Rewarding Learning

ADVANCED
General Certificate of Education
2022

Centre Number

Candidate Number

Chemistry

Assessment Unit A2 3
assessing
Further Practical Chemistry
Practical Booklet A

ACH31

[ACH31]
THURSDAY 12 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 black ink only. **Do not write with a gel pen.**
Answer **all three** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 30.
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 (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.

12885

1 You are provided with a sample of an iron(II) salt and an iron(III) salt and are required to investigate their chemistry.

All volumes of 3 cm^3 or less in this question may be measured approximately using the graduations on a disposable pipette.

(a) Dissolve all of the sample of each iron salt in separate 50 cm^3 portions of deionised water in the labelled 100 cm^3 beakers. Describe the appearance of both solutions.

iron(II) salt: _____

iron(III) salt: _____ [2]

(b) Test each of the salt solutions formed in **(a)** with universal indicator paper and complete the table below.

Salt solution	Colour with universal indicator paper	Approximate pH
iron(II) salt		
iron(III) salt		

[4]

(c) Add 2 cm^3 of each iron salt solution from **(a)** to separate test tubes. Add 1 cm^3 of sodium hydroxide solution to each test tube. Note any observations in each test tube.

iron(II) salt: _____

iron(III) salt: _____ [2]

(d) Light a Bunsen burner. Add 2 cm^3 of the iron(III) salt solution from **(a)** to a test tube. Add a spatula measure of sodium carbonate to the test tube, shake gently and immediately place a lit splint in the mouth of the test tube. Note any observations.

_____

_____

_____ [3]

(e) Add 2 cm^3 of each iron salt solution from **(a)** to separate test tubes. Add 1 cm^3 of potassium iodide solution, followed by 2 cm^3 of cyclohexane, to each test tube. Insert a bung into each test tube and shake each test tube gently. Note the appearance of the upper layer in each test tube.

iron(II) salt: _____

iron(III) salt: _____ [2]

(f) Add 2 cm^3 of each iron salt solution from **(a)** to separate test tubes. Add 1 cm^3 of ammonium thiocyanate solution to each test tube and note any observations.

iron(II) salt: _____

iron(III) salt: _____ [2]

[Turn over

(g) **(i)** Add 2 cm^3 of each iron salt solution from **(a)** to separate test tubes. Add 1 cm of magnesium ribbon to each test tube and shake gently. State **one** observation that is the same in each test tube.

_____ [1]

(ii) Explain how the observations from both test tubes in **(g)(i)** support the deduction that magnesium is more reactive with iron(III) salt solutions than iron(II) salt solutions.

_____ [1]

(h) The iron(III) salt solution can be used to follow the conversion of salicylic acid to aspirin as the solution turns purple in the presence of salicylic acid but does not turn purple in the presence of aspirin.

Add a spatula measure of solid **A** and solid **B** to separate test tubes.
Add five drops of the iron(III) solution from **(a)** to each test tube and use your observations to identify and explain whether solid **A** or **B** contains more salicylic acid.

_____

_____ [1]

2 You are required to carry out a back titration using an indigestion tablet.

(a) Weigh an indigestion tablet and record the mass to 1 decimal place. Crush the tablet in a mortar using a pestle and then transfer all of the crushed tablet into a 250 cm^3 beaker.

Mass of tablet: _____ [1]

(b) Measure 50 cm^3 of 1.0 mol dm^{-3} hydrochloric acid using a measuring cylinder and add to the 250 cm^3 beaker with stirring. Note any observations.

_____

_____ [1]

(c) Filter the mixture through filter paper into a 250 cm^3 volumetric flask, ensuring the beaker and glass rod are rinsed with deionised water and the washings are transferred into the flask. Describe the appearance of the residue and the filtrate.

residue: _____

filtrate: _____ [1]

(d) Make up the solution to the mark with deionised water, then stopper and invert the flask. Titrate three 25.0 cm^3 portions from the volumetric flask with 0.20 mol dm^{-3} sodium hydroxide solution using phenolphthalein indicator. Complete the following table and calculate the mean titre.

Rough titration			
First accurate titration			
Second accurate titration			

mean titre = _____ [5]

[Turn over

3 You are provided with a solid, labelled **M**, which contains a transition metal ion.

All volumes of 3 cm^3 or less in this question may be measured approximately using the graduations on a disposable pipette.

(a) Dissolve all of the sample of **M** in 30 cm^3 of 2.0 mol dm^{-3} sulfuric acid in a 100 cm^3 beaker. State the colour of the solution.

_____ [1]

(b) Add 2 cm^3 of the solution of **M** to a test tube. Add 2 cm^3 of ammonium iron(II) sulfate solution and shake the test tube gently. State the colour of the solution.

_____ [1]

(c) **(i)** Add 2 cm^3 of the solution of **M** to a test tube. Add 2 cm^3 of potassium iodide solution and shake gently. State the colour of the solution.

_____ [1]

(ii) Add 2 cm^3 of sodium thiosulfate solution to the solution formed in **(c)(i)** and shake the test tube gently. State **one** observation.

_____

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
Total Marks	

Examiner Number

Rewarding Learning

ADVANCED
General Certificate of Education
2022

Chemistry

Assessment Unit A2 3

assessing

Further Practical Chemistry
Practical Booklet A

[ACH31]

THURSDAY 12 MAY, MORNING

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.

It is the responsibility of the centre to be cognisant of all health and safety issues and to carry out a thorough risk assessment. Up to date information can be obtained at www.cleapss.org.uk

Practical Examination

Each candidate must be supplied with safety goggles or glasses.

Question No. 1

Each candidate must be supplied with:

- 1 × deionised water bottle
- 2 × 100 cm^3 beakers, one labelled iron(II) solution and one labelled iron(III) solution.
- 1 × 50 cm^3 measuring cylinder
- universal indicator paper, pH range 1–14 and access to corresponding colour chart.
- 12 × test tubes
- 2 × glass stirring rods
- 2 × test tube racks
- minimum of six disposable pipettes (graduated 3 cm^3)
- 1 × Bunsen burner
- 1 × heat-proof mat
- 1 × wooden splint
- 2 × bungs to fit test tubes
- 3 × spatulas
- about 1 g of iron(II) sulfate-7-water in a stoppered tube labelled **iron(II) salt** and **corrosive**
- about 1 g of iron(III) chloride-6-water in a stoppered tube labelled **iron(III) salt** and **corrosive**
- about 1 g of anhydrous sodium carbonate in a stoppered tube labelled **sodium carbonate** and **handle with caution**
- about 10 cm^3 of 0.5 mol dm^{-3} sodium hydroxide solution labelled s**odium hydroxide solution for use in question 1** and **handle with caution**
- about 10 cm^3 of potassium iodide solution in a stoppered reagent bottle labelled **potassium iodide solution**. This solution should be approximately 0.05 mol dm^{-3}
- about 10 cm^3 of cyclohexane in a stoppered reagent bottle labelled **cyclohexane** and **toxic**
- about 10 cm^3 of ammonium thiocyanate solution in a stoppered reagent bottle labelled **ammonium thiocyanate solution** and **handle with caution**. This solution should be approximately 0.5 mol dm^{-3}.
- 2 × 1 cm lengths of magnesium ribbon (untarnished).
- about 1 g of salicylic acid in a stoppered tube labelled **A** and **corrosive**.
- about 0.5 g of crushed aspirin tablets in a stoppered tube labelled **B** and **handle with caution**.

Question No. 2

Each candidate must be supplied with:

- 1 × weighing boat
- 1 × pestle and mortar
- 1 × spatula
- 1 × 100 cm^3 beaker
- 1 × 250 cm^3 beaker
- 1 × 50 cm^3 measuring cylinder
- 1 × glass rod
- 1 × 250 cm^3 volumetric flask
- 1 × piece of filter paper and filter funnel
- 1 × 25 cm^3 pipette (at least class B quality) and pipette filler
- 3 × 250 cm^3 conical flasks
- 1 × white tile
- 1 × 50.0 cm^3 burette of at least class B quality
- 1 × funnel for filling burette
- 1 × retort stand and clamp
- 1 × indigestion tablet containing 500 mg calcium carbonate (e.g. supermarket homebrand)
- 1 × deionised water bottle
- phenolphthalein indicator with dropper
- about 100 cm^3 of hydrochloric acid in a reagent bottle labelled **hydrochloric acid** and **handle with caution**. This solution should be 1 mol dm^{-3}
- about 150 cm^3 of sodium hydroxide solution in a beaker labelled **sodium hydroxide solution for use in question 2** and **handle with caution**. This solution should be 0.2 mol dm^{-3}
- access to an electronic balance (minimum of 1 decimal point)

Question No. 3

Each candidate must be supplied with:

- 1 × 100 cm^3 beaker
- 1 × glass rod
- 2 × test tubes
- 1 × test tube rack
- 1 × 50 cm^3 measuring cylinder
- minimum of four disposable pipettes (graduated 3 cm^3)
- about 0.25 g of ammonium vanadate(V) (ammonium metavanadate) in a stoppered tube labelled **M** and **toxic**
- about 10 cm^3 of ammonium iron(II) sulfate solution in a reagent bottle/beaker labelled **ammonium iron(II) sulfate solution** and **handle with caution**. This solution should be approximately 0.1 mol dm^{-3}
- about 10 cm^3 of potassium iodide solution in a reagent bottle labelled **potassium iodide solution**. This solution should be approximately 0.05 mol dm^{-3}. (This is the same solution as used in question 1 and it may be provided in one bottle or separately)
- about 10 cm^3 of sodium thiosulfate solution in a reagent bottle labelled **sodium thiosulfate solution**. This solution should be approximately 0.1 mol dm^{-3}
- about 50 cm^3 of 2.0 mol dm^{-3} sulfuric acid labelled **2.0 mol dm^{-3} sulfuric acid** and **handle with caution** and **corrosive**

Rewarding Learning

ADVANCED
General Certificate of Education
2022

Chemistry

Assessment Unit A2 3

Practical Assessment

Practical Booklet A

[ACH31]

THURSDAY 12 MAY, MORNING

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 Monday 9 May 2022.** 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 Monday 9 May 2022.**

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 they are on the premises.

7. All apparatus 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 themselves 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 needs to 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.

14. All JCQ procedures for conducting examinations should be followed for this practical examination including displaying JCQ posters with examination information in the laboratory and removal of mobile phones. Posters should be available from your Examinations Officer.

Northern Ireland Council for the Curriculum, Examinations and Assessment

General Certificate of Education

Advanced

Chemistry

Practical Booklet A

[ACH31]

Thursday 12 May 2022

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 . . . . . .