–11);
- about 15 cm^3 of cyclohexene in a stoppered reagent bottle labelled **Y**;
- about 10 cm^3 of bromine water in a stoppered reagent bottle labelled **bromine water** and **harmful**. This solution should be approximately 0.02 mol dm^{-3} (i.e. 0.1% v/v);
- about 5 cm^3 of dilute sulfuric acid in a stoppered reagent bottle and labelled **dilute sulfuric acid** and **corrosive**. This solution should be approximately 2 mol dm^{-3};

- about 10 cm^3 of potassium dichromate(VI) solution in a stoppered reagent lled **potassium dichromate(VI) solution** and **irritant**. This solution should be ap y 0.1 mol dm^{-3}, made by dissolving 30 g of potassium dichromate(VI) in 100 cm^3 o deionised water and made up to 1 dm^3 with deionised water;

- A kettle for hot water.

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2013

Chemistry

Assessment Unit AS 3

Internal Assessment

Practical Examinations 1 and 2

[AC131] [AC132]

MONDAY 20 AND TUESDAY 21 MAY

Confidential Instructions to the Supervisor of the Practical Examination

8182.03

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 Wednesday 15 May 2013.** 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 15 May 2013.**

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 of the examination concerning appropriate safety procedures and precautions. S are also advised to remind candidates that all substances in the examination mu treated with caution. **Only those tests specified in the question paper should b attempted. Candidates must not attempt any additional confirmatory tests**. Anyt 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 Subsidiary

Chemistry

Practical Examination 1

Monday 20 May 2013

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 . . . .

8182.03

Northern Ireland Council for the Curriculum, Examinations and Assessment

General Certificate of Education

Advanced Subsidiary

Chemistry

Practical Examination 2

Tuesday 21 May 2013

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 . . . .

8182.03