

GCSE Chemistry (9 – 1)

Gas Tests

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/3
2	/9
3	/10
4	/7
5	/6
6	/7
Total	/42
%	
Grade	

Information

- The maximum mark for this paper is 42 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Gas tests serve as the chemical 'fingerprints' for invisible substances, allowing us to instantly recognise gases like hydrogen and oxygen through their reactions to things like heat, litmus paper, or limewater.

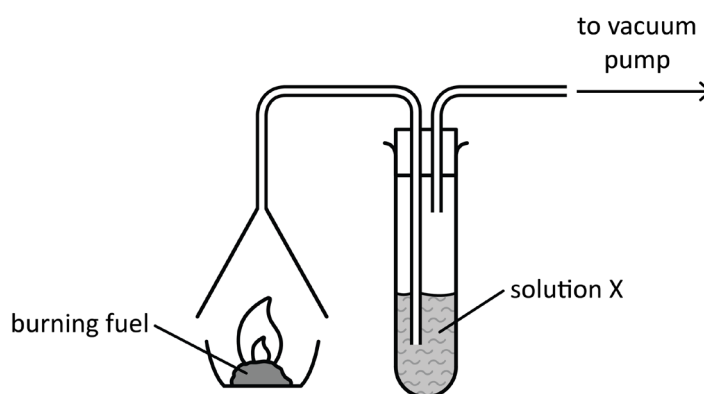
Circle the letter of the correct answer for each of the following questions.

- a) A student collects a gas in a test tube. They insert a glowing splint into the tube and the splint relights. Which gas is present?

A	B	C	D
Hydrogen	Carbon dioxide	Oxygen	Chlorine

(1 mark)

- b) Gases made by burning a fuel containing carbon compounds are bubbled through solution **X** using the apparatus shown below.



Which row from the table below identifies solution **X** and the result obtained when the fuel containing compounds of carbon is burned and passed through solution **X**?

	Solution X	Positive results
A	Universal indicator	Turns colourless
B	Limewater	Becomes cloudy
C	Universal indicator	No result
D	Limewater	Becomes cloudy

(1 mark)

- c) Why must the litmus paper be "damp" when testing for chlorine gas?

- A** To cool down the gas so it doesn't burn the paper.
- B** To dissolve the gas so it can react with the indicator on the paper.
- C** To make the paper stick to the test tube.
- D** To prevent the paper from catching fire.

(1 mark)

(Total for Question 1 is 3 marks)

2. A student investigates the reaction between magnesium metal and dilute ethanoic acid.

The reaction produces a salt, magnesium ethanoate, and a gas.

- a) Identify the gas produced in this reaction and describe the chemical test for it.

Gas:

Test:

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Result:

(3 marks)

- b) Ethanoic acid is a weak carboxylic acid. In the space below, draw the displayed formula for a molecule of ethanoic acid.

(2 marks)

- c) The student writes a balanced symbol equation for the reaction.
Complete the equation by filling in the missing formulae.



(1 mark)

- d) The theoretical yield for the reaction was 7.1 g but the actual yield the student obtained was 5.68 g.
Using this information calculate the percentage yield.

Relative atomic masses (Ar): H = 1 C = 12 O = 16 Mg = 24

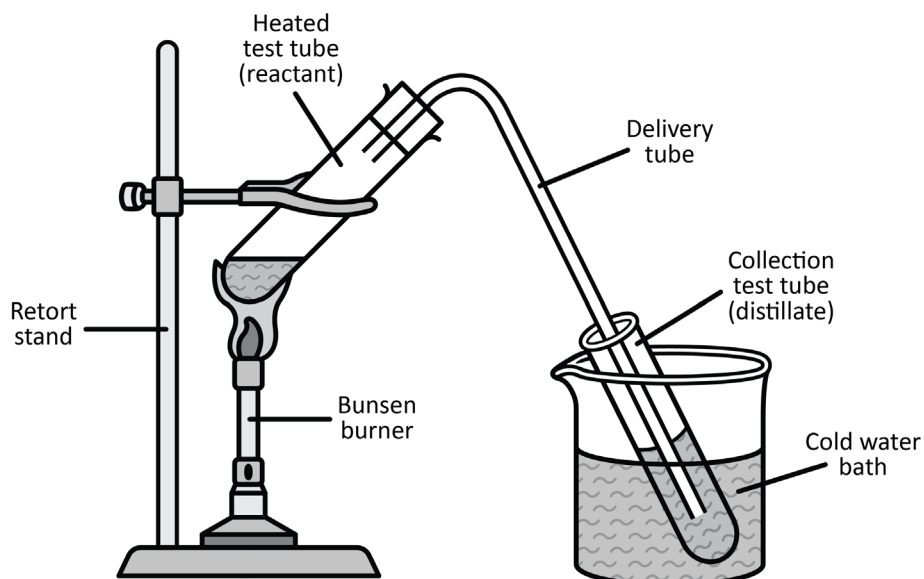
Percentage yield = ...

(3 marks)

(Total for Question 2 is 9 marks)

3. A student heats a sample of green copper carbonate powder in a test tube.

The copper carbonate decomposes to form a black copper oxide solid and carbon dioxide.



- a) The student wants to test the gas produced to prove that it is carbon dioxide.

Describe the chemical test that the student should do to determine if the gas is carbon dioxide.

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(2 marks)

- b) Complete the balanced symbol equation for this reaction.



(2 marks)

- c) Carbon dioxide (CO₂) is a covalent compound.

Carbon is in group 4 of the periodic table and oxygen is in group 6.

Draw the **dot and cross diagram** to show the bonding in a **molecule** of carbon dioxide.

Show outer shell electrons only.

(2 marks)

d) The student measures the mass of the test tube and contents before and after heating.

Before heating: mass of test tube + copper carbonate = **24.5 g**

After heating: mass of test tube + copper oxide = **20.1 g**

Calculate the mass of carbon dioxide gas that escaped during the reaction.

Mass of gas = ... g

(2 marks)

e) Explain why the mass of the solid in the test tube decreased during the reaction.

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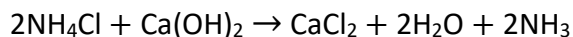
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(2 marks)

(Total for Question 3 is 10 marks)

4. A teacher prepares a sample of ammonia gas, $\text{NH}_3(\text{g})$ in the laboratory by heating a mixture of solid ammonium chloride and solid calcium hydroxide.

The balanced equation for this reaction is:



- a) Describe the chemical test to confirm the gas produced is ammonia.

Include the necessary condition of the test paper and the result.

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(2 marks)

- b) Ammonia is an alkaline gas.

The student bubbles the ammonia gas into a solution of dilute sulfuric acid, H_2SO_4 .

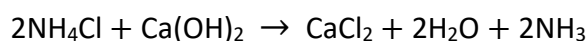
Name the salt formed in this reaction and write its chemical formula.

Name of salt:

Formula:

(2 marks)

- c) Calculate the percentage atom economy for the production of ammonia (NH_3) in this reaction.



Give your answer to 3 significant figures.

Relative atomic masses (A_r) :H = 1, N = 14, O = 16, Cl = 35.5, Ca = 40

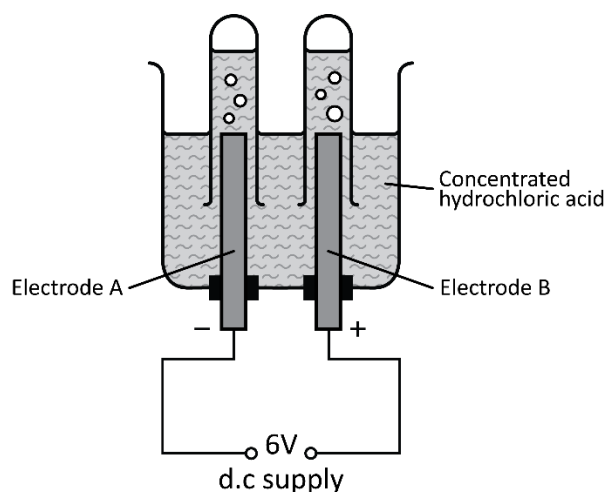
Atom economy = ... %

(3 marks)

(Total for Question 4 is 7 marks)

5. A student investigates the electrolysis of concentrated hydrochloric acid, HCl using carbon electrodes.

The apparatus is set up as shown in the diagram below:



Explain how the student can identify the gases produced at electrode A and electrode b.

In your answer, you should:

- Identify the gas produced at **electrode A** and the gas produced at **electrode B**.
- Describe the specific chemical test and the positive result for the gas produced at **electrode A**.
- Describe the specific chemical test and the positive result for the gas produced at **electrode B**.

This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(6 marks)

(Total for Question 5 is 6 marks)

6. A student investigates the decomposition of hydrogen peroxide solution, H_2O_2 .

The hydrogen peroxide breaks down to form water and a gas.

To speed up the reaction, the student adds a small amount of black manganese dioxide powder, MnO_2 .

- a) The student collects the gas produced in a test tube.

Describe the test and positive result to confirm that the gas is oxygen.

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(2 marks)

- b) Complete the balanced symbol equation for the decomposition of hydrogen peroxide.



(2 marks)

- c) The manganese dioxide powder remains chemically unchanged at the end of the reaction.

What is the chemical name given to a substance that speeds up a reaction without being used up?

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(1 mark)

- d) Explain why the rate of the reaction decreases as the reaction proceeds.

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(2 marks)

(Total for Question 6 is 7 marks)