



General Certificate of Education
Advanced Level Examination
June 2014

Chemistry

CHM6X/TN

Unit 6X A2 Externally Marked Practical Assignment

Teachers' Notes

Confidential

The Exams Officer should make two copies of these Teachers' Notes; one copy for the Head of A-level Chemistry and one for the technician. These copies can be released to the Head of A-level Chemistry and the technician at any point following publication but must be kept under secure conditions at all times. Teachers can have sight of the Teachers' Notes but no further copies should be made.

Estimated entries must be submitted to AQA in order for centres to receive hard copies of the materials to be used by candidates.

Teachers' Notes**Confidential**

These notes must be read in conjunction with the **Instructions for the Administration of the Externally Marked Practical Assignment: A-level Chemistry** published on the AQA Website. Please note that these have been revised for 2014.

Task 1 An investigation of an iron(II) salt

Candidates are required to carry out a titration between potassium manganate(VII) and an iron(II) salt.

Task 1 Materials

Each candidate should be provided with the following reagents in suitable closed containers.

Reagent	Concentration / mol dm ⁻³	Volume / cm ³	Note
Ammonium iron(II) sulfate solution (acidified)	0.090–0.110	200	Labelled ' Solution X for Task 1 ' When making up the solution, the solid should be dissolved in approx. 1 mol dm ⁻³ sulfuric acid. This should be made up no more than 1 day before Task 1
Potassium manganate(VII) solution	0.0190–0.0210	200	Labelled ' Potassium manganate(VII) solution '
Sulfuric acid	Approx. 0.5	150	Labelled ' Dilute sulfuric acid '

General

It is the responsibility of the centre to ensure that the investigation works with the materials provided to the candidates **before** candidates carry out the task.

Spare supplies of all reagents specified in these notes must be available.

Task 1 Apparatus

Each candidate will require the following:

- 50 cm³ burette and stand
- funnel suitable for filling a burette
- 25 cm³ pipette
- pipette filler
- 250 cm³ conical flask
- two 100 cm³ beakers
- measuring cylinder (25 cm³ or 50 cm³)
- wash bottle
- plentiful supply of distilled or deionised water
- eye protection.

Checking the burette reading

In Task 1, candidates are instructed to ask their teacher to check one of their final burette readings. If a candidate does not read the burette correctly, the teacher must tell the candidate the correct reading. There is no penalty for an incorrect reading. The centre is not required to inform AQA of an incorrect reading. This is to ensure that a candidate does not lose several accuracy marks because of an incorrect reading.

Turn over for details of Task 2

Turn over ►

Task 2 An investigation of some salt solutions

Candidates are given solutions of three metal salts and asked to carry out a series of observational exercises on them.

Task 2 Materials

Each candidate should be provided with the following reagents in suitable closed containers.

Reagent	Approx. concentration / mol dm ⁻³	Volume / cm ³	Note
Ammonium iron(II) sulfate solution	0.1	10	Labelled ' Solution X for Task 2 ' When making up the solution, the solid should be dissolved in water. If the solution is not completely clear just sufficient drops of dilute sulfuric acid should be added to produce a clear solution. This should be made up no more than 1 day before Task 2
Zinc sulfate solution	0.1	10	Labelled ' Solution Y '
Copper(II) sulfate solution	0.1	10	Labelled ' Solution Z '

Each candidate will also need the following reagents. Individual supplies are **not** required.

Reagent	Approx. concentration / mol dm ⁻³	Volume / cm ³	Note
Sodium hydroxide solution	0.4	20	Labelled ' Sodium hydroxide solution '
Potassium iodide solution	0.5	20	Labelled ' Potassium iodide solution '
Potassium thiocyanate solution	0.5	20	Labelled ' Potassium thiocyanate solution '
Hydrogen peroxide solution	10 vol	20	Labelled ' Hydrogen peroxide solution '

General

It is the responsibility of the centre to ensure that the investigation works with the materials provided to the candidates **before** candidates carry out the task.

Spare supplies of all reagents specified in these notes must be available.

Note

Centres are reminded that it is essential that contamination of shared reagents is avoided. One way to avoid cross-contamination of reagents is to attach a test tube containing a plastic dropping pipette to the reagent bottle using elastic bands or adhesive tape. This dropping pipette can then be returned to the test tube after use by the candidate.

Task 2 Apparatus

Each candidate will require the following:

- six test tubes
- three boiling tubes
- test-tube rack that can hold at least three boiling tubes
- test-tube rack that can hold at least six test tubes
- three graduated dropping pipettes (for solutions **X**, **Y** and **Z**)
- plentiful supply of distilled or deionised water
- four dropping pipettes*
- eye protection.

* Candidates will **not** need their own supply of these dropping pipettes if the centre adopts the strategy to avoid contamination outlined in the note above.

Risk assessment and risk management

Risk assessment and risk management are the responsibility of the centre.

Notes from CLEAPSS

Technicians/teachers should always follow the latest CLEAPSS Hazcards or safety data sheets provided by the supplier for guidance on handling reagents. The worldwide regulations covering the labelling of reagents by suppliers have changed. More details about these changes can be found in CLEAPSS secondary science guidance leaflets, including GL101, which is an introduction to classification, labelling and packaging (CLP): chemical hazard labelling.

Additional information

AQA might publish additional information about an EMPA practical. This will be placed on e-AQA in Secure Key Materials. We will email Exams Officers who have downloaded the particular Teachers' Notes so they can print a copy for the Head of A-level Chemistry. Additional information may cover issues such as suitable suppliers or tips on getting a practical to work.

Turn over ►

Teacher results

A teacher must carry out the tasks, using similar apparatus and samples of the same stock solutions/chemicals as the candidates, in order to obtain teacher results. This must **not** be done in the presence of candidates.

Teacher results:

- are required for both tasks
- are required for each group of candidates
- must be recorded on the Teacher Results Sheets
- are used to assess the accuracy of candidates' results
- must be included with the scripts sent to the examiner.

In order to ensure that each candidate can be matched to the appropriate teacher results, teachers must:

- complete all details on each Teacher Results Sheet
- ensure that all candidates complete all details on the Candidate Results Sheets, clearly identifying their teaching group and/or teacher.

Centres with more than one teaching set

Centres may wish to divide their candidates into manageable groups and to conduct the tasks at different times. However, each centre must arrange for all of their candidates to complete a particular EMPA Written Test on the same day within the assessment window.

Assessment Advisers

If you have any queries about the practical work for the EMPA, please contact your Assessment Adviser. Contact details for your Assessment Adviser can be obtained by emailing your centre name and number to science-gce@aqa.org.uk

Data Sheet

Centres should be aware that the three tables of data on the Data Sheet have been relabelled for the 2014 assessments. As a consequence, centres must ensure that candidates use the version provided as an insert and not any version previously supplied.

Information to be given to candidates

Candidates **must not** be given information about an EMPA assessment until 1 week before Task 1. One week before Task 1, candidates should be given the following information.

The aim of these tasks is to investigate an iron compound by means of titration with potassium manganate(VII) in acidic conditions and then to carry out observational exercises on a series of metal salt solutions.

The main areas of the specification in the Written Test include Section 3.1.2 (Amount of Substance), Section 3.4.1 (Kinetics), Section 3.5.3 (Redox Equilibria), Section 3.5.4 (Transition Metals), Section 3.5.5 (Reactions of Inorganic Compounds in Aqueous Solution) and Section 3.6 (Investigative and Practical Skills, A2 Organic Chemistry).

There **must** be no further discussion and candidates **must not** be given any further resources to prepare for the assessment.

Teacher Results Sheet for Task 1

A completed copy of this sheet must be included with the scripts sent to the examiner.

Centre Number

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Teacher Name Teacher Group

Results

Record your results in the table below.

Final burette reading / cm ³				
Initial burette reading / cm ³				
Volume of KMnO ₄ used / cm ³				
Tick the titres to be used in calculating the average titre				

Average titre / cm³

This sheet may be photocopied

Turn over ►

Teacher Results Sheet for Task 2

A completed copy of this sheet must be included with the scripts sent to the examiner.

Centre Number

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 Teacher Name Teacher Group

Results

Record your observations in the table below.

Use a separate sample in each of the following tests.	Observations with Solution X	Observations with Solution Y	Observations with Solution Z
<p>Test 1 Use a graduated plastic pipette to add about 1 cm³ of the sample to a clean boiling tube. Add sodium hydroxide solution, dropwise with shaking, until you observe no further change. You should not fill more than half the boiling tube. Allow to stand for about 10 minutes.</p>			
<p>Test 2 Use a graduated plastic pipette to add about 1 cm³ of the sample to a clean test tube. Add about 10 drops of potassium iodide solution and shake the mixture. Allow to stand for about 5 minutes.</p>			
<p>Test 3 Use a graduated plastic pipette to add about 1 cm³ of the sample to a clean test tube. Add about 5 drops of potassium thiocyanate solution. Then add about 5 drops of hydrogen peroxide solution.</p>			

This sheet may be photocopied

Task 1

An investigation of an iron(II) salt

A chemist prepared crystals of an iron(II) salt by an unusual method and investigated some properties of this salt. The first experiment was to find out how the salt reacts with potassium manganate(VII).

The chemist made a solution of the iron(II) salt by dissolving 5.60 g of the crystals in a small volume of dilute sulfuric acid. This solution was made up to 250 cm³ using deionised water. This is given to you as solution **X** for Task 1.

You are to titrate solution **X** for Task 1 with the 0.0200 mol dm⁻³ potassium manganate(VII) solution provided.

Procedure

- **Wear eye protection at all times.**
 - **Assume that all solutions are toxic and corrosive.**
- 1 Rinse a burette with a small amount of the potassium manganate(VII) solution. Set up the burette and use a funnel to fill it with the potassium manganate(VII) solution. Record the initial burette reading in a table of your own design on the Candidate Results Sheet for Task 1.
 - 2 Pour a small amount of solution **X** for Task 1 into a clean 100 cm³ beaker. Use a pipette filler to rinse a pipette with this solution. Use this pipette to transfer 25.0 cm³ of this solution to a 250 cm³ conical flask.
 - 3 Use a measuring cylinder to transfer approximately 20 cm³ of dilute sulfuric acid to the conical flask. Swirl the flask.
 - 4 Add potassium manganate(VII) solution from the burette until the solution in the conical flask just turns pink. Record your final burette reading in your table.
 - 5 Rinse the conical flask with distilled or deionised water and repeat the titration until you obtain **two** titres that are concordant. You should do no more than five titrations.

Have one of your final burette readings checked by your teacher.

- 6 Calculate and record the average titre on the Candidate Results Sheet for Task 1. Show clearly the titres used in calculating this average titre.

You are **not** required to carry out any further calculations on the Candidate Results Sheet for Task 1.

You will use your results in **Section A** of the Written Test.

Turn over ►

Task 2**An investigation of some salt solutions**

You have been provided with solutions **X**, **Y** and **Z**. Use a separate sample of each one to carry out each of the following tests.

Record what you **observe** in a table of your own design on the Candidate Results Sheet for Task 2. Where no visible change is observed, write 'no visible change'.

You are **not** required to identify any of the solutions **X**, **Y** and **Z** in this task.

Procedure

- **Wear eye protection at all times.**
- **Assume that all solutions are toxic and corrosive.**
- **Use a separate solution in each of the following tests.**

Test 1 Test with sodium hydroxide solution

Use a graduated plastic pipette to add about 1 cm³ of solution **X** for Task 2 to a clean boiling tube. Add sodium hydroxide solution, dropwise with shaking, until you observe no further change. You should **not** fill more than half the boiling tube. Allow to stand for about 10 minutes.

Repeat the test with solution **Y** and then with solution **Z**.

Test 2 Test with potassium iodide solution

Use a graduated plastic pipette to add about 1 cm³ of solution **X** for Task 2 to a clean test tube. Add about 10 drops of potassium iodide solution and shake the mixture. Allow to stand for about 5 minutes.

Repeat the test with solution **Y** and then with solution **Z**.

Test 3 Test with potassium thiocyanate solution

Use a graduated plastic pipette to add about 1 cm³ of solution **X** for Task 2 to a clean test tube. Add about 5 drops of potassium thiocyanate solution. Then add about 5 drops of hydrogen peroxide solution.

Repeat the test with solution **Y** and then with solution **Z**.