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ADVANCED
General Certificate of Education
2015

Centre Number

Candidate Number

Chemistry

Assessment Unit A2 3
assessing
Module 3: Practical Examination
Practical Booklet A

AC233

[AC233]
TUESDAY 5 MAY, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Answer **both** questions.
Write your answers in the spaces provided.

INFORMATION FOR CANDIDATES

The total mark for this paper is 20.
Question 1 is a practical exercise worth 8 marks.
Question 2 is a practical exercise worth 12 marks.
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	
	Examiner Mark	Remark
1		
2		
Total Marks		

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Practical Booklet A

Examiner Mark	Remark

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

1 Titration exercise

You are required to titrate standard sodium thiosulfate solution against iodine liberated by the reaction of a solution of potassium iodate(V) with acidified potassium iodide solution.

You are provided with the following:

- a solution of potassium iodate(V)
- four 20 cm^3 portions of sulfuric acid
- potassium iodide solution
- sodium thiosulfate solution of concentration 0.10 mol dm^{-3}
- starch indicator

1. Rinse and fill the burette with the appropriate solution.
2. Use a measuring cylinder to pour 10 cm^3 of potassium iodide solution into a 250 cm^3 conical flask.
3. Add 20 cm^3 of dilute sulfuric acid to the solution in the conical flask.
4. Use a measuring cylinder to add 5 cm^3 of potassium iodate(V) solution to the acidified potassium iodide solution.
5. Titrate 0.10 mol dm^{-3} sodium thiosulfate solution against the iodine formed.

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

Results table

[8]

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2 Observation exercise

Examiner Mark	Remark

(a) You are provided with a salt, labelled **X**. Carry out the following tests on **X** and record your observations in the table below.

	Test	Observations
1	Describe the appearance of **X**.	[1]
2	Add 3 spatula measures of **X** to 20 cm^3 of water and stir until there is no further change. Use this solution for tests 3, 4 and 5.	[1]
3	**(a)** In a fume cupboard add 5 drops of concentrated ammonia solution to 2 cm^3 of the solution of **X** in a test tube. **(b)** Add a further 5 cm^3 of concentrated ammonia solution to the test tube.	[2]
4	**(a)** Add 5 drops of sodium hydroxide solution to 2 cm^3 of the solution of **X** in a test tube. **(b)** Add a further 5 cm^3 of sodium hydroxide solution to the test tube.	[2]
5	Add 2 cm^3 of barium chloride solution to a test tube containing 2 cm^3 of the solution of **X**.	[1]
6	Place a half spatula measure of **X** onto a watch glass in a fume cupboard. Wearing gloves, slowly add 10 drops of concentrated sulfuric acid to **X**.	[1]
7	Place a spatula measure of **X** in a dry boiling tube. Heat the boiling tube gently.	[2]

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Examiner Mark	Remark

(b) You are provided with an organic liquid labelled **Y**. Carry out the following tests and record your observations in the table below.

N.B. Water bath filled using hot water from a kettle.

	Test	Observations
1	Add 10 drops of **Y** to 2 cm^3 of acidified potassium dichromate solution in a test tube. Place the test tube in a hot water bath for 5 minutes.	[1]
2	Add 1 cm^3 of **Y** to 2 cm^3 of Fehling's solution in a test tube. Place the test tube in a hot water bath for 5 minutes.	[1]

THIS IS THE END OF THE QUESTION PAPER

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APPARATUS AND MATERIALS LIST

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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.**

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Practical Examination

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;
- a funnel for filling the burette;
- a retort stand and clamp;
- a beaker of 100 cm^3 capacity;
- two 10 cm^3 measuring cylinders;
- a plastic dropper;
- three conical flasks of 250 cm^3 capacity;
- a white tile or white paper;
- a wash bottle containing deionised water;
- 150 cm^3 of 0.10 mol dm^{-3} sodium thiosulfate solution labelled **sodium thiosulfate solution 0.10 mol dm^{-3}**;
- sulfuric acid 4 × 20 cm^3 portions of approximately 2 mol dm^{-3} sulfuric acid solution labelled **sulfuric acid, corrosive** and **irritant**;
- 4 × 10 cm^3 portions of 1M potassium iodide solution, labelled **potassium iodide solution**;
- 150 cm^3 of approximately 0.10 mol dm^{-3} potassium iodate(V) solution labelled **potassium iodate(V) solution** and **oxidising**;
- starch indicator 2% (w/v) with dropper. Add 2 g of starch to a small amount of water, make into a paste. Make up to 100 cm^3 in boiling water. Labelled **starch indicator**.

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

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Question 2

Candidates should have access to a fume cupboard.

Each candidate must be supplied with:

- small beaker (100 cm^3);
- six test tubes;
- one boiling tube;
- a test tube rack;
- a spatula;
- a heatproof mat;
- a Bunsen burner;
- several plastic droppers;
- one 250 cm^3 beaker;
- one pair of gloves;
- tongs;
- a watch glass;
- about 3.0 g of hydrated iron(II) sulfate, labelled **X**;
- about 10 cm^3 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 $BaCl_2.2H_2O$);
- about 10 cm^3 of sodium hydroxide solution in a reagent bottle/beaker labelled **sodium hydroxide solution** and **corrosive**. This solution should be approximately 2 mol dm^{-3};
- a reagent bottle containing concentrated ammonia solution labelled **concentrated ammonia solution** and **irritant** (Placed in fume cupboard);
- a reagent bottle containing concentrated sulfuric acid labelled **concentrated sulfuric acid** and **corrosive** (Placed in fume cupboard);
- about 10 cm^3 of ethanal in a stoppered container labelled **Y, flammable** and **harmful**;
- 10 cm^3 of Fehling's solution (a mix of equal volumes of Fehling's No 1 and Fehlings No 2) labelled **Fehling's solution** and **corrosive**;
- about 5 cm^3 of potassium dichromate(VI) solution in a stoppered reagent bottle labelled **acidified potassium dichromate solution** and **irritant**. This solution should be about 0.1 mol dm^{-3}, made by dissolving 30 g of potassium dichromate(VI) in 100 cm^3 of 1 mol dm^{-3} sulfuric acid and made up to 1 dm^3 with deionised water;
- access to a kettle.

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Risk Assessment

The risk assessment below applies both to the preparation of the materials for the practical examination as well as the conducting of the examination.

Care should be taken when handling glassware, and breakages should be removed immediately and disposed of safely.

Candidates should only conduct the tasks as described in the practical exam.

Under no circumstances should ethanal be heated with a naked flame; a water bath must be used. If hot water is obtained from a kettle, the kettle should be PAT tested and be labelled as such.

Question 1

Sodium thiosulfate is low hazard, if contact is made with eyes or mouth wash with water.
EMERGENCY ACTION • In the eye. Flood the eye with gently-running tap water for 10 minutes. See a doctor if pain persists. • Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. • Spilt on the skin or clothing. Brush solid off contaminated clothing. Rinse clothing or the skin as necessary. • Spilt on the floor, bench, etc. Brush up solid spills, trying to avoid raising dust, then wipe with a damp cloth. Wipe up solution spills with a cloth and rinse it well.
Sulfuric acid (2.0 M) is corrosive and can cause severe burns, care should be taken to avoid contact with skin and eyes. If handling larger quantities gloves should be worn.
EMERGENCY ACTION • In the eye. Flood the eye with gently-running tap water for 10 minutes. See a doctor. • Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. • Spilt on the skin or clothing. Remove contaminated clothing. Especially with concentrated acid, quickly use a *dry* cloth or paper towel to wipe as much liquid as possible off the skin. Then drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. • Spilt on the floor, bench etc. Wipe up small amounts with a damp cloth and rinse it well. For larger amounts and especially for (moderately) concentrated acid, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise with sodium carbonate. Rinse with plenty of water.

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Potassium iodide is low hazard, if contact is made with eyes or mouth wash with water.

EMERGENCY ACTION

- In the eye. Flood the eye with gently-running tap water for 10 minutes. See a doctor if pain persists.
- Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor.
- Spilt on the skin or clothing. Brush solid off contaminated clothing. Rinse clothing or the skin as necessary.
- Spilt on the floor, bench etc. Brush up solid spills, trying to avoid raising dust, then wipe with a damp cloth. Wipe up solution spills with a cloth and rinse it well.

Potassium iodate is an oxidising agent and may also cause irritation to the skin and eyes, care should be taken to avoid contact with the skin.

EMERGENCY ACTION

- In the eye. Flood the eye with gently-running tap water for 10 minutes. See a doctor if pain persists.
- Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor.
- Spilt on the skin or clothing. Brush solid off contaminated clothing. Rinse clothing or the skin as necessary.
- Spilt on the floor, bench, etc. Brush up solid spills, trying to avoid raising dust, then wipe with a damp cloth. Wipe up solution spills with a cloth and rinse it well.
- Disposal. 50 g should be dissolved in 1 litre of water before pouring down a drain.

Starch solution may be an irritant to the skin and eyes.

If contact is made with skin or eyes it should be flushed with copious amounts of water and medical advice sought if necessary.

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Question 2

Iron sulfate is harmful if swallowed.
EMERGENCY ACTION • In the eye. Flood the eye with gently-running tap water for at least 10 minutes. See a doctor. • Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. • Dust breathed in. Remove the casualty to fresh air. See a doctor if breathing is difficult. • Spilt on the skin or clothing. Remove contaminated clothing and rinse it. Wash off the skin with plenty of water. • Spilt on the floor, bench, etc. Scoop up solid (take care not to raise dust). Wipe up small solution spills or any traces of solid with cloth. For larger spills use mineral absorbent (e.g. cat litter). • Disposal. Dilute to below 0.2 M and pour down a drain.
Barium chloride is toxic if swallowed, harmful by inhalation and irritating to the eyes, skin and lungs. Wash hands after handling barium compounds.
EMERGENCY ACTION • In the eye. Flood the eye with gently-running tap water for at least 20 minutes. See a doctor. If a visit to hospital is necessary, continue washing the eye during the journey in an ambulance. • Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. • Spilt on the skin or clothing. Remove contaminated clothing. Drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. • Spilt on the floor, bench, etc. Wipe up small amounts with a damp cloth and rinse it well. For larger amounts, and especially for (moderately) concentrated solutions, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Rinse with plenty of water. • Disposal. Dilute to below 0.05 M and pour down a drain.

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Sodium hydroxide. It causes severe burns; it is particularly dangerous to the eyes. Small amounts should be used. Gloves should be worn if larger amounts are used.

EMERGENCY ACTION

- In the eye. Flood the eye with gently-running tap water for at least 20 minutes. See a doctor. If a visit to hospital is necessary, continue washing the eye during the journey in an ambulance.
- Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor.
- Spilt on the skin or clothing. Remove contaminated clothing. Drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor.
- Spilt on the floor, bench, etc. Wipe up small amounts with a damp cloth and rinse it well. For larger amounts and especially for (moderately) concentrated solutions, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise with citric acid. Rinse with plenty of water.

Ammonia solution is corrosive and causes burns and is dangerous to the eyes, goggles should be worn, and ammonia causes severe internal damage if swallowed.

EMERGENCY ACTION

- In the eye. Flood the eye with gently-running tap water for at least 20 minutes (for alkalis). See a doctor. If it is necessary to go to hospital continue washing the eye during the journey in an ambulance.
- Vapour breathed in. Remove the casualty to fresh air. Call a doctor if breathing is difficult.
- Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor.
- Spilt on the skin or clothing. Remove contaminated clothing. Drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor.
- Spilt on the floor, bench etc.
  Consider the need to evacuate the laboratory and open windows if large amounts are spilt and especially for (moderately) concentrated solutions. Cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise with citric acid. Rinse with plenty of water. Wipe up small amounts with a damp cloth and rinse it well.

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Sulfuric acid is corrosive, causing severe burns and reacts violently with water. If handling larger amounts, gloves could be worn.
EMERGENCY ACTION • In the eye. Flood the eye with gently-running tap water for 10 minutes. See a doctor. • Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. • Spilt on the skin or clothing. Remove contaminated clothing. Especially with concentrated acid, quickly use a *dry* cloth or paper towel to wipe as much liquid as possible off the skin. Then drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor. • Spilt on the floor, bench, etc. Wipe up small amounts with a damp cloth and rinse it well. For larger amounts, and especially for (moderately) concentrated acid, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise with sodium carbonate. Rinse with plenty of water.
Ethanal is extremely flammable and can be irritating to the eyes and respiratory system. Ethanal may boil spontaneously and should be cooled before use.
EMERGENCY ACTION • In the eye. Immediately rinse the eye with gently-running water for 10 minutes. See a doctor. • Vapour breathed in. Remove the casualty to fresh air. Keep him/her warm. See a doctor if breathing is difficult. • Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor. • Spilt on the skin or clothing. Remove contaminated clothing. Wash the affected area and clothing with plenty of water. • Spilt on the floor, bench etc. Put out all Bunsen burner flames. Wipe up small amounts with a cloth and rinse it well. For larger amounts, open all windows, cover with mineral absorbent (e.g. cat litter), and scoop into a bucket and add water.
Fehling's solution contains concentrated sodium hydroxide solution (see entry for sodium hydroxide above) as well as copper(II) sulfate which is low hazard.
EMERGENCY ACTION (see sodium hydroxide above)

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Potassium dichromate is toxic by inhalation and if swallowed may cause ulcers. Potassium dichromate is also oxidising and may be carcinogenic by inhalation, however inhalation is unlikely in school use.

EMERGENCY ACTION

- In the eye. Flood the eye with gently-running tap water for at least 10 minutes See a doctor.
- Swallowed. Do no more than wash out the mouth with water. Do **not** induce vomiting. Sips of water may help cool the throat and help keep the airway open. See a doctor.
- Spilt on the skin or clothing. Remove contaminated clothing and rinse it until no colour remains. Wash off the skin with plenty of water. If skin contamination is more than small, see a doctor.
- Spilt on the floor, bench, etc. Wear eye protection and gloves. Scoop up the solid. Rinse the area with water and wipe up, rinsing repeatedly until no colour remains. Rinse the mop or cloth thoroughly.

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2015

Chemistry

Assessment Unit A2 3

Practical Assessment

Practical Booklet A

[AC233]

TUESDAY 5 MAY

Confidential Instructions to the Supervisor of the Practical Examination

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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 Practical Booklet A on Wednesday 29 April 2015.** 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 29 April 2015.**

6. Centres may need to carry out multiple sessions to accommodate all their candidates sitting Practical Booklet A in a laboratory. Supervision must take place from 30 minutes after the scheduled starting time of the examination, as set out in the timetable, until the time when the candidate(s) begin(s) their examination(s). This is in order to ensure that there is no contact with other candidates. The centre must appoint a member of staff from the centre to supervise the candidate at all times while he/she is on the premises.

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.**

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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.

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Northern Ireland Council for the Curriculum, Examinations and Assessment

General Certificate of Education

Advanced

Chemistry

Practical Booklet A

Tuesday 5 May 2015

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 . . . . . .

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