



General Certificate of Education
Advanced Level Examination
June 2014

Chemistry

CHM6T/Q14/TN

Unit 6T A2 Investigative Skills 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.

All teacher-assessed marks to be returned to AQA by 15 May

Teachers' Notes**Confidential**

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

An investigation of some redox reactions

In this investigation, candidates will make observations of the changes that occur in some redox reactions.

Materials

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

Reagent	Quality / Concentration	Volume / Quantity	Note
Ammonium or sodium vanadate(V)	Normal lab. reagent	0.1 g	Labelled ' Solid A '
Granulated zinc	Normal lab. reagent	1 g	Labelled ' Zinc metal New or used samples may be used
Potassium manganate(VII) solution	0.02 mol dm ⁻³	2 cm ³	Labelled ' Solution B This should be made up in distilled or deionised water (not in acid) immediately before the task
Hydrogen peroxide solution	Approx. '20 volume'	4 cm ³	Labelled ' Solution C '
Ammonium iron(II) sulfate solution	0.5 mol dm ⁻³	2 cm ³	Labelled ' Solution D This should be made up in distilled or deionised water (not in acid) immediately before the task
Copper(II) sulfate solution	1 mol dm ⁻³	2 cm ³	Labelled ' Solution E '
Potassium iodide solution	1 mol dm ⁻³	4 cm ³	Labelled ' Solution F '
Iron(III) chloride solution	0.1 mol dm ⁻³	2 cm ³	Labelled ' Solution G This should be made up in distilled or deionised water immediately before the task. If the solution is not clear, add just enough dilute HCl to produce a clear solution
Chromium(III) potassium sulfate	0.5 mol dm ⁻³	1 cm ³	Labelled ' Solution H Chromium(III) sulfate can be used
Hydrochloric acid	2 mol dm ⁻³	5 cm ³	Labelled ' Hydrochloric acid '
Sodium hydroxide solution	2 mol dm ⁻³	3 cm ³	Labelled ' Sodium hydroxide solution '
Sulfuric acid	1 mol dm ⁻³	2 cm ³	Labelled ' Sulfuric acid '

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.

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.

If you have any queries about the practical work for the ISA, 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

Apparatus

Each candidate will require the following:

- two boiling tubes
- small spatula
- Bunsen burner
- boiling-tube holder
- cotton wool (sufficient to plug the boiling tube)
- test-tube rack (which can also accommodate a boiling tube)
- five test tubes
- stopper (bung or cork) to fit a test tube
- ten plastic graduated dropping pipettes
- plentiful supply of recently boiled water (eg electric kettle)
- 250 cm³ glass beaker
- eye protection.

Candidates will **not** need their own supply of dropping pipettes if the centre adopts the strategy to avoid contamination outlined in the note at the top of this page.

Using the spatula

In the task, candidates are instructed to add a small amount of solid **A** to a boiling tube. Candidates should be shown how to measure out approximately 0.1 g of a solid using the spatulas available in the centre. It is important that candidates do not use a large excess of the solid in this part of the task.

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 ISA 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.

Teacher results

A teacher must carry out the task, 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 each group of candidates
- must be recorded on the Teacher Results Sheet
- are used to assess the accuracy of candidates' results
- must be included with the sample sent to the moderator.

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 Sheet, 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 task at different times. However, each centre must arrange for all of their candidates to complete a particular ISA Written Test on the same day within the assessment window.

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 at the end of the ISA Written Test and not any version previously supplied.

Information to be given to candidates

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

The aim of this task is to investigate some redox reactions.

The main areas of the specification in the Written Test include Section 3.5.3 (Redox Equilibria), Section 3.5.4 (Transition Metals) and Section 3.5.5 (Reactions of Inorganic Compounds in Aqueous Solution).

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

ISA CHM6T/Q14 Teacher Results SheetCentre Number

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Teacher Name..... Teacher Group

Results

Record your results in this table.

Test	Part	Observation
1 Ammonium or sodium vanadate(V) + hydrochloric acid	1	
	2	
	3	
2 Potassium manganate(VII) + hydrogen peroxide	1	
	2	
3 Ammonium iron(II) sulfate + sodium hydroxide	1	
	2	
4 Copper(II) sulfate + potassium iodide solution		
5 Iron(III) chloride + potassium iodide solution		
6 Chromium(III) potassium sulfate + alkaline hydrogen peroxide	1	
	2	

This sheet may be photocopied

Task Sheet

An investigation of some redox reactions

In modern life there is an increasing need for the development of cells and batteries for the storage of electrical energy in a wide variety of applications. These include cells for electric cars and for portable devices. Cells utilise the energy changes that occur in redox reactions.

In this investigation, you will make observations of the changes that occur in some redox reactions. You are provided with a range of substances that are to be used in six separate tests.

Procedure

- **Wear eye protection at all times.**
- **Assume that all substances are toxic and corrosive.**

Read through all the instructions that follow. On the Candidate Results Sheet, record your observations at the appropriate points in each part of each test. Please note that there may be more than one observation to be recorded for each part.

Test 1

- Part 1 Use a spatula to add a small amount (approximately 0.1 g as demonstrated by your teacher) of solid **A** to a boiling tube.
Use a dropping pipette to add about 5 cm³ of hydrochloric acid.
Use a suitable holder to grip the tube. Warm the tube **gently** with a Bunsen burner flame for about 1 minute or until the solid dissolves. (If the solid does not dissolve completely, do **not** continue heating but carry on with the rest of the test.)
- Part 2 Add a small piece of zinc metal to the solution in the boiling tube. Place a cotton wool plug in the top of the tube. Shake the tube gently.
- Part 3 Place the boiling tube in a test-tube rack. Observe any changes that occur over about 15 minutes while you continue with the other tests.

Test 2

- Part 1 In a test tube, place about 1 cm³ of solution **B**.
Add about 1 cm³ of solution **C** and gently shake the mixture.
- Part 2 Repeat this test with a fresh sample of solution **B** but add about 2 cm³ of sulfuric acid before solution **C** is added.

Test 3

- Part 1 In a test tube, place about 2 cm³ of solution **D**.
Add about 1 cm³ of sodium hydroxide solution and gently shake the mixture.
- Part 2 Place a stopper securely in the test tube and shake the tube vigorously for a further 2 minutes.

Test 4

In a test tube, place about 2 cm³ of solution **E**.
Add about 2 cm³ of solution **F** and gently shake the mixture.
Allow the mixture to stand for a few minutes.

Test 5

In a test tube, place about 2 cm³ of solution **G**.
Add about 2 cm³ of solution **F** and gently shake the mixture.
Allow the mixture to stand for a few minutes.

Test 6

- Part 1 In a boiling tube, place about 1 cm³ of solution **H**.
Add about 2 cm³ of sodium hydroxide solution and gently shake the mixture.
- Part 2 Now add about 2 cm³ of solution **C** and gently shake the mixture.
Leave this mixture, for approximately 10 minutes, in a beaker of hot water that has just been boiled.

On the Candidate Results Sheet, you are **not** required to identify any compounds or reaction products.

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