

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE



S25-3410U30-1A

MONDAY, 6 JANUARY – FRIDAY, 21 FEBRUARY 2025

CHEMISTRY – Unit 3 (3410U30)

PRACTICAL ASSESSMENT

**INVESTIGATING THE RATE OF THE REACTION BETWEEN
CALCIUM CARBONATE AND HYDROCHLORIC ACID**

SECTION A

1 hour

For Examiner's use only		
	Maximum Mark	Mark Awarded
Section A	6	

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The total number of marks available for this section of the task is 6.

The number of marks is given in brackets at the end of each question or part-question.

This task is in 2 sections, **A** and **B**. You will complete Section **A** in one lesson and Section **B** in the next science lesson.

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Introduction

Your task is to investigate the effect of changing temperature on the rate of the reaction between calcium carbonate and dilute hydrochloric acid.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection

1 × 100 cm³ conical flask

1 × 25 cm³ measuring cylinder

1 × 100 cm³ gas syringe

1 × single holed rubber bung connected to delivery tube

1 × thermometer

5 × 2 g pre-weighed sample of calcium carbonate chippings (2–4 mm in diameter)

1 × 250 cm³ beaker containing approximately 150 cm³ of dilute hydrochloric acid (1 mol/dm³)

1 × stopwatch

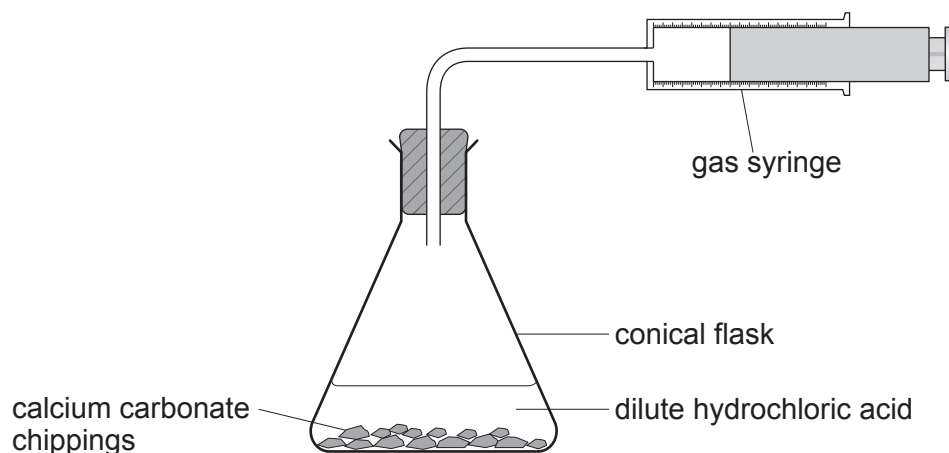
Access to:

waste bowl

water bath – set at 60 °C

CLEAPSS student safety sheet: 20 – Hydrochloric acid. This is provided on page 6 of this examination paper.



Diagram

Read the method and answer questions 1.(a) and 1.(b) before carrying out the experiment and recording your results.

Method

1. Wear eye protection.
2. Connect the delivery tube to the gas syringe as shown in the diagram.
3. Take a beaker containing dilute hydrochloric acid (1.0 mol/dm^3) from the water bath at approximately 60°C .
4. Use the measuring cylinder to measure 25 cm^3 of the dilute hydrochloric acid.
5. Pour the dilute hydrochloric acid into the conical flask.
6. Measure and record the temperature of the acid in the conical flask.
7. Add 2 g of pre-weighed calcium carbonate chippings to the conical flask and **quickly** insert the rubber bung.
8. Whilst continuously swirling the flask, record the time taken **in seconds** to collect 100 cm^3 of gas in the gas syringe.
9. Empty the contents of the conical flask into the waste bowl and rinse with cold water.
10. Repeat steps 4–9 using hydrochloric acid at approximately 50°C , 40°C , 30°C and 20°C . Give the acid in the beaker time to cool to reach the required temperatures.



SECTION AAnswer **all** questions.

1. (a) State a hypothesis for this experiment. [1]

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.....

- (b) Complete the risk assessment below for this experiment. [2]
Use the student safety sheet on page **6** of this examination paper.

HAZARD	RISK	CONTROL MEASURE
Hot glassware		
1.0 mol/dm ³ dilute hydrochloric acid is not classified as hazardous		

You may record raw results in the space below.



(c) Present your results in a table. Include all of your results.

[3]

Examiner
only

END OF PAPER

6



Student safety sheets

20

Hydrochloric acid

also applied to hydrogen chloride gas

Substance	Hazard	Comment
Hydrogen chloride Gas	 CORROSIVE  TOXIC	DANGER. It causes severe skin burns and eye damage. It is toxic if breathed in. For a 15-minute exposure, the concentration in the atmosphere should not exceed 8 mg/m^3 . Effects of exposure by inhalation may or may not be immediately apparent and can develop and/or increase over time. Inhalation by those with known breathing difficulties (e.g. asthma) may exacerbate such pre-existing conditions.
Concentrated hydrochloric acid (If 6.8 mol/dm^3 or more)	 CORROSIVE  IRRITANT	DANGER. It causes burns. The vapour irritates the lungs.
Moderately-concentrated hydrochloric acid (If less than 6.8 mol/dm^3 but 2.7 mol/dm^3 or more)	 IRRITANT	WARNING. It may irritate the eyes and respiratory system.
Dilute hydrochloric acid (If less than 2.7 mol/dm^3)	Currently not classified as hazardous	This includes stomach acid. Dilute acid may still cause harm to the eyes or the skin. Treat as for more concentrated samples.

Typical control measures to reduce risk

- Use the lowest concentration possible.
- Use the smallest volume possible.
- Wear eye protection; goggles for concentrated acids.
- Avoid breathing the gas or fumes from concentrated solutions, e.g. by use of a fume cupboard.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
e.g. hazardous products (such as chlorine) produced as a result of a reaction with the acid or choking fumes if the concentrated acid is over-heated.
- How serious would it be if something did go wrong?
NB There are occasional reports of students being taken to hospital as a result of breathing in chlorine.
- How can the risk(s) be controlled for this activity?
e.g. can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- **In the eye** Irrigate the eye with gently running tap water for at least 20 minutes. Call 999/111.
- **Vapour breathed in** Remove to fresh air. Call 999/111 if breathing is difficult.
- **In the mouth/ swallowed** Do no more than wash out the mouth with drinking water. Do **not** induce vomiting. Call 999/111.
- **Spilt on the skin or clothing** Remove contaminated clothing. Quickly use a dry cloth or paper towel to wipe as much liquid off the skin as possible. Irrigate the affected area with gently-running tap water for at least 20 minutes. If a large area is affected or symptoms occur, call 999/111.
- **Spilt on the floor, bench, etc.** For release of gas, including larger spills, consider the need to evacuate the laboratory and open all windows. For large spills, and especially for (moderately) concentrated acid, cover with mineral absorbent (e.g. cat litter), then scoop into a bucket. Neutralise with sodium carbonate. Rinse with plenty of water. Wipe up small amounts with a damp cloth and rinse well.



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