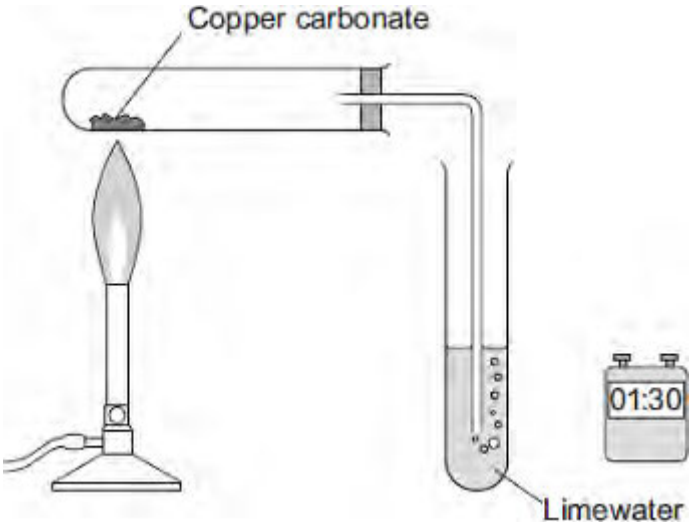
**Q1.**Carbon dioxide is produced when copper carbonate is heated.

A student investigated heating copper carbonate.
The student used the apparatus to measure how long it took for carbon dioxide to be produced.
The student also noted what happened during each minute for three minutes.




(a) The student used changes to the limewater to measure how long it took for carbon dioxide to be produced.

Describe how.

.....

.....

.....

.....

**(2)**

(b) The student wrote down her observations.

| **Time interval in minutes** | **Observations** |
|---|---|
| Between 0 and 1 | A slow release of gas bubbles.<br>The limewater did not change.<br>The solid in the test tube was green. |
| Between 1 and 2 | A fast release of gas bubbles. |

| | |
|---|---|
| | The limewater changed at 1 minute 10 seconds. |
| Between 2 and 3 | No release of gas bubbles.<br>The solid in the test tube was black. |

(i) Suggest the reason for the student's observations between 0 and 1 minute.

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**(2)**

(ii) Explain the student's observations between 1 and 2 minutes.

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**(2)**

(iii) Explain the student's observations between 2 and 3 minutes.

.....

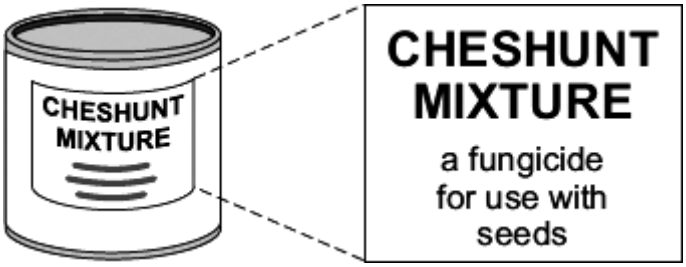
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**(2)**

**Q2.** Cheshunt mixture is a powder containing copper sulfate, $CuSO_4$, and ammonium carbonate, $(NH_4)_2CO_3$




(a) A student tested the Cheshunt mixture.

(i) Hydrochloric acid was added.
A gas was produced that turned limewater milky.

Complete the sentence.

The gas was ..... which shows

that ..... ions are in the mixture.

**(2)**

(ii) Sodium hydroxide solution was added.
A gas was produced that indicates that ammonium ions are in the mixture.

Complete the sentence.

The gas was ..... which turns

damp red ..... blue.

**(2)**

(b) Cheshunt mixture is dissolved in water before it is used.
When the student dissolved the Cheshunt mixture in water it formed a blue solution.

(i) Suggest how the student knew that copper ions are in this solution.

.....

.....

**(1)**

(ii) The student tested the Cheshunt solution and the result of the test indicated that sulfate ions are in the solution.

Complete the sentence.

The student added a solution of ..... in the presence of

dilute hydrochloric acid and a ..... precipitate was produced.

**(2)**

**(Total 7 marks)**

**Q3.** Read the information in the box and then answer the questions.

Seidlitz Powder is the name of a medicine.

Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid ($C_4H_6O_6$). The other powder is wrapped in blue paper and contains potassium sodium tartrate ($KNaC_4H_4O_6$) and sodium hydrogencarbonate ($NaHCO_3$).

The contents of the blue paper are completely dissolved in water and then the contents of the white paper are added.

The equation which represents this reaction is:

$$C_4H_6O_6\ (aq) + 2NaHCO_3\ (aq) \longrightarrow Na_2C_4H_4O_6\ (aq) + 2H_2O\ (l) + 2CO_2\ (g)$$

(a) Describe and give the result of a test to identify the gas produced in this reaction.

.....

.....

.....

.....

**(2)**

(b) One of the chemicals in Seidlitz Powder is potassium sodium tartrate ($KNaC_4H_4O_6$).

Suggest why it would be difficult to identify **both** potassium ions and sodium ions in potassium sodium tartrate using a flame test.

.....

.....

**(1)**

(c) Some Seidlitz Powder was bought on the Internet. However, when tested, it was found to be only magnesium sulfate.

(i) Describe and give the result of a chemical test to show that magnesium sulfate contains sulfate ions.

Test .....

.....

Result .....

.....

**(2)**

(ii) Magnesium sulfate contains magnesium ions.

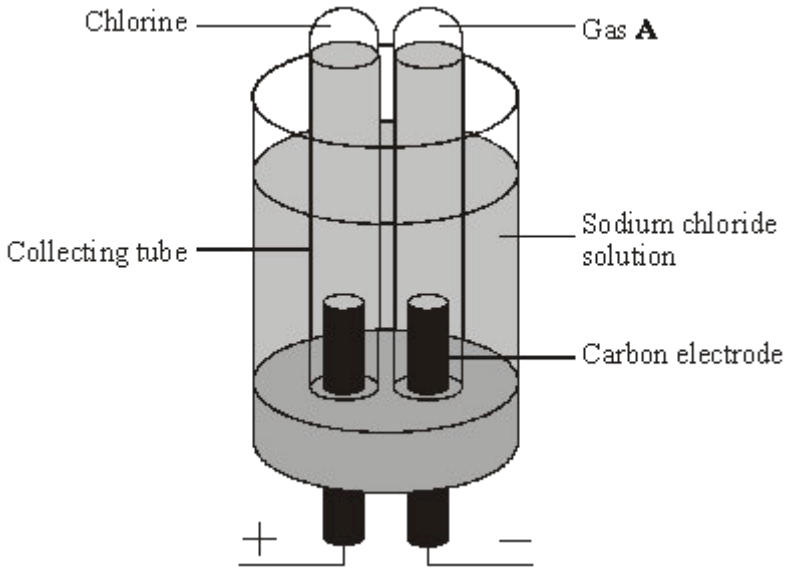
Describe what you **see** when sodium hydroxide solution is added to a solution of magnesium sulfate.

.....

.....

**(1)**
**(Total 6 marks)**

**Q4.** The electrolysis of sodium chloride solution is an important industrial process. The apparatus shown below can be used to show this electrolysis in the laboratory.




(a) Name gas **A**. .....

**(1)**

(b) Chlorine is produced at the positive electrode. Describe and give the result of a chemical test to prove that the gas is chlorine.

.....

.....

.....

.....

**(2)**

(c) Chloride ions move to the positive electrode. Explain why.

.....

.....

**(1)**

(d) A small quantity of chlorine is added to drinking water. Explain why.

.....

.....

**(1)**

(e) The solution around the negative electrode becomes alkaline. Name the ion which makes the solution alkaline.

.....

.....

**(1)**
**(Total 6 marks)**

**Q5.** Hydrogen peroxide, $H_2O_2$, is often used as a bleach. It decomposes forming water and oxygen.

(a) (i) Write the balanced chemical equation for the decomposition of hydrogen peroxide.

.....

**(3)**

(ii) Give a test for oxygen.

Test .....

Result of test .....

.....

**(2)**

(b) The rate of decomposition of hydrogen peroxide at room temperature is very slow. Manganese oxide is a catalyst which can be used to speed up the decomposition. Complete the sentence.

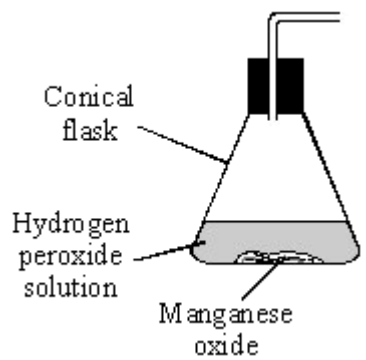
A catalyst is a substance which speeds up a chemical reaction. At the end of the

reaction, the catalyst is .....

**(1)**

(c) Two experiments were carried out to test if the amount of manganese oxide, $MnO_2$ affected the rate at which the hydrogen peroxide decomposed.

(i) Complete the diagram to show how you could measure the volume of oxygen formed during the decomposition.

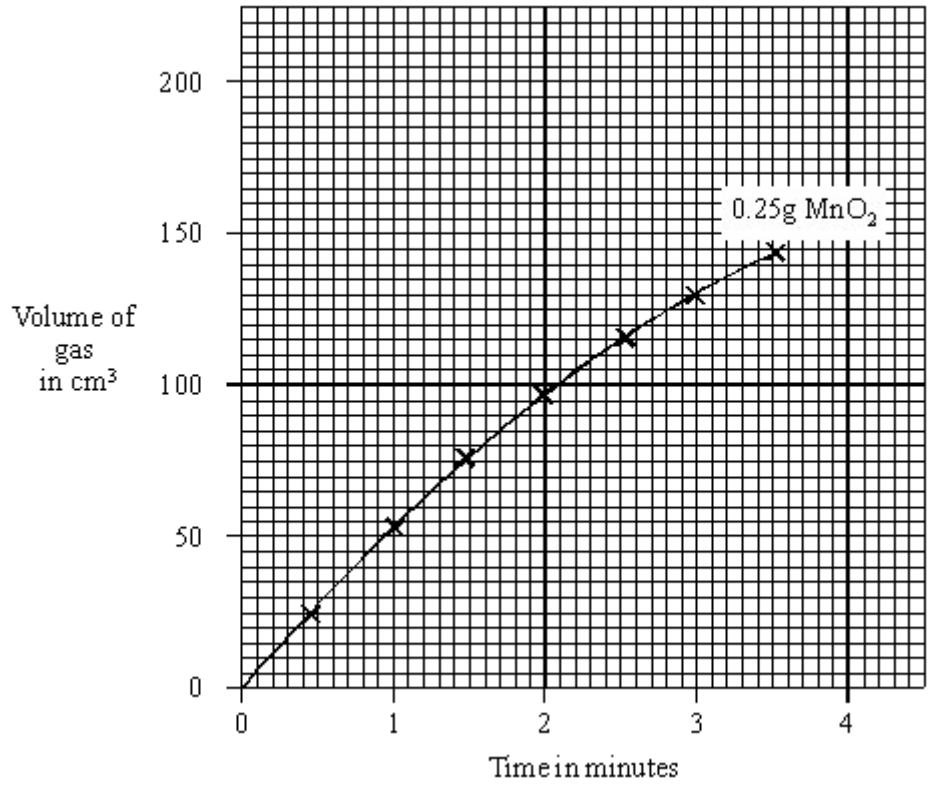



**(2)**

(ii) The results are shown in the table.

| **Time in minutes** | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 |
|---|---|---|---|---|---|---|---|---|
| **Volume of gas in $cm^3$ using 0.25 g $MnO_2$** | 0 | 29 | 55 | 77 | 98 | 116 | 132 | 144 |
| **Volume of gas in $cm^3$ using 2.5 g $MnO_2$** | 0 | 45 | 84 | 118 | 145 | 162 | 174 | 182 |

Draw a graph of these results. The graph for 0.25 g $MnO_2$ has been drawn for you.




**(3)**

(iii) Explain why the slopes of the graphs become less steep during the reaction.

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**(2)**

(iv) The same volume and concentration of hydrogen peroxide solution was used for both experiments. What **two** other factors must be kept the same to make it a fair test?

1 .....

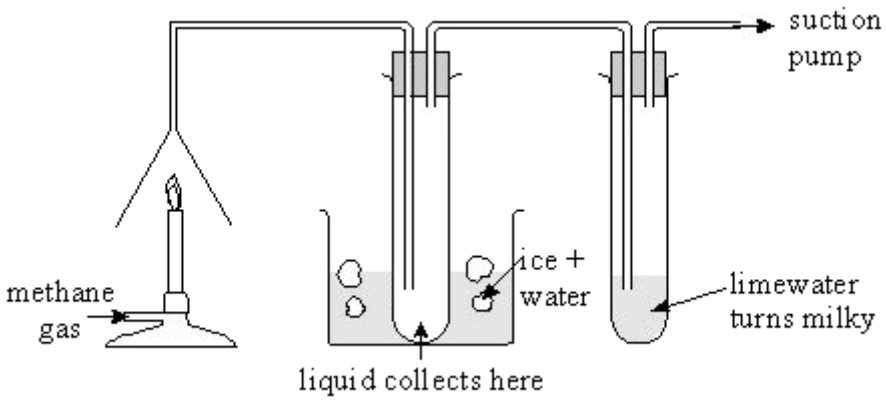
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2 .....

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**(2)**
**(Total 15 marks)**

**Q6.** Methane $CH_4$ contains the elements carbon and hydrogen only. A student wanted to find out which new substances are produced when methane is burned. The student set up the apparatus shown below.




(a) Which gas in the air reacts with methane when it burns?

.....

**(1)**

(b) Name the liquid collected.

.....

**(1)**

(c) Name the gas which turns limewater milky.

.....

**(1)**

(d) When methane burns an exothermic reaction takes place. What is meant by an exothermic reaction?

.....

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**(2)**

**(Total 5 marks)**