

Advanced Subsidiary GCE

F323 (3)

CHEMISTRY A

Unit F323: Practical Skills in Chemistry 1:
Evaluative 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

- Evaluative Task: Acid/carbonate reaction

INFORMATION FOR TEACHERS

- Mark scheme.
- Instructions for Teachers and Technicians.

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CHEMISTRY A

Unit F323: Practical Skills in Chemistry 1:
Evaluative Task

Specimen Task

For use from September 2008 to June 2009.

Candidates answer on this task sheet.

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**.

INFORMATION FOR TEACHERS

- Before carrying out this task, it would normally be expected that candidates will have carried out Unit F323 Task 2: '*Calculating the relative atomic mass of lithium*'.

ADVICE TO CANDIDATES

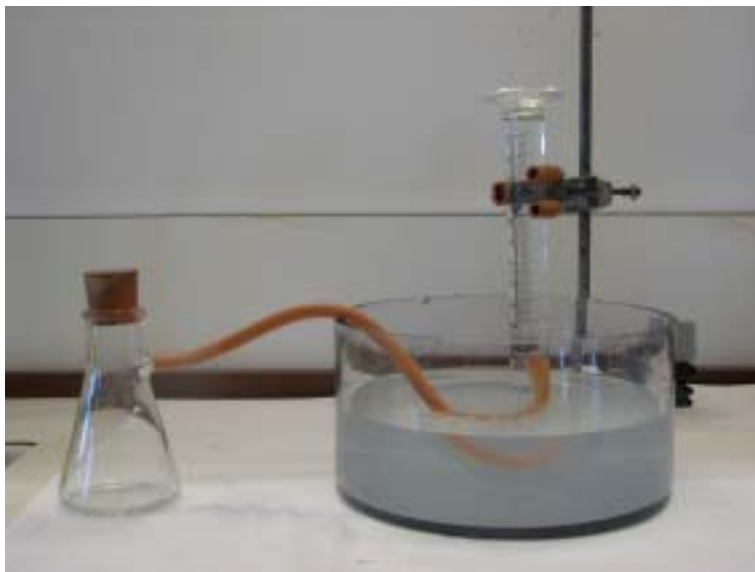
- Read each part carefully and make sure you know what you have to do before starting your answer.

FOR TEACHER'S USE		
Part	Max.	Mark
C1	5	
C3	5	
C4	5	
TOTAL	15	

This task consists of 6 printed pages.

Acid/carbonate reaction

A student suggested that it would be possible to calculate the volume of carbon dioxide evolved from the reaction of a Group 2 carbonate with sulfuric acid using the following apparatus.



Procedure

A 50.0 cm³ sample of 0.100 mol dm⁻³ sulfuric acid was measured using a pipette. This was added to the flask with the side arm.

0.30 g of magnesium carbonate, MgCO₃, was accurately weighed on a digital balance.

The measuring cylinder was filled with exactly 100 cm³ of water and supported upside down in a trough of water.

The two pieces of apparatus were connected by a delivery tube so that any gas produced in the side arm flask would be collected in the measuring cylinder. The apparatus was airtight and no leaks were present.

The rubber bung was removed from the side arm flask. The MgCO₃ was quickly added and the bung replaced.

Bubbles of carbon dioxide were seen collecting in the measuring cylinder.

When no more gas was seen to collect in the measuring cylinder, the volume of gas collected was recorded as 64 cm³.

Analysis

- (a) Construct a fully balanced equation for the reaction between H_2SO_4 and MgCO_3 , including state symbols.

..... C1 [1]

- (b) Calculate the number of moles of H_2SO_4 and MgCO_3 used in the experiment.

moles H_2SO_4 = mol C1[1]

moles MgCO_3 = mol C1[1]

- (c) State and explain whether the H_2SO_4 or MgCO_3 is in excess.

..... C1[1]

- (d) Show by calculation that the expected volume of carbon dioxide is greater than the 64 cm^3 obtained.

Assume that one mole of CO_2 occupies 24.0 dm^3 under the conditions used in the experiment.

volume CO_2 = cm^3 C1[1]

[Turn over

Evaluation

- (a) The volume of gas obtained by a student carrying out this practical work was significantly less than the calculated volume. One procedural error is the time lag in replacing the bung. Suggest **one** other possible error with the procedure above. Outline why this error would lead to less gas being collected than expected.

.....
.....
..... C3 [1]

- (b) Her friend suggested that there would be large errors with the measurements made because the measuring equipment was not accurate enough.

- (i) The 100 cm³ measuring cylinder used to measure the water was calibrated to within 1 cm³.

Calculate the percentage error in the volume of CO₂(g) collected in this experiment using this measuring cylinder.

C3 [1]

- (ii) The balance used to measure 0.30 g of MgCO₃ was accurate to 0.01 g.

State and explain whether the balance or the measuring cylinder contributed most to the measurement errors in this experiment.

.....
.....
.....
.....
..... C3 [2]

- (c) In the procedure 0.100 mol dm⁻³ sulfuric acid was measured out using a 25.0 cm³ pipette accurate to 0.06 cm³ to reduce the possible errors in the experiment. The pipette was used twice to obtain the 50.0 cm³.

State and explain why a piece of apparatus with such a high degree of accuracy is **not** needed in this case.

.....
.....
..... C3 [1]

- (d) The students decided that the experiment could be carried out more accurately if both the procedure and measuring apparatus were modified.

- (i) Draw a labelled diagram to show how the carbonate and acid could be reacted together without needing to remove the bung from the flask.

C4 [2]

- (ii) Suggest another modification to the general **procedure** that would produce more reliable and accurate results.

.....
..... C4 [1]

- (e) The same method was used to measure the volume of carbon dioxide produced when magnesium carbonate reacted with **hydrochloric** acid.

Suggest, with reasons, any modifications you may need to make if the sulfuric acid used in the procedure was replaced with the **same concentration and volume** of hydrochloric acid.

.....
.....
..... C4 [2]

Total [15]

END OF TASK

Total [15]

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

Instructions for teachers

Before carrying out this task, it would normally be expected that candidates will have carried out Unit F323 Task 2: '*Calculating the relative atomic mass of lithium*'.

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Quality C1	
writes correct equation and state symbols $\text{H}_2\text{SO}_4(\text{aq}) + \text{MgCO}_3(\text{s}) \rightarrow \text{MgSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$	[1]
calculates correctly the number of moles of H_2SO_4 (5.00×10^{-3} mol)	[1]
calculates correctly the number of moles of MgCO_3 (3.56×10^{-3} mol)	[1]
explains why H_2SO_4 is in excess	[1]
calculates correctly the volume of CO_2 (71.4 cm^3)	[1]
Quality C3	
(a) gas soluble in water	[1]
b(i) 1.56% error for measuring cylinder	[1]
b(ii) states that the most significant error is the mass measurement	[1]
justifies why the balance has the greatest error (3% error)	[1]
(c) explains that sulfuric acid is in excess so the quantity is not significant	[1]
Quality C4	
d(i) arrangement in conical flask that keeps carbonate and acid separate and which would allow them to be mixed easily without removing bung	[1]
equipment used that is available in the laboratory	[1]
d(ii) better gas collection method, e.g. syringe (not over water)	[1]
(e) explains that the stoichiometry means that with same quantity of HCl the acid is not in excess	[1]
so double the volume of HCl is required	[1]
Total:	[15]



Oxford Cambridge and RSA Examinations

Advanced Subsidiary GCE

CHEMISTRY A

F323

Unit F323: Practical Skills in Chemistry 1: Evaluative Task

Instructions for Teachers and Technicians

For use from September 2008 to June 2009.

This document consists of 2 printed pages.

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

Candidates may attempt more than one evaluative 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 recognising and interpreting data, identifying anomalies and reaching valid conclusions, assessing the reliability and accuracy of an experimental task, identifying significant weaknesses in experimental procedures and measurements, and understanding and selecting simple improvements to experimental procedures and measurements. 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 Evaluative 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.