

Cambridge IGCSE[™]

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

CHEMISTRY

Paper 5 Practical Test May/June 2021

1 hour 15 minutes

0620/53

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

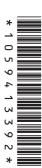
- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do not write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [].
- Notes for use in qualitative analysis are provided in the question paper.

For Examiner's Use		
1		
2		
3		
Total		

This document has 12 pages. Any blank pages are indicated.

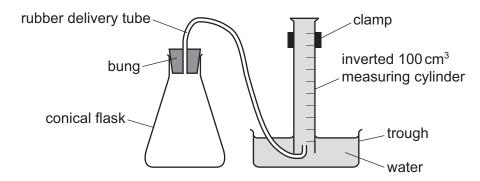


1 You are going to investigate the rate at which hydrogen gas is made when magnesium reacts with dilute sulfuric acid.

Read all of the instructions carefully before starting the experiments.

Instructions

You are going to do five experiments using the apparatus shown.



Experiment 1

- Use a 25 cm³ measuring cylinder to pour 25 cm³ of dilute sulfuric acid into the conical flask.
- Use a 50 cm³ measuring cylinder to pour 30 cm³ of distilled water into the conical flask.
- Set up the apparatus as shown in the diagram. Ensure the inverted measuring cylinder is full of water.
- Remove the bung from the conical flask.
- Add a coiled length of magnesium ribbon to the conical flask, immediately replace the bung and start the timer.
- Measure the volume of gas collected in the inverted measuring cylinder after 30 seconds. Record the volume of gas collected in the table in (a).

Experiment 2

- Empty the conical flask and rinse it with distilled water.
- Repeat Experiment 1 using 20 cm³ of distilled water instead of 30 cm³.
 Measure the water using the second 25 cm³ measuring cylinder.

Experiment 3

Repeat Experiment 2 using 10 cm³ of distilled water instead of 20 cm³.

Experiment 4

Repeat Experiment 3 using 5 cm³ of distilled water instead of 10 cm³.

Experiment 5

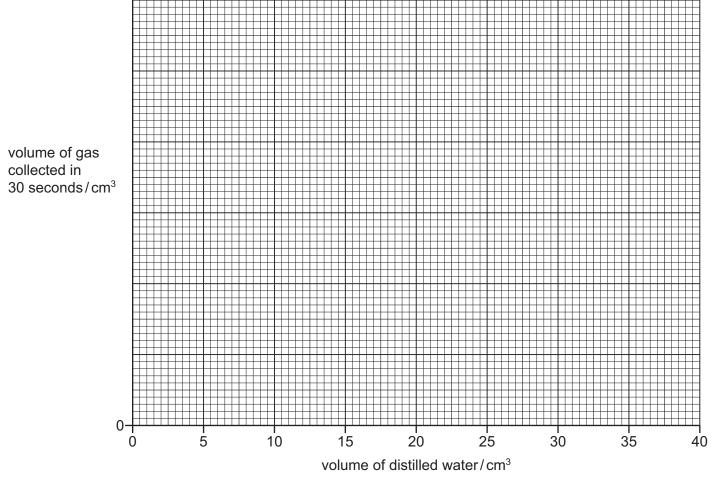
Repeat Experiment 4 but do not add any distilled water to the dilute sulfuric acid.

(a) Complete the table.

experiment	volume of dilute sulfuric acid/cm³	volume of distilled water/cm³	volume of gas collected in 30 seconds/cm³
1			
2			
3			
4			
5			

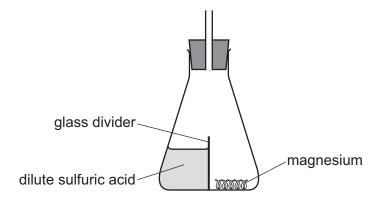
[4]

(b) Write a suitable scale on the *y*-axis and plot your results from Experiments 1 to 5 on the grid. Draw a smooth curve of best fit.



(c)		rapolate (extend) the line on your graph and deduce the volume of gas that would be ected in 30 seconds if 35 cm³ of distilled water was added to the dilute sulfuric acid.
		cm ³ [2]
(d)	The	e rate of reaction can be calculated using the equation shown.
		rate of reaction = $\frac{\text{volume of gas collected}}{\text{time taken to collect the gas}}$
	(i)	Use this equation to calculate the rate of reaction in Experiment 3. Give the units for the rate you have calculated.
		rate =
		units =[2]
	(ii)	State which Experiment, 1, 2, 3, 4 or 5, had the highest rate of reaction.
		[1]
(e)		e volume of the dilute sulfuric acid was measured using a measuring cylinder. A 25 cm ³ ette can be used instead of a measuring cylinder.
	(i)	State one advantage of using a 25 cm³ pipette instead of a measuring cylinder.
		[1]
	(ii)	State one disadvantage of using a 25 cm ³ pipette instead of a measuring cylinder.
		[1]
(f)		me another item of apparatus, which can be used instead of an inverted measuring cylinder, collect and measure the volume of gas made in the reaction.
		[1]

(g) The diagram shows a modified conical flask that can be used in this investigation.



Explain the advantage of using this type of conical flask instead of the type you nvestigation.	u used in the
	[2]
	[Total: 18]

You are provided with two solids, solid I and solid J.
Do the following tests on the substances, recording all of your observations at each stage.

tests on solid I

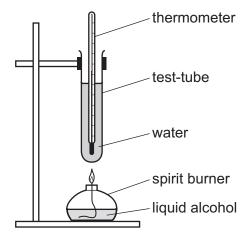
Place solid **I** in a boiling tube. Add about 10 cm³ of distilled water to the boiling tube. Place a stopper in the boiling tube and shake the tube to dissolve solid **I** and form solution **I**. Divide solution **I** into four approximately equal portions in four test-tubes.

(a)	To the first portion of solution I , add aqueous sodium hydroxide dropwise and then in excern Record your observations.	es.
(b)	To the second portion of solution ${f I}$, add aqueous ammonia gradually until there is no furt	her
	change. Record your observations.	
		[2]
(c)	To the third portion of solution I , add about 1 cm depth of dilute nitric acid followed by a drops of aqueous silver nitrate. Leave the mixture to stand for about 5 minutes. Record your observations.	few
		[1]
(d)	To the fourth portion of solution ${\bf I}$, add about 2cm depth of aqueous sodium carbonate. Record your observations.	
		[1]
(e)	Use your observations from (a), (b) and (c) to identify solid I.	

tests on solid J

(f)		Carry out a flame test on solid J . Record your observations.					
(g)	(i)	Place approximately half of solid J in a boiling tube. Add about 10 cm ³ of dilute sulfuric acid to solid J in the boiling tube. Test any gas produced. Record your observations.					
	(ii)	Identify the gas produced in (g)(i) .					
(h)	Pla	[1] ce the remaining solid J in a boiling tube. Add about $10\mathrm{cm^3}$ of distilled water to the					
(11)	boil	ing tube. Place a stopper in the boiling tube and shake the tube to dissolve solid $\bf J$ and form $\bf J$.					
	Divi	ide solution ${f J}$ into two approximately equal portions in two test-tubes.					
	(i)	To the first portion of solution ${\bf J}$, add about 1 cm depth of aqueous sodium hydroxide. Record your observations.					
	(ii)	To the second portion of solution ${\bf J},$ add about 2 cm depth of aqueous copper(II) sulfate. Record your observations.					
<i>(</i> 1)		[1]					
(i)	US6	e your observations from (f) and (g) to identify solid J .					
		[2]					
		[Total: 16]					

3 The energy given out when different liquid alcohols are burned can be compared using the apparatus shown.



Describe how the apparatus shown can be used to compare the amount of energy given out by

three different liquid alcohols, ethanol, propanol and butanol. Your answer should include how the results can be used to determine which fuel gives out the most energy.

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Notes for use in qualitative analysis Tests for anions

anion	test	test result
carbonate (CO ₃ ²⁻)	add dilute acid	effervescence, carbon dioxide produced
chloride (C <i>l</i> ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
bromide (Br ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	cream ppt.
iodide (I ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate (NO ₃ ⁻) [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulfate (SO ₄ ²⁻) [in solution]	acidify, then add aqueous barium nitrate	white ppt.
sulfite (SO ₃ ²⁻)	add dilute hydrochloric acid, warm gently and test for the presence of sulfur dioxide	sulfur dioxide produced will turn acidified aqueous potassium manganate(VII) from purple to colourless

Tests for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia	
aluminium (Al³+)	white ppt., soluble in excess, giving a colourless solution	white ppt., insoluble in excess	
ammonium (NH ₄ ⁺)	ammonia produced on warming	_	
calcium (Ca ²⁺)	white ppt., insoluble in excess	no ppt., or very slight white ppt.	
chromium(III) (Cr ³⁺)	green ppt., soluble in excess	grey-green ppt., insoluble in excess	
copper(II) (Cu ²⁺)	light blue ppt., insoluble in excess	light blue ppt., soluble in excess, giving a dark blue solution	
iron(II) (Fe ²⁺)	green ppt., insoluble in excess	green ppt., insoluble in excess	
iron(III) (Fe ³⁺)	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess	
zinc (Zn ²⁺)	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution	

Tests for gases

gas	test and test result		
ammonia (NH ₃)	turns damp red litmus paper blue		
carbon dioxide (CO ₂)	turns limewater milky		
chlorine (Cl ₂)	bleaches damp litmus paper		
hydrogen (H ₂)	'pops' with a lighted splint		
oxygen (O ₂)	relights a glowing splint		
sulfur dioxide (SO ₂)	turns acidified aqueous potassium manganate(VII) from purple to colourless		

Flame tests for metal ions

metal ion	flame colour
lithium (Li ⁺)	red
sodium (Na⁺)	yellow
potassium (K⁺)	lilac
copper(II) (Cu ²⁺)	blue-green

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