

GCSE



CCEA GCSE TEACHER GUIDANCE

Chemistry Practical Manual

Unit 3: Practical Skills

C9: Investigate the preparation, properties, tests and reactions of the gases hydrogen, oxygen and carbon dioxide

Investigate the preparation, properties, tests and reactions of the gases hydrogen, oxygen and carbon dioxide

In this practical we will make a sample of each gas and use it to investigate the properties, tests and reactions of each gas.

In order to make each gas we need to have a method of collecting and storing the gas. In the case of all gases we can use the displacement of water out of test-tubes or gas jars to collect the gas – this allows us to see when the test-tube or gas jar is full.

For all experiments, follow the safety advice given by your teacher.

1) Preparation of carbon dioxide gas

Apparatus and Chemicals

Conical flask with side arm, Thistle funnel, Delivery tube

3 gas jars with lids (or test tubes with stoppers)

Basin/trough of water

Test-tube rack

calcium carbonate small pieces 3 g

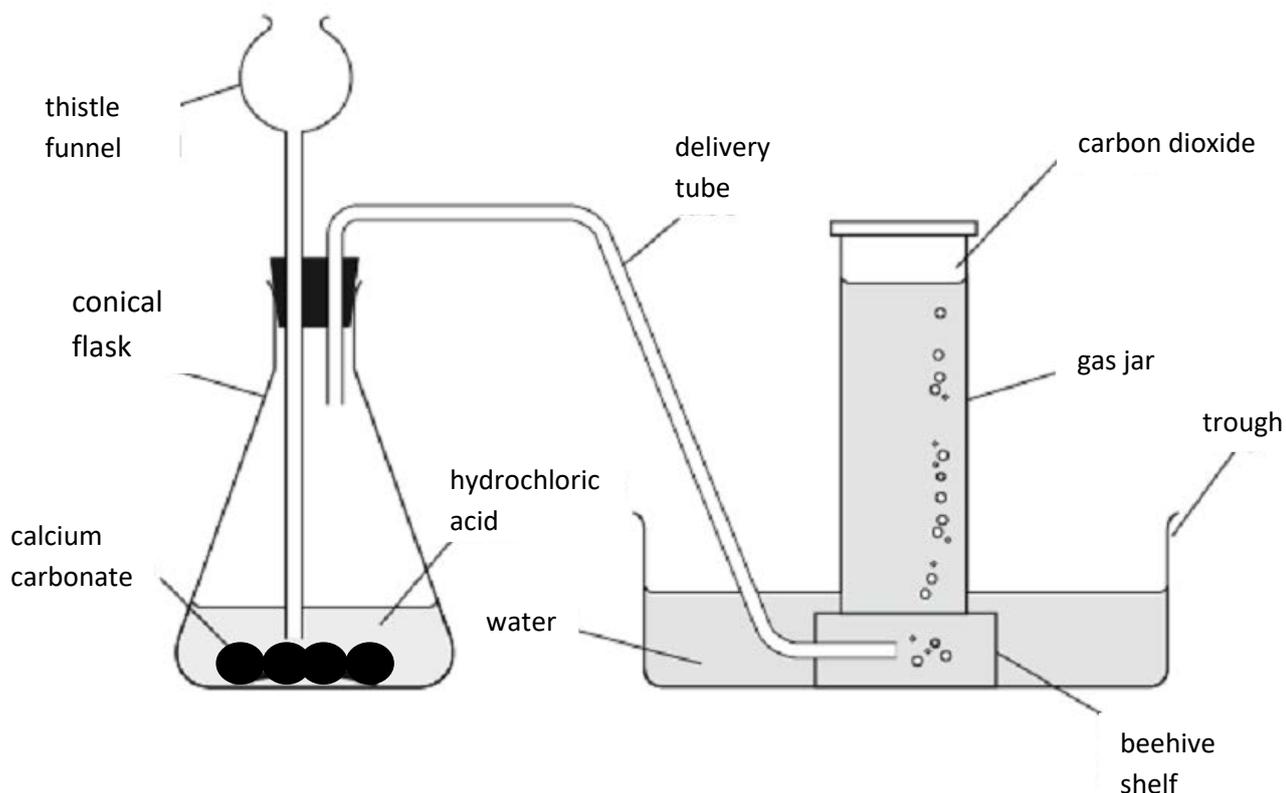
50 cm³ of hydrochloric acid 1 mol/dm³

Wooden Splint

Limewater 5 cm³

Universal indicator solution

Apparatus



Method

- 1) Carefully place the calcium carbonate into the conical flask
- 2) Collect 50 cm³ of hydrochloric acid in a small beaker
- 3) Connect the delivery tube and thistle funnel to the conical flask with the delivery tube in a basin of water
- 4) Have three gas jars/test tubes filled with water also inverted in the basin of water
- 5) Carefully pour the hydrochloric acid into the thistle funnel, wait 5 s then carefully place the first water filled gas jar/test tube over the end of the delivery tube. Allow the gas jar/test tube to fill with gas (when all of the water has been displaced)
- 6) Leave the gas jar/test tube inverted in the water to retain the gas
- 7) Repeat step 5 until three gas jars/test tubes of gas have been collected
- 8) Remove each gas jars/test tube from the water as required for the following tests

Testing the gas

- 1) To the first gas jar/test tube insert a lit splint – record your observations

- 2) To the second gas jar/test tube add 1 cm³ of limewater, stopper and shake – record your observations

- 3) To the third gas jar/test tube add 5 drops of universal indicator, stopper and shake – record your observations. Add a little deionised water if no change observed and shake again

Underline the correct answer in each of the following statements

Carbon Dioxide is

- Less dense/more dense than air
- Able to support combustion/used to extinguish flames
- Acidic/Basic
- Able to react with limewater to produce a soluble/insoluble product

2) Making Hydrogen gas

Apparatus and Chemicals

Conical flask with side arm, Thistle funnel, Delivery tube

3 gas jars/test tubes and 3 stoppers

Basin/trough of water

Test tube rack

Basin/trough half-filled with water, bee hive shelf especially for gas jars

Zinc approx. 2.5 g

50 cm³ of hydrochloric acid 1 mol/dm³

Wooden splint

Method

The same method is used as for carbon dioxide except zinc (or sometimes magnesium ribbon) is used in place of calcium carbonate. Collect 3 gas jars/test tubes of hydrogen gas in the same way.

- 1) Carefully place the zinc into the conical flask
- 2) Collect 50 cm³ of hydrochloric acid in a small beaker
- 3) Connect the delivery tube and thistle funnel to the conical flask with the delivery tube in a basin of water
- 4) Have three gas jars/test tube filled with water also inverted in the basin of water
- 5) Carefully pour the hydrochloric acid into the thistle funnel, wait 5 s then carefully place the first water filled gas jar/test tube over the end of the delivery tube. Allow the gas jar/test tube to fill with gas (when all of the water has been displaced)
- 6) Leave the gas jar/test tube inverted in the water to retain the gas
- 7) Repeat step 5 until three gas jars/test tubes of gas have been collected
- 8) Remove each gas jar/test tube from the water as required for the following tests

Testing the gas

- 1) To the first gas jar/test tube insert a lit splint – record your observations. You may need to repeat using a different gas jar/test tube of the gas

- 2) Write a balanced symbol equation for the reactions to produce the hydrogen gas and when a lit splint is applied

3) Making Oxygen gas

Apparatus and Chemicals

Conical flask with side arm, Thistle funnel, Delivery tube

2 gas jars/test tubes and 2 stoppers

Basin/trough of water

Test tube rack

Basin/trough half-filled with water, bee hive shelf (optional, but helps to stabilise test tubes)

manganese dioxide/manganese(IV) oxide (3 g)

hydrogen peroxide solution (20 vol)

Wooden Splint

Method

- 1) Carefully place the manganese(IV) oxide into the conical flask
- 2) Collect 50 cm³ of hydrogen peroxide solution in a small beaker
- 3) Connect the delivery tube and thistle funnel to the conical flask with the delivery tube in a basin of water
- 4) Have three test tube filled with water also inverted in the basin of water
- 5) Carefully pour the hydrogen peroxide solution into the thistle funnel, wait 5 s then carefully place the first water filled test-tube over the end of the delivery tube. Allow the test-tube to fill with gas (when all of the water has been displaced)
- 6) Leave the test-tube inverted in the water to retain the gas
- 7) Repeat step 5 until two test tubes of gas have been collected
- 8) Remove each test tube from the water as required for the following tests

Testing the gas

To the first test-tube insert a glowing splint – record your observations. Repeat with the second test-tube of gas
