

Advanced Subsidiary GCE

F323 (2)

CHEMISTRY A

Unit F323: Practical Skills in Chemistry 1:
Quantitative Task

Specimen Task

For use from September 2008 to June 2009.

Candidates answer on the task sheet.

All items required by teachers and candidates for this task are included in this pack.

INFORMATION FOR CANDIDATES

- Quantitative Task: Calculating the relative atomic mass of lithium

INFORMATION FOR TEACHERS

- Mark scheme.
- Instructions for Teachers and Technicians.

An error was made in the Instructions for Teachers and Technicians for this task. The task containing the error was available on the main OCR website until 13 November 2008, when it was taken down for the error to be corrected. The booklet of published specimen assessment materials available from Publications also contains the error.

Teachers who downloaded the task before 13 November, or have the published booklet, and intend to use this task with students should ensure that the quantity of lithium issued to each student is between 0.15 and 0.20 g.

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For use from September 2008 to June 2009.

Candidates answer on this task sheet.

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INSTRUCTIONS TO CANDIDATES

- Answer **all** parts of the task.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each part of the task.
- The total number of marks for this task is **15**.

ADVICE TO CANDIDATES

- Read each part carefully and make sure you know what you have to do before starting your answer.

FOR TEACHER'S USE

Part	Max.	Mark
A2	5	
B2	5	
C2	5	
TOTAL	15	

This task consists of **5** printed pages and **1** blank page.

Calculating the relative atomic mass of lithium

Introduction

In this Practical Task you will first react lithium with water to form a solution of lithium hydroxide, LiOH(aq) . You will then titrate the LiOH(aq) with standard HCl(aq) .

You will also be assessed on the:

- consistency of your titration results,
- the accuracy of your final answer.

From the results, you will calculate the relative atomic mass of lithium.

Part 1 – Titration

Two chemicals are supplied.

- Lithium metal in a weighing bottle.
- $0.100 \text{ mol dm}^{-3}$ hydrochloric acid, HCl(aq) .

Corrosive



Irritant



Phenolphthalein is available as indicator.

Flammable



Record all your readings on page 3.

- 1 Using a measuring cylinder, measure 100 cm^3 of water into a 250 cm^3 beaker.

Weigh the bottle provided, containing between 0.15 g and 0.20 g of lithium metal.

Record the mass on page 3.

Add the lithium metal into a beaker containing 100 cm^3 of water.

Weigh the empty weighing bottle.

Calculate the mass of lithium used and record your answer on page 3.

- 2 Wait for all the lithium to react completely with the water in the beaker. This may take two or three minutes.

- 3 When the reaction stops, transfer the solution in the beaker to a 250 cm^3 volumetric flask.

Rinse the beaker with distilled (or deionised) water and add this to the volumetric flask.

Add distilled (or deionised) water to make up the solution to exactly 250 cm^3 .

Mix this solution thoroughly before using it for your titrations.

- 4 Wash the pipette out thoroughly with distilled (or deionised) water.

Rinse the pipette with the solution you made up in the volumetric flask.

Using the pipette and filler, transfer 25.0 cm^3 of the solution into a conical flask.

Add about five drops of phenolphthalein indicator.

5 Rinse the burette with some of the $0.100 \text{ mol dm}^{-3}$ hydrochloric acid.

Fill the burette with fresh $0.100 \text{ mol dm}^{-3}$ hydrochloric acid.

Record all burette readings to 0.05 cm^3 in a table below.

Carry out a rough/trial titration.

The colour change at the end point is from pink to colourless.

6 Now carry out the titration accurately and obtain two consistent values for the titre, recording all your results below.

Readings

Mass measurements and mass of Li used.

mass of lithium used = B2[1]

Record your titration results in a suitable format below and calculate your mean titre.

mean titre = B2[4]

Titration results

You will also be assessed on the:

- consistency of your titration results, A2 [2]
- the accuracy of your final answer. A2 [2]

Safety

State the relevant hazard associated with the handling of lithium metal and any precautions taken to minimise this hazard.

hazard

precaution taken

..... A2 [1]
 [Turn over]

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Specimen Mark Scheme

The maximum mark for this task is **15**.

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Quality A2	
obtains consistent titres within 0.2 cm ³	[1]
obtains consistent titres within 0.1 cm ³	[1]
Calculates A_r correctly to give a value within 20% of centre value	[1]
Calculates A_r correctly to give a value within 20% of centre value	[1]
states one relevant safety point, and a precaution	[1]
Quality B2	
records mass results correctly, with units	[1]
records titration results correctly to a consistent number of decimal places	[1]
uses a clear table for titration results with initial and final burette readings, and titre	[1]
uses appropriate units for volume in titration table	[1]
obtains correct average titre by selecting most appropriate titres	[1]
Quality C2	
(a) calculates correctly the number of moles of HCl $a = \text{vol} \times 10^{-4} \text{ mol}$	[1]
(b) calculates correctly the number of moles of LiOH in 250 cm ³ $b = 10 \times a \text{ mol}$	[1]
(c) calculates correctly relative atomic mass of lithium to two (or three) significant figures $A_r = \text{mass}/b$	[1]
(d) mass Li is most significant error backed up by % error calculation or consideration of oil	[1] [1]
Total:	[15]

Instructions for Teachers and Technicians

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This is a Quantitative Task. There is no time limit but it is expected that it can be completed within one hour.

Candidates may attempt more than one quantitative task with the best mark from this type of task being used to make up the overall mark for Unit F323.

Preparing for the assessment

It is expected that before candidates attempt Practical Skills in Chemistry 1 (Unit F323) they will have had some general preparation in their lessons. They will be assessed on a number of qualities such as demonstration of skilful and safe practical techniques using suitable quantitative methods, the ability to make and record valid observations, and the ability to organise results suitably. It is therefore essential that they should have some advance practice in these areas so that they can maximise their attainment.

Preparing candidates

At the start of the task the candidates should be given the task sheet.

Candidates must work on the task individually under controlled conditions with the completed task being submitted to the teacher at the end of the lesson. Completed tasks should be kept under secure conditions until results are issued by OCR.

Candidates should not be given the opportunity to redraft their work, as this is likely to require an input of specific advice. If a teacher feels that a candidate has under-performed, the candidate may be given an **alternative** task. In such cases it is essential that the candidate be given detailed feedback on the completed assessment before undertaking another Quantitative Task. Candidates are permitted to take each task **once** only.

Assessing the candidate's work

The mark scheme supplied with this pack should be used to determine a candidate's mark out of a total of 15 marks. The cover sheet for the task contains a grid for ease of recording marks. To aid moderators it is preferable that teachers mark work using red ink, including any appropriate annotations to support the award of marks.

Notes to assist teachers with this task

Teachers must trial the task before candidates are given it, to ensure that the apparatus, materials, chemicals etc provided by the centre are appropriate. The teacher carrying out the trial must complete a candidate's task sheet showing the results attained, and retain this, clearly labelled, so that it can be provided to the moderator when requested.

Health and Safety



Attention is drawn to Appendix G of the specification.

Apparatus list

Students must not be told any information about these materials apart from what is given on the assessment sheets.

Materials

Each student will require the following materials, labelled by the indicated name only and the hazard warning symbol.

name		hazard	
Lithium	Between 0.15–0.20 g of lithium, Li, in a stoppered weighing bottle. The lithium should have been freshly cut.	Corrosive	
HCl	Aqueous (dilute) hydrochloric acid of concentration 0.100 mol dm ⁻³ . Each candidate will require about 100 cm ³ in a suitable bottle.	Irritant	

Apparatus

Each student will require:

- Safety spectacles
- Burette and white tile
- Pipette (25.0 cm³) and filler
- Clamp stand, with boss and clamp (for supporting the burette)
- Filter funnel
- Measuring cylinder (25 cm³)
- Glass rod
- Spatula
- Dropping pipette
- Volumetric flask (250 cm³)
- Wash bottle containing distilled or deionised water (about 300 cm³ will be required)
- Two conical flasks or conical beakers (250 cm³)
- Glass beaker (250 cm³)

Each student will also need access to the following:

- a top pan balance weighing to 0.01 g.
- a dropping bottle containing phenolphthalein

Flammable



Note: The quantities of chemicals required are approximate and due allowance should be made for wastage.

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