



Rewarding Learning

ADVANCED
General Certificate of Education
2016

Centre Number

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Candidate Number

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Chemistry

Assessment Unit A2 3

assessing

Module 3: Practical Examination

Practical Booklet A



AC233

[AC233]

WEDNESDAY 4 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.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in blue or black ink only. **Do not write with a gel pen.**

Answer **both** questions.

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.

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

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1 Titration

You are required to titrate a standard solution of potassium manganate(VII) against a solution containing iron(II) ions.

You are provided with:

a solution of potassium manganate(VII) of concentration $0.020 \text{ mol dm}^{-3}$

a solution containing iron(II) ions

a solution of 1 mol dm^{-3} sulfuric acid

Carry out the titration by:

- rinsing and filling the burette with the solution of potassium manganate(VII)
- rinsing a 25.0 cm^3 pipette with the iron(II) ion solution
- transferring 25.0 cm^3 of the iron(II) ion solution into a conical flask
- adding 15 cm^3 of 1 mol dm^{-3} sulfuric acid to the conical flask.

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

[8]

[Turn over



2 Observation

(a) You are provided with a solid, labelled **A**. Carry out the following tests on **A** and record your observations in the spaces below.

Test	Observations
1 Describe the appearance of A .	[1]
2 Dissolve two spatula measures of A in 50 cm ³ of water. Keep this solution for use in tests 3–6.	[1]
3 Place 4 cm ³ of the solution from test 2 in a test tube. Add 1 cm ³ of barium chloride solution dropwise.	[1]
4 Place 4 cm ³ of the solution from test 2 in a test tube. Slowly add an equal volume of sodium hydroxide solution. Add a further 5 cm ³ of sodium hydroxide solution.	[2]
5 Place 4 cm ³ of the solution from test 2 in a test tube. Add 2 cm ³ of concentrated hydrochloric acid. Add 8 cm ³ of water and cautiously shake the test tube.	[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. Add 10 cm ³ of water and cautiously shake the test tube.	[2]

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

Test	Observations
1 In a fume cupboard, add half a spatula measure of phosphorus(V) chloride to 2 cm ³ of B in a test tube placed in a test tube rack. Test any gas given off with damp blue litmus paper.	[2]
2 To 4 cm ³ of B in a boiling tube, add a spatula measure of sodium carbonate.	[1]

THIS IS THE END OF THE QUESTION PAPER



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Question Number	Marks	
	Examiner Mark	Remark
1		
2		
Total Marks		

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

Practical Examination

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;
- one 25 cm³ measuring cylinder;
- a safety pipette filler;
- three conical flasks of 250 cm³ capacity;
- a white tile or white paper;
- a wash bottle containing deionised water;
- 150 cm³ of a 0.020 mol dm⁻³ solution of potassium manganate(VII) which has either been prepared by dissolving 3.16 g of KMnO₄ in 0.1 mol dm⁻³ sulfuric acid to make 1 dm³ of solution or a pre-purchased 0.02 mol dm⁻³ solution. This solution should be labelled **0.020 mol dm⁻³ potassium manganate(VII)**;
- 150 cm³ of a solution of diammonium iron(II) sulfate which has been prepared by dissolving 39.21 g of Fe(NH₄)₂(SO₄)₂·6H₂O in 0.1 mol dm⁻³ sulfuric acid to make 1 dm³ of solution. This solution should be labelled **iron(II) ion solution** and **caution**;
- 100 cm³ of 1 mol dm⁻³ sulfuric acid and labelled **1 mol dm⁻³ sulfuric acid** and **caution**.

Question No. 2

Candidates should have access to a fume cupboard.

Each candidate must be supplied with:

- small beaker (100 cm³);
- six test tubes;
- a test tube rack;
- a spatula;
- a stirring rod;
- several plastic droppers;
- one 10 cm³ measuring cylinder;
- hydrated copper(II) sulfate (approximately 3.0 g) labelled **A** and **caution**;
- about 10 cm³ of concentrated hydrochloric acid in a stoppered reagent bottle labelled **concentrated hydrochloric acid** and **corrosive**;
- about 10 cm³ of an aqueous solution of sodium hydroxide (approximately 2.0 M) labelled **sodium hydroxide** and **corrosive**;

The fume cupboard should contain:

- phosphorus(V) chloride labelled **danger (very toxic)**;
- a reagent bottle containing concentrated ammonia solution labelled **concentrated ammonia solution** and **irritant/corrosive** (available in the fume cupboard(s)). Each candidate will only need about 10 cm³;
- a test tube rack;
- about 10 cm³ of an aqueous solution of barium chloride (approximately 0.1 M) labelled **barium chloride solution** and **harmful**;
- about 5 cm³ of 2 mol dm⁻³ hydrochloric acid labelled **B – corrosive**;
- a few grams of anhydrous sodium carbonate labelled **sodium carbonate** and **irritant**;
- blue litmus paper.

Risk Assessment

Chemical	Notes	Emergency action
Potassium manganate(VII) (0.02 mol dm ⁻³)	All solutions are LOW HAZARD. See Hazcard 81. Wear eye protection.	see standard procedures on Hazcard E but also: If spilt on the skin or clothes: Wash off the skin with plenty of water. Remove and soak clothing and rinse thoroughly.
Iron(II) solution	CAUTION See Hazcard 55B. Wear eye protection.	see standard procedures on Hazcard E
Sulfuric acid (0.1 mol dm ⁻³) Sulfuric acid (1.0 mol dm ⁻³)	Low hazard Even at this low concentration it may still cause harm in the eyes or in a cut. CAUTION – wear eye protection.	see standard procedures on Hazcard E 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.
Hydrated copper(II) sulfate	HARMFUL IF SWALLOWED. IRRITATING TO EYES AND SKIN. See Hazcard 27C. Wear eye protection.	see standard procedures on Hazcard E

<p>Concentrated hydrochloric acid</p>	<p>CORROSIVE</p> <p>It causes burns. The vapour irritates the lungs.</p> <p>See Hazcard 47A.</p> <p>Wear goggles.</p> <p>Use a fume cupboard.</p> <p>Wear disposable nitrile gloves.</p>	<p>see standard procedures on Hazcard E</p> <p>In the eye – flood the eye with gently-running tap water for 10 minutes. See a doctor.</p> <p>Vapour breathed in – remove to fresh air. Call a doctor if breathing is difficult.</p> <p>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.</p> <p>Spilt on the skin or clothing – remove contaminated clothing. Then drench the skin with plenty of water. If a large area is affected or blistering occurs, see a doctor.</p> <p>Spilt on the floor, bench, etc. – for release of gas, consider the need to evacuate the laboratory and open all windows. For large spills, and especially for (moderately) concentrated acid, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket.</p> <p>Neutralise with sodium carbonate. Rinse with plenty of water. Wipe up small amounts with a damp cloth and rinse it well.</p>
<p>Sodium hydroxide (2 mol dm⁻³)</p>	<p>CORROSIVE</p> <p>See Hazcard 91.</p> <p>Causes severe burns; it is particularly dangerous to the eyes</p> <p>Wear goggles.</p>	<p>see standard procedures on Hazcard E</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Neutralise with citric acid. Rinse with plenty of water.</p>

Phosphorus(V) chloride	<p>REACTS VIOLENTLY WITH WATER. CONTACT WITH WATER LIBERATES TOXIC GAS. VERY TOXIC BY INHALATION. HARMFUL IF SWALLOWED. DANGER OF SERIOUS DAMAGE TO HEALTH BY PROLONGED EXPOSURE THROUGH INHALATION. CAUSES BURNS.</p> <p>See Hazcard 74.</p> <p>Use small quantities.</p> <p>Wear goggles.</p> <p>Use fume cupboard.</p>	see standard procedures on <i>Hazcard E</i>
Sodium carbonate	<p>IRRITANT</p> <p>See Student Safety Sheet 33.</p> <p>Irritating to the eyes but the anhydrous solid presents a bigger risk because it is finely powdered, whereas the hydrate is crystalline.</p> <p>Wear eye protection.</p>	<p>In the eye – flood the eye with gently-running tap water for 10 minutes. See a doctor if pain persists.</p> <p>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.</p> <p>Spilt on the skin or clothing – brush solid off contaminated clothing. Rinse clothing or the skin as necessary.</p> <p>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.</p>



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Assessment Unit A2 3

Practical Assessment

Practical Booklet A

[AC233]

WEDNESDAY 4 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 Practical Booklet A on Thursday 28 April 2016.** 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 28 April 2016.**
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(s) 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 is 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.

