The Atmosphere

Composition of Air

- Air is a mixture of different gases

Gas	%
Nitrogen	**78%**
Oxygen	**21%**
Argon	**1%**
Carbon Dioxide	**0.04%**
Water Vapour	**Varies day to day**

Experiment to show 1/5 of air is oxygen

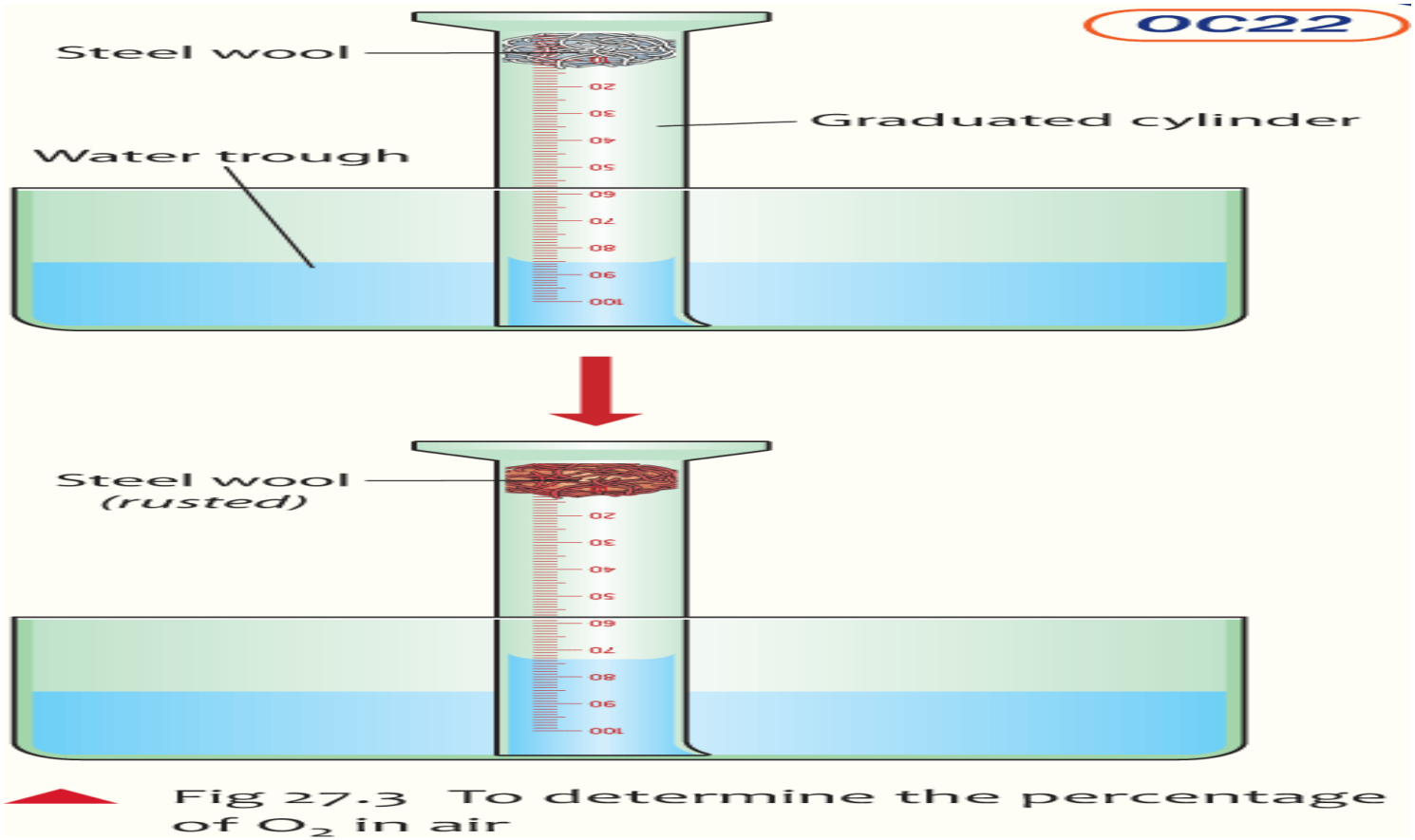


Fig 27.3 To determine the percentage of O_2 in air

- The steel wool begins to rust. As it rusts its uses up the oxygen in the graduated cylinder
- The water level rises to replace the oxygen that was used
- The water rises up 1/5 or 20%
- This shows there is 1/5 oxygen in air

Experiment to show that air contains Carbon Dioxide

Fig 27.5 Air bubbling through limewater

- Suck air through the vacuum pump tube
- Air will be drawn into the limewater through the other tube
- The limewater will turn milky
- This shows that air contains Carbon Dioxide

Experiment to show there is water vapour in air

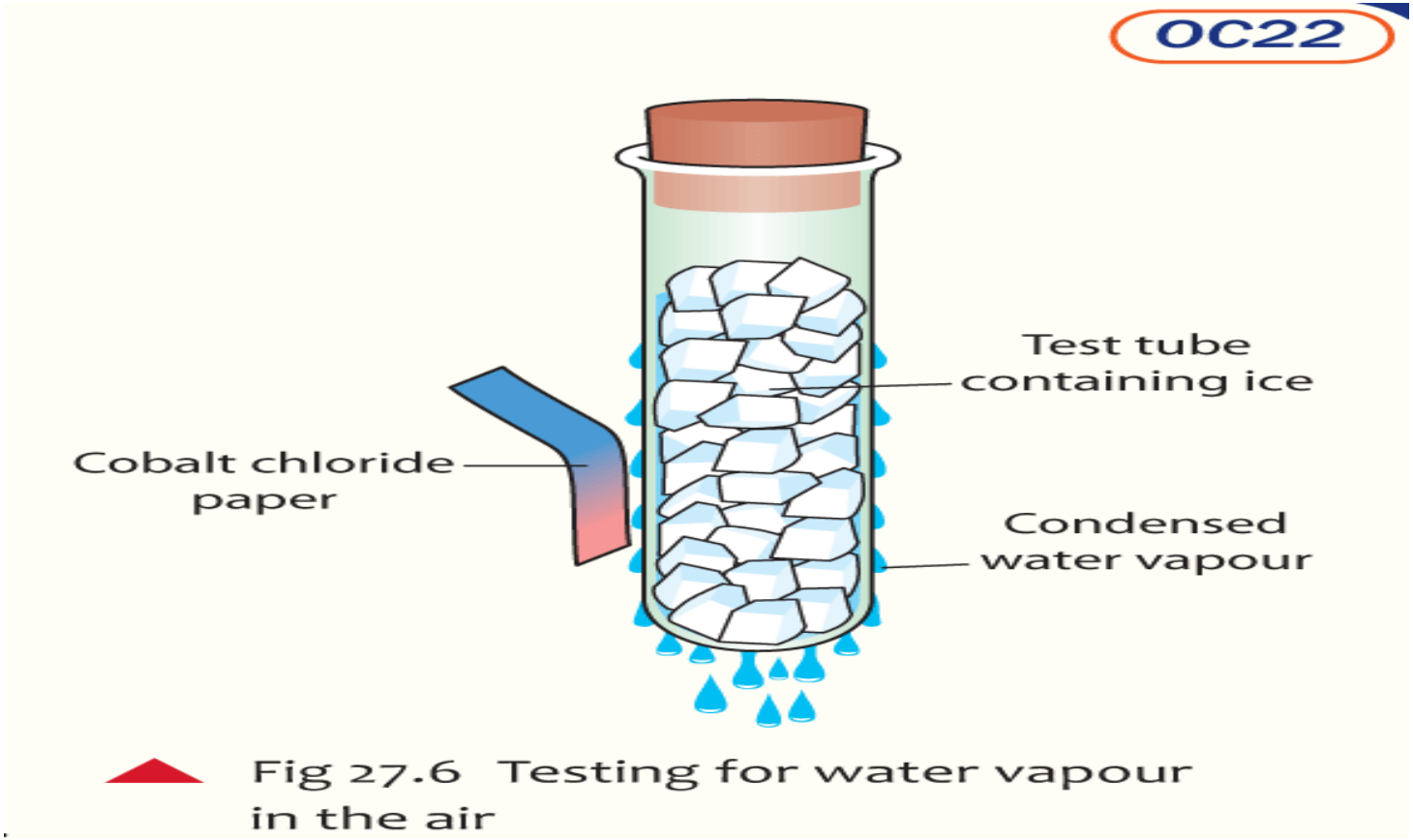


Fig 27.6 Testing for water vapour in the air

- Water vapour begins to condense on the outside of the cold glass
- Test the condensation with Cobalt Chloride paper
- It turns from blue to pink
- This shows us there is water vapour in air

An experiment to make Oxygen gas

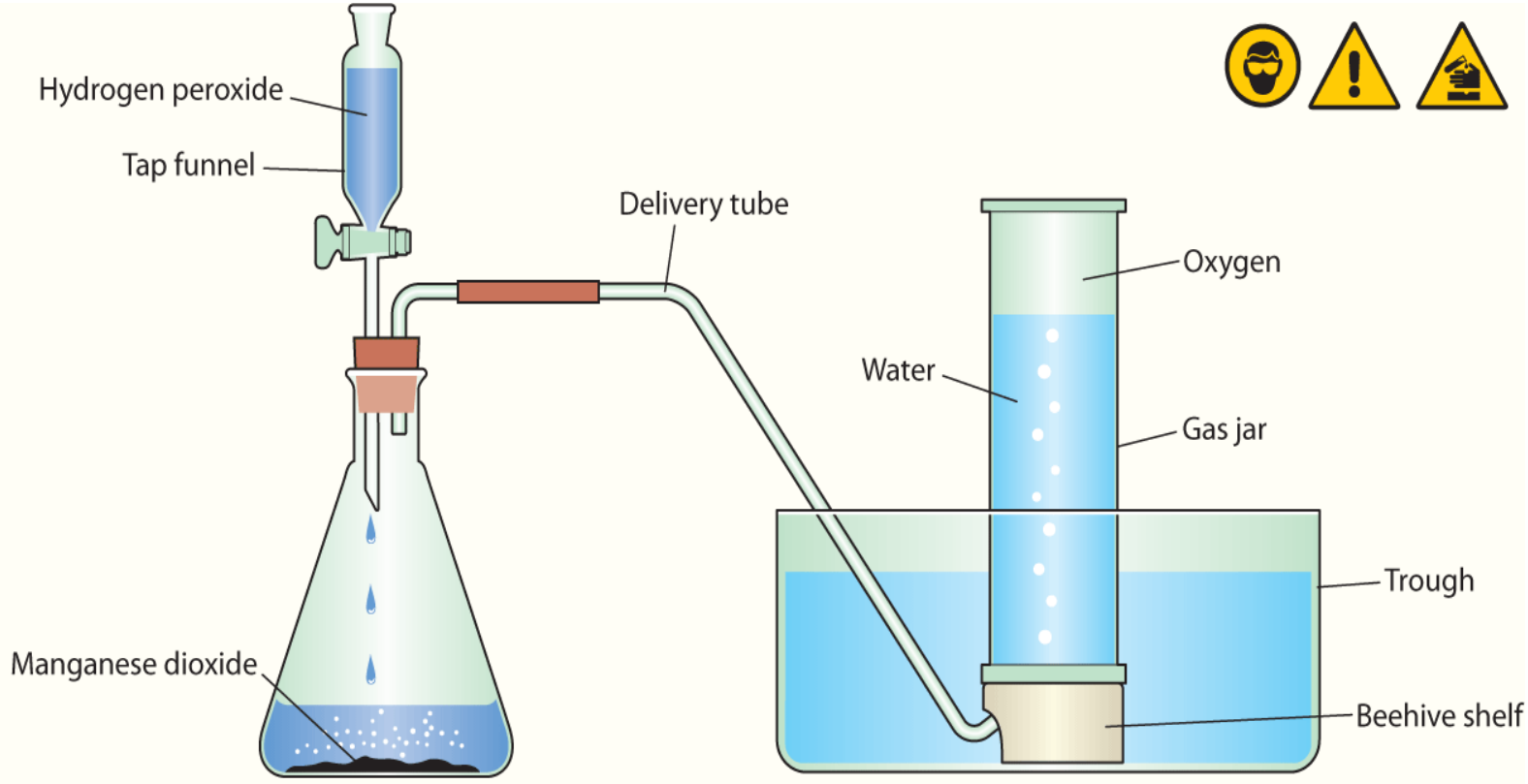


Fig 27.9 To prepare oxygen gas

- Hydrogen peroxide (H_20_2) is a clear liquid
- Manganese Dioxide (MnO_2) is a black powder
- Manganese Dioxide is a **catalyst.** This means it speeds up the chemical reaction without being used in the reaction
- It speeds up oxygen being made

- When Hydrogen Peroxide hits Manganese Dioxide, bubbles of gas start to fizz
- This gas travels through the tubing and into the glass jar of water
- The oxygen gas displaces (takes the place) of the water
- When the glass jar is full of oxygen gas stopper it

Word Equation:

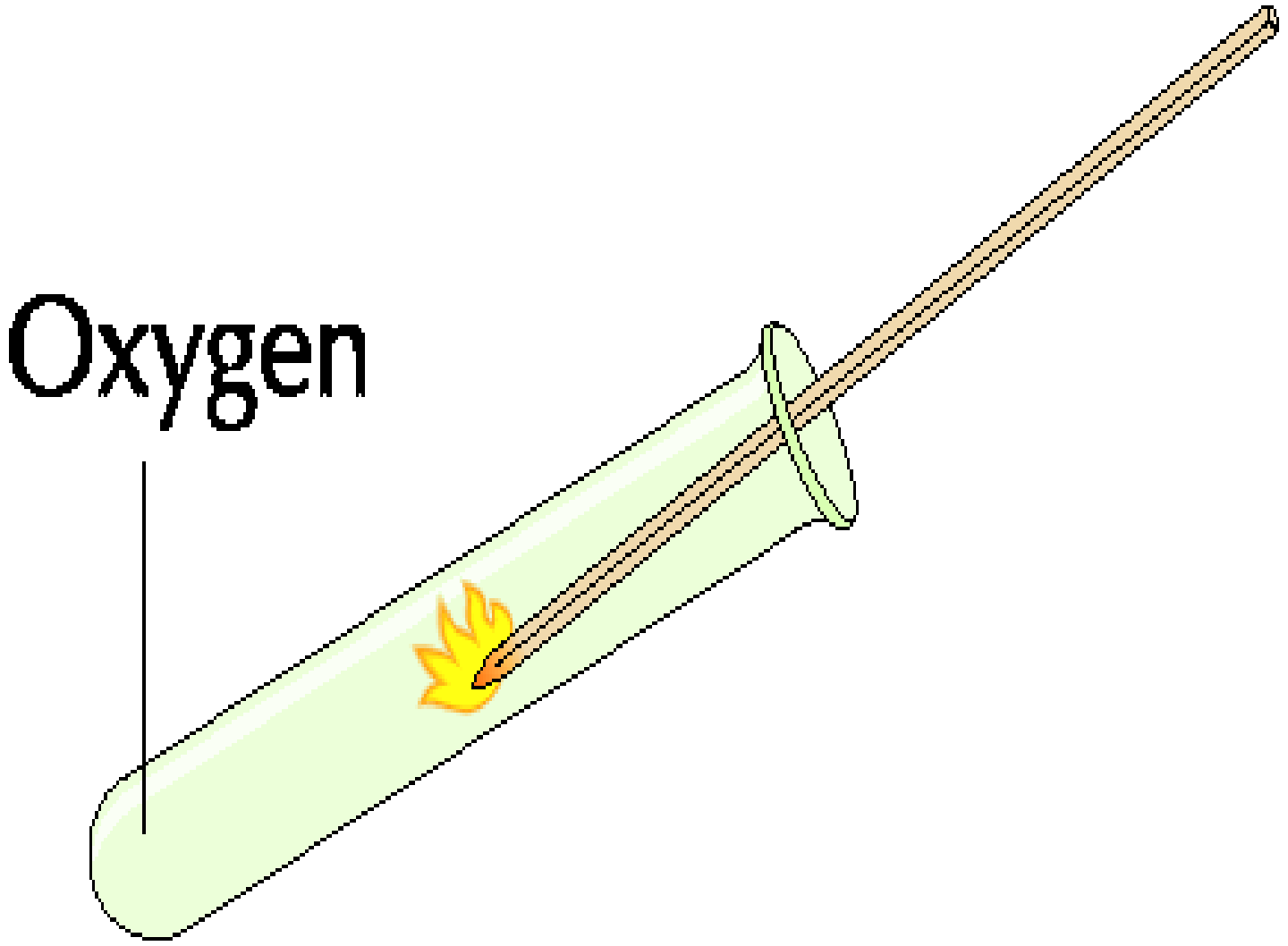
- Hydrogen Peroxide + Manganese Dioxide (catalyst) → Oxygen + Water

Chemical Equation:

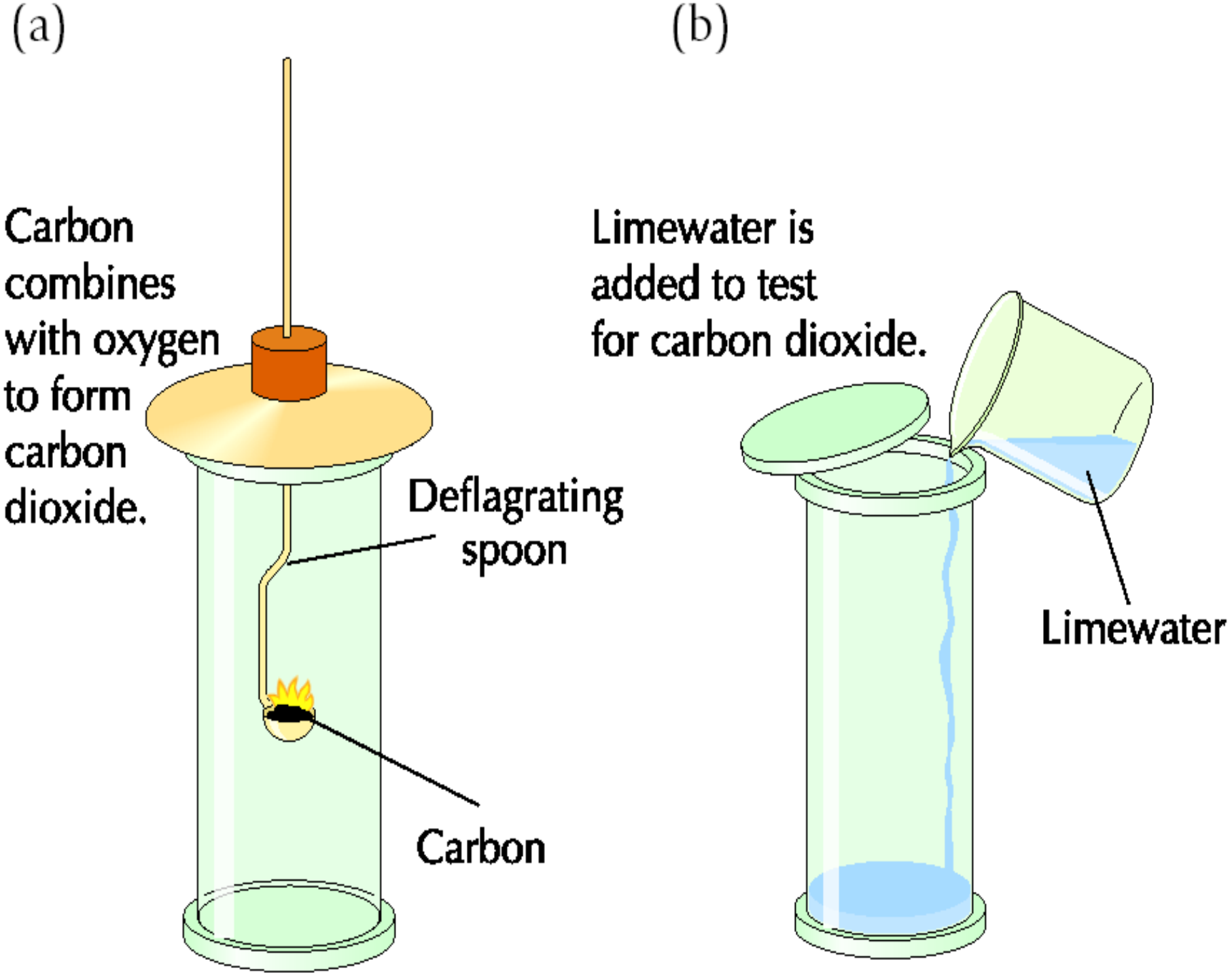
- $H_2O_2 + MnO_2 \rightarrow O_2 + H_2O$

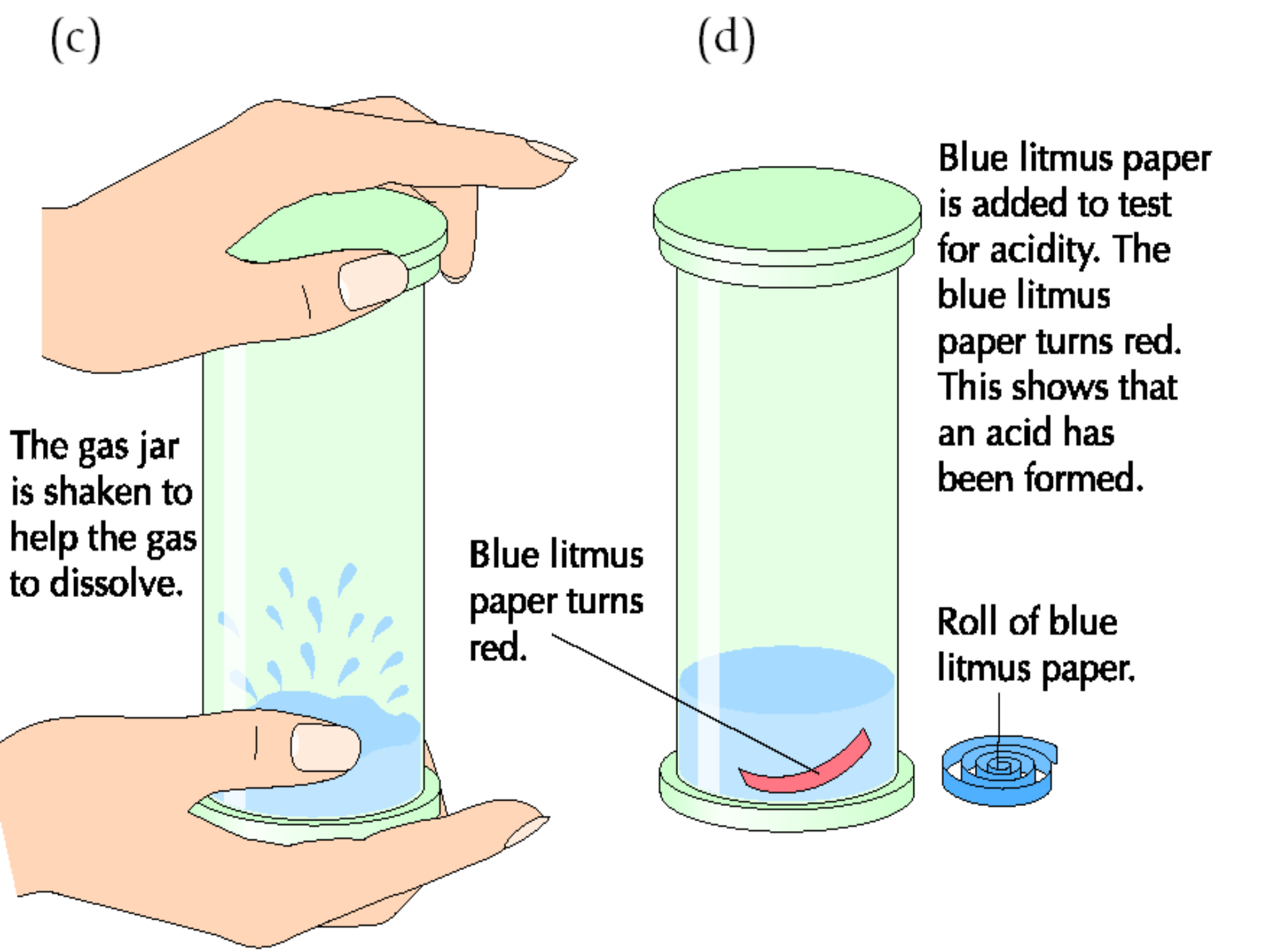
Tests for Oxygen Gas

- Light a splint. Blow it out
- Put it into the test tube full of oxygen gas
- It relights again because of the oxygen
- Oxygen gas is a colourless, odourless and neutral gas


Oxygen

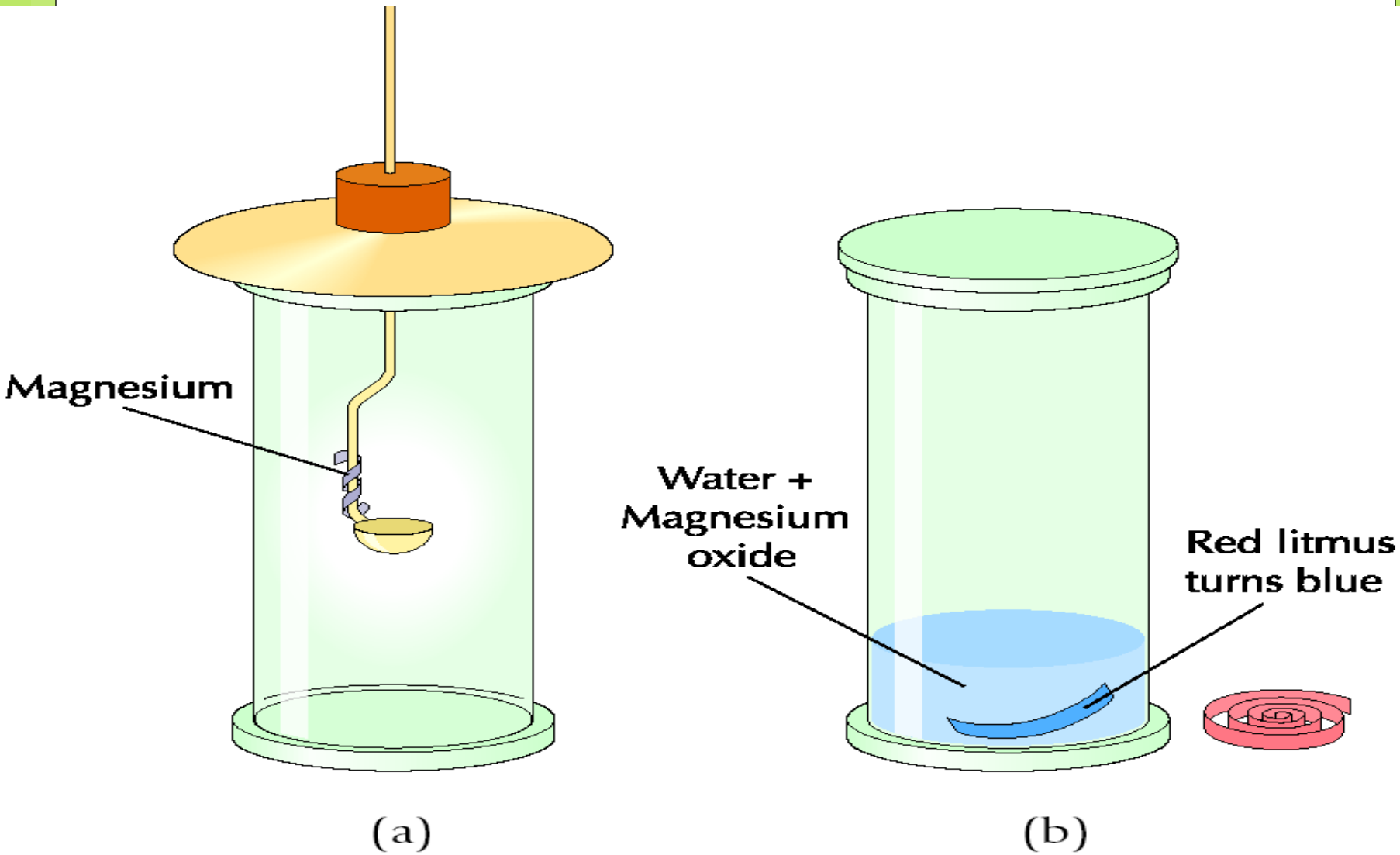
- Heat a piece of carbon in a deflagrating spoon until it glows
- Quickly insert it into a jar of oxygen
- Carbon will burn brightly in oxygen and will make the gas Carbon Dioxide
- Carbon Dioxide is an acidic gas (turns blue litmus red) and will turn limewater milky


(a)
(b)
Carbon combines with oxygen to form carbon dioxide.
Deflagrating spoon
Carbon
Limewater is added to test for carbon dioxide.
Limewater


(c)
(d)
The gas jar is shaken to help the gas to dissolve.
Blue litmus paper turns red.
Blue litmus paper is added to test for acidity. The blue litmus paper turns red. This shows that an acid has been formed.
Roll of blue litmus paper.

- Burn magnesium ribbon until it burns with a bright white flame.
- Insert into a jar of oxygen gas.
- It burns vividly with a bright white light
- Magnesium Oxide (white powder) is formed which is a base (turns red litmus blue)

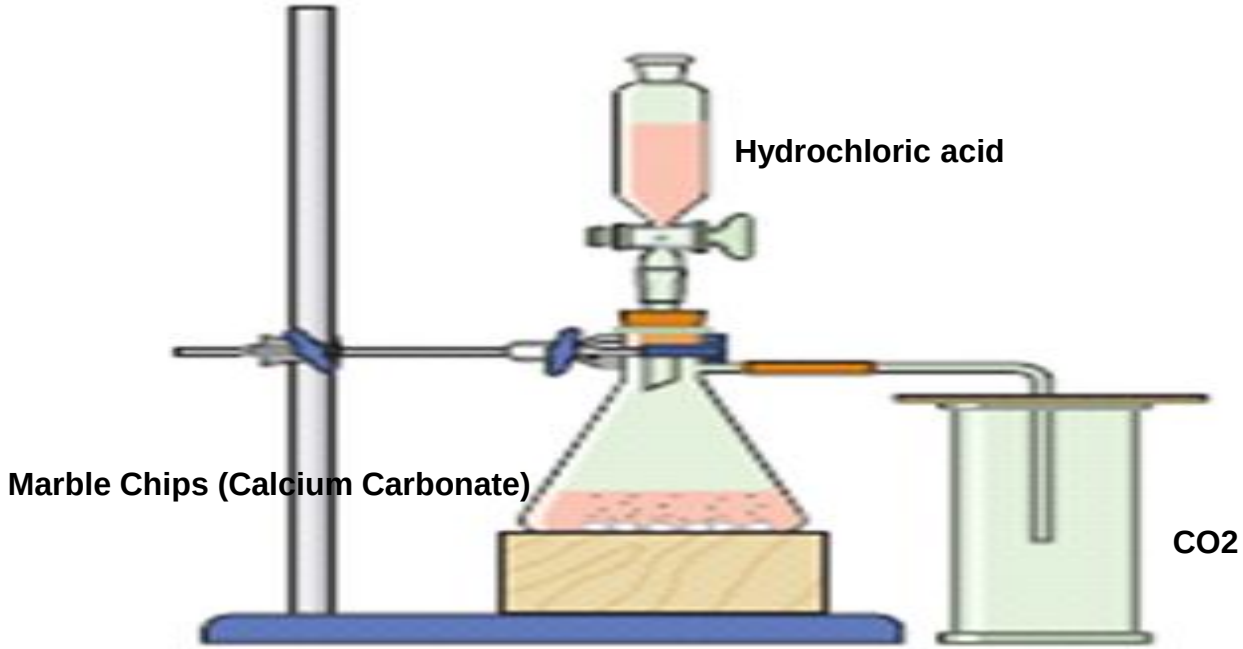
Burning Magnesium in oxygen



Reactions of Oxygen

Element	Reaction with Oxygen	Compound formed	Acidity Test- Litmus
Carbon	Glows brightly	Carbon Dioxide	Blue litmus turns red(acidity)
Magnesium	Burns vigorously- white flame	Magnesium Oxide	Red litmus blue (base)

To Make Carbon Dioxide Gas



To Make Carbon Dioxide Gas

- Hydrochloric acid (HCL) is a clear liquid
- Calcium Carbonate ($CaCo_3$) looks like tiny white pebbles. This can also be called marble chips
- When HCL is dropped on Calcium Carbonate bubbles of Carbon Dioxide fizz up

Word:

- Hydrochloric Acid + Calcium Carbonate → Calcium Chloride + Water + Carbon Dioxide

Chemical:

- $CaCo_3 + 2HCL \rightarrow CaCl_2 + H_20 + CO_2$

Tests for Carbon Dioxide

- Light a splint
- Put it into the test tube full of Carbon Dioxide gas
- The flame goes out because of the Carbon Dioxide Gas
- Carbon Dioxide is a colourless, odourless and acidic gas (it turns blue litmus red and limewater milky)

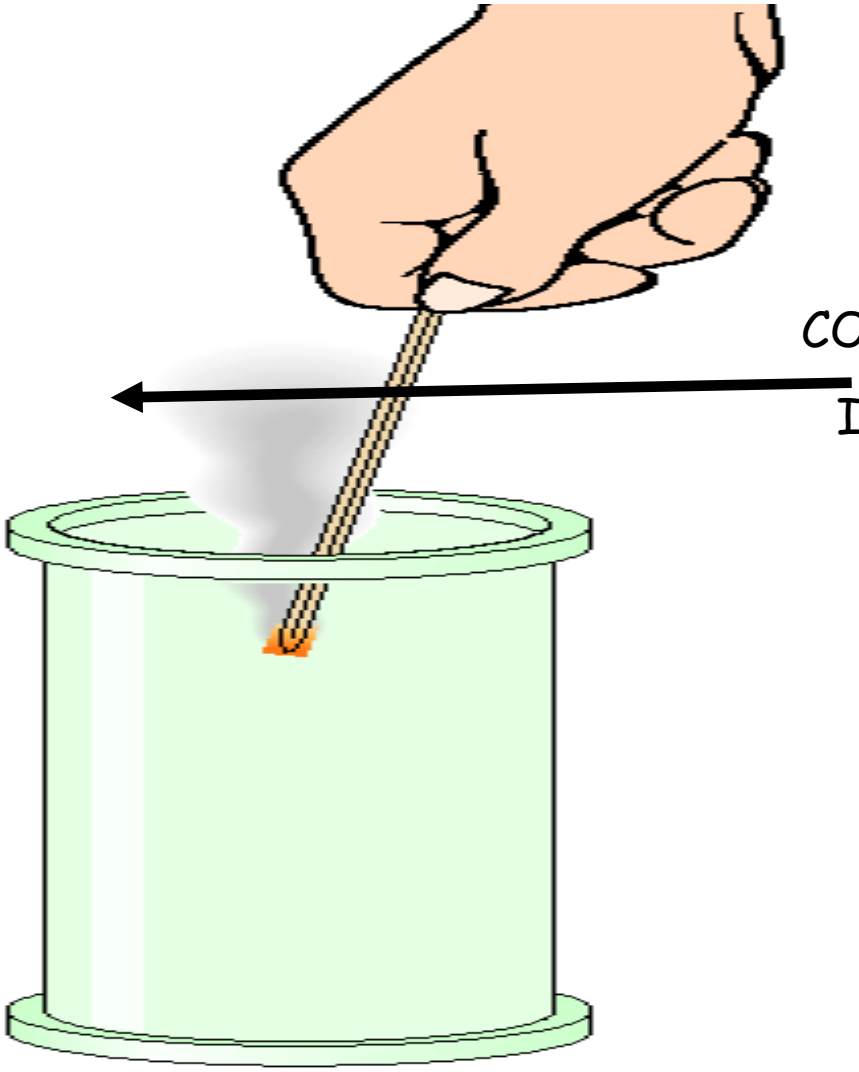
Limewater and Carbon Dioxide

Word Equation:

Calcium Hydroxide + Carbon Dioxide → Calcium Carbonate + Water

Chemical Equation

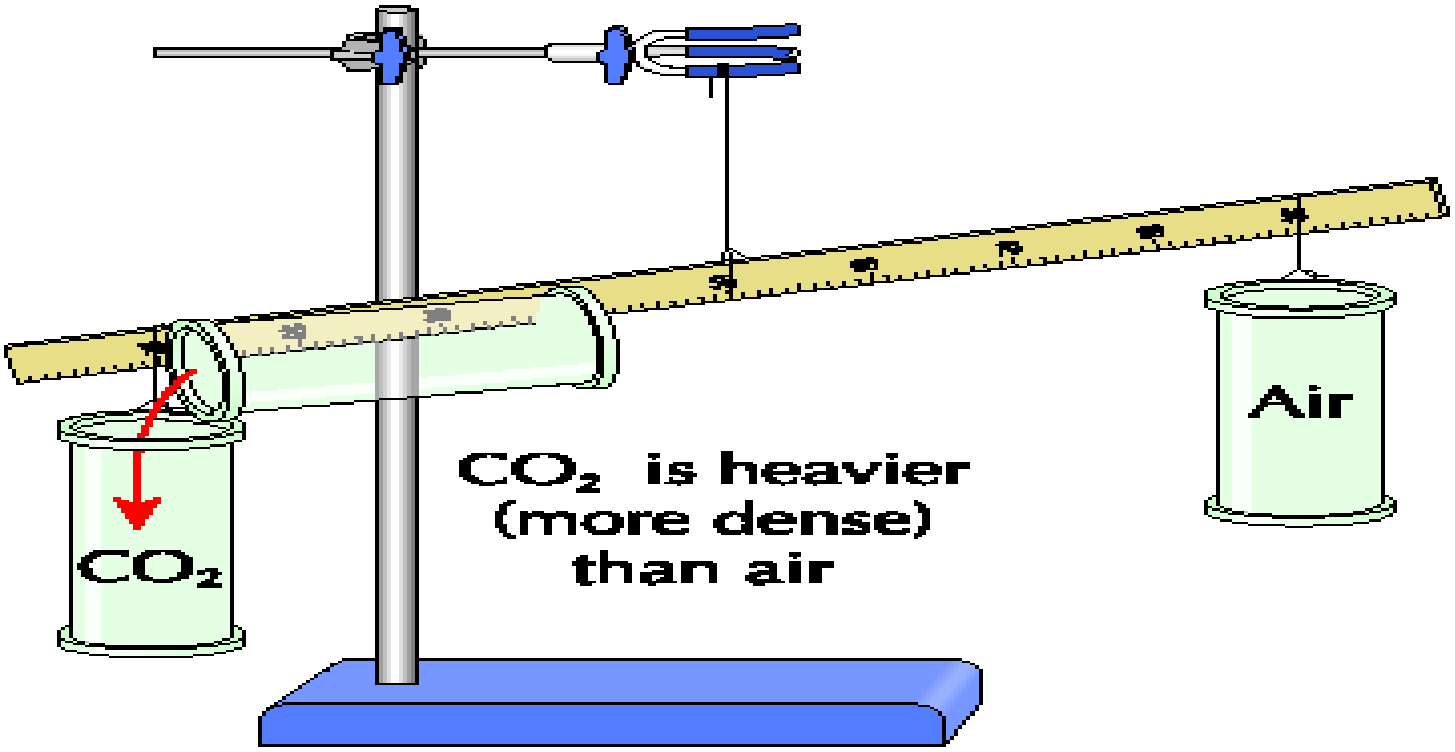
$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$



CO_2 puts out a flame –

It does not support combustion

Carbon Dioxide is more dense than air



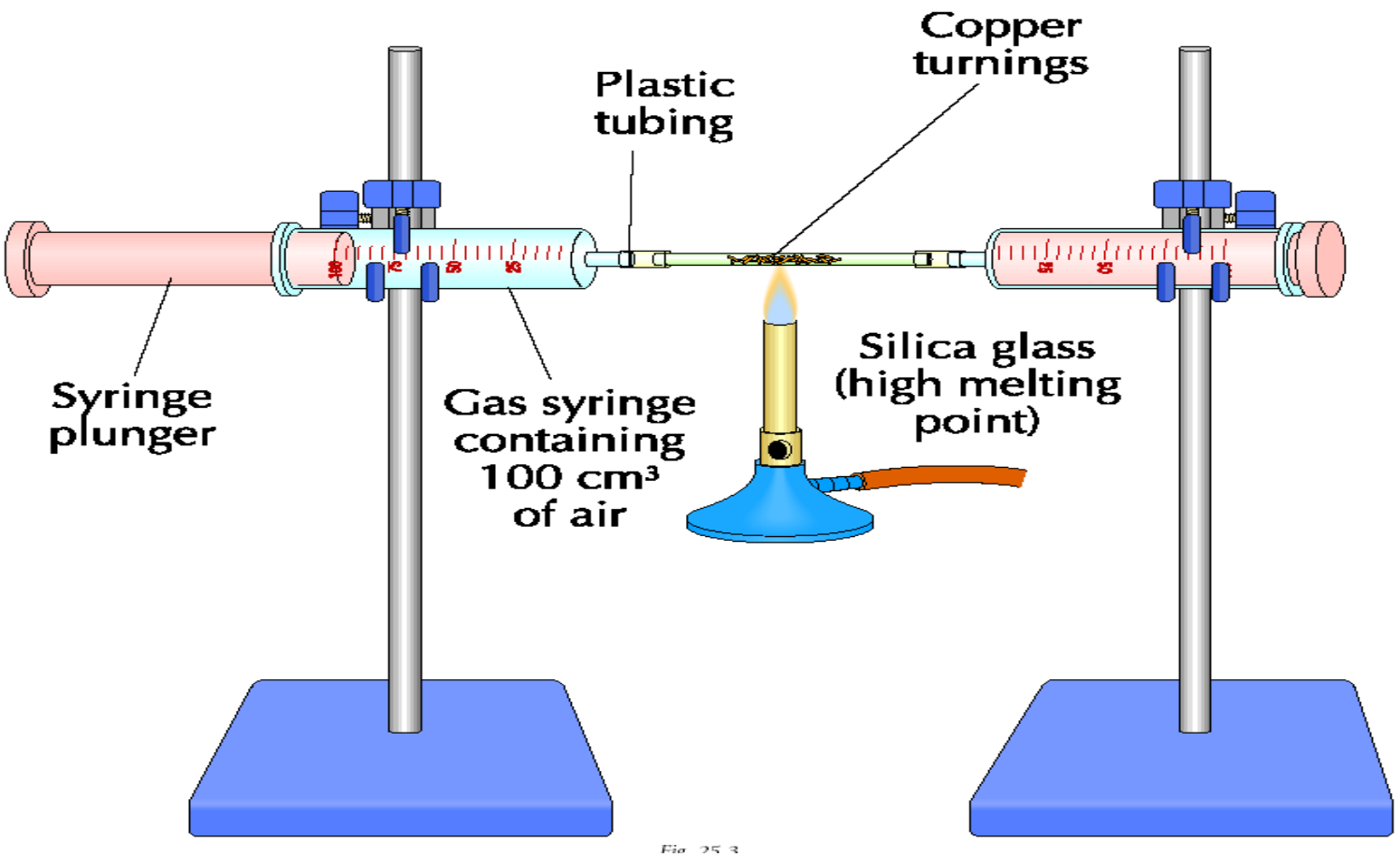
- What would happen if you emptied a jar of Carbon Dioxide above a candle?

- The flame would go out because Carbon Dioxide would sink on top of the flame putting it out

Uses of Carbon Dioxide

- Carbon Dioxide is used in fire extinguishers, to put fires out
- It's also used in fizzy drinks

A different way to show the percentage of oxygen in air:



- 100 cm^3 of air is in one syringe, the other syringe is empty
- Copper is placed in the centre
- Copper is burned over the bunsen and the syringe will move across as oxygen is used
- The syringe will stop when the copper stops burning
- This will be at approx 79 cm^3 showing there is approx 20% oxygen in air