



General Certificate of Education
Advanced Subsidiary Examination
June 2014

Chemistry

CHM3T/Q14/TN

Unit 3T AS 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 Group 2 compounds

Materials

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

Reagent	Approximate concentration / mol dm ⁻³	Volume / cm ³	Note
Magnesium oxide*	approximately 2 g of solid		Labelled ' Compound X '
Calcium chloride	0.2	10	Labelled ' Solution Z '
Sulfuric acid*	1.0	30	Labelled ' Solution A '

* Centres **must** ensure that a residue is left using these quantities following step 4 of Part 1 of the task.

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

Reagent	Approximate concentration / mol dm ⁻³	Volume / cm ³	Note
Sodium hydroxide	0.2	3	Labelled ' Sodium hydroxide solution '
Sulfuric acid	0.5	20	Labelled ' Sulfuric acid '
Sodium carbonate	0.5	2	Labelled ' Sodium carbonate solution '
Silver nitrate	0.05	2	Labelled ' Silver nitrate solution '
Barium chloride	0.1	2	Labelled ' Barium chloride solution '
Sodium phosphate (Na ₃ PO ₄)	0.1	2	Labelled ' Solution B '
Ammonium chloride	1.0	20	Labelled ' Solution C '

Teachers should inform students of a suitable method for the safe disposal of silver nitrate residues.

Spare supplies of solution Y

Centres should have a supply of magnesium sulfate solution available.

This solution should **only** be issued to candidates whose own solution cannot be used because it is not a colourless solution.

Reagent	Approximate concentration / mol dm ⁻³	Volume / cm ³	Note
Magnesium sulfate	1.0	20	Labelled ' Solution Y '

If a replacement solution is required as a result of candidate error, then there will be a penalty. See the Marking Guidelines.

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:

- 100 cm³ beaker
- 25 cm³ or 50 cm³ measuring cylinder
- Bunsen burner
- tripod
- gauze
- stirring rod
- filter funnel with filter paper
- two boiling tubes
- five standard 15 cm test tubes
- ten dropping pipettes
- test-tube rack with holes for boiling tubes
- plentiful supply of distilled or deionised water
- eye protection
- method for labelling a boiling tube.

Only three dropping pipettes will be needed if the centre adopts the strategy to avoid contamination outlined in the note on page 3.

The number of test tubes and boiling tubes in the apparatus list above assumes that candidates will wash and reuse the tubes as appropriate.

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 Sheets
- 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 result, 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 Group 2 metal compounds by a series of observation exercises.

The main areas of the specification in the Written Test include Section 3.1.2 (Amount of Substance), Section 3.2.5 (Group 7(17), the Halogens) and Section 3.2.6 (Group 2, the Alkaline Earth Metals).

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

ISA CHM3T/Q14 Teacher Results SheetCentre Number

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Teacher Group

Teacher Name

Results for Part 1 - Preparation of solution Y

Record your observations for Part 1 in this table.

Appearance of the residue on the filter paper	
Appearance of the filtrate	

Record your observations for Part 2 in the table on page 7.

This sheet may be photocopied

ISA CHM3T/Q14 Teacher Results Sheet

 Centre Number

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Teacher Group

Teacher Name

Results for Part 2 - The Tests

Record your observations for Part 2 in this table.

Use a separate sample in each of the following tests.	Observations with solution Y	Observations with solution Z
Test 1 Sodium hydroxide Place about 10 drops of the sample in a test tube. Add about 15 drops of sodium hydroxide solution and shake the mixture.		
Test 2 Sulfuric acid Place about 10 drops of the sample in a test tube. Add about 10 drops of sulfuric acid and shake the mixture.		
Test 3 Sodium carbonate Place about 10 drops of the sample in a boiling tube. Add about 10 drops of sodium carbonate solution and shake the mixture. Add sulfuric acid to the mixture, with shaking, until no further change occurs. Do not fill more than one-third of the boiling tube.		
Test 4 Silver nitrate Place about 10 drops of the sample in a test tube. Add about 10 drops of silver nitrate solution and shake the mixture.		
Test 5 Barium chloride Place about 10 drops of the sample in a test tube. Add about 10 drops of barium chloride solution and shake the mixture.		
Test 6 Solution B (Sodium phosphate) Place about 10 drops of the sample in a test tube. Add about 10 drops of solution B and shake the mixture. Add solution C (ammonium chloride solution) to the mixture, with shaking, until no further change occurs. Do not fill more than one-third of the test tube.		

This sheet may be photocopied

Turn over ►

Task Sheet

An investigation of Group 2 compounds

Some Group 2 compounds are used in medicines.

X and **Z** are compounds of different Group 2 metals. Compound **X** is an insoluble white solid. Compound **Z** is provided as an aqueous solution.

In **Part 1**, you will react **X** with solution **A** to form solution **Y** so that the metal ions can be tested in solution.

In **Part 2**, you will carry out tests on solutions **Y** and **Z** using laboratory reagents and solutions **B** and **C**.

In this task, you are **not** required to identify the metal ion in **X**, in **Y** or in **Z**, or any of the reaction products.

Procedure

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

Part 1 Preparation of solution Y

- 1 Use a measuring cylinder to transfer 25 cm³ of solution **A** to a small beaker.
- 2 Place the beaker on a tripod and gauze.
- 3 Add the sample of compound **X** to the beaker and stir the mixture.
- 4 Heat the mixture gently in the beaker. Stir the mixture from time to time. Stop heating when the liquid starts to boil.
- 5 Allow the mixture to cool until the beaker is safe to handle. Filter the mixture into a boiling tube. Do **not** discard the filtrate.

On your Candidate Results Sheet, describe the appearance of the residue on the filter paper and the appearance of the filtrate.

- 6 Label the boiling tube containing the filtrate as **Y**. Use solution **Y** in the following tests.
Have your filtrate Y checked by your teacher.

Part 2 The Tests

Carry out each test in a separate clean test tube or boiling tube. Use distilled or deionised water to clean the test tubes and boiling tube as appropriate.

Record what you **observe** for each test in **Part 2** in a table of your own design on the Candidate Results Sheet.

Where no visible change occurs in any of the tests, write 'no visible change'.

Test 1 Place about 10 drops of solution **Y** in a test tube. Add about 15 drops of sodium hydroxide solution and shake the mixture.

Repeat this test with solution **Z** instead of solution **Y**.

Test 2 Place about 10 drops of solution **Y** in a test tube. Add about 10 drops of sulfuric acid and shake the mixture.

Repeat this test with solution **Z** instead of solution **Y**.

Test 3 Place about 10 drops of solution **Y** in a boiling tube. Add about 10 drops of sodium carbonate solution and shake the mixture. Add sulfuric acid to the mixture, with shaking, until no further change occurs. Do **not** fill more than one-third of the boiling tube.

Repeat this test with solution **Z** instead of solution **Y**.

Test 4 Place about 10 drops of solution **Y** in a test tube. Add about 10 drops of silver nitrate solution and shake the mixture.

Repeat this test with solution **Z** instead of solution **Y**.

Test 5 Place about 10 drops of solution **Y** in a test tube. Add about 10 drops of barium chloride solution and shake the mixture.

Repeat this test with solution **Z** instead of solution **Y**.

Test 6 Place about 10 drops of solution **Y** in a test tube. Add about 10 drops of solution **B** and shake the mixture. Add solution **C** to the mixture, with shaking, until no further change occurs. Do **not** fill more than one-third of the test tube.

Repeat this test with solution **Z** instead of solution **Y**.