

Chapter 25 - Air/Oxygen

Air is a mixture of gases.

What gas makes up most of the air around us?



GAS	PERCENTAGE CONTENT IN DRY AIR
Nitrogen	78%
Oxygen	21%
Inert gases* + carbon dioxide	1%

3 Experiments

1. To show **Oxygen** is present in air
2. To show **Carbon Dioxide** is present in air
3. To show **Water Vapour** is present in air



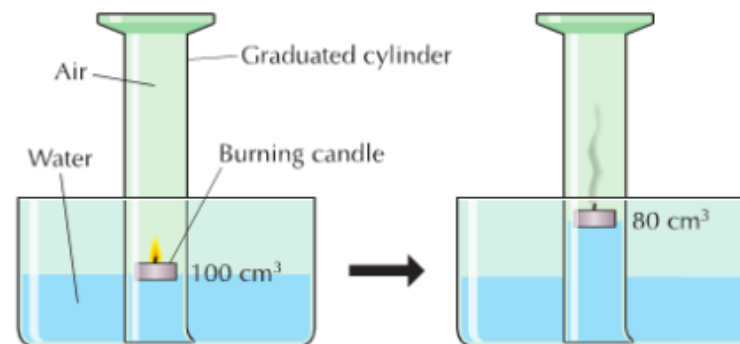
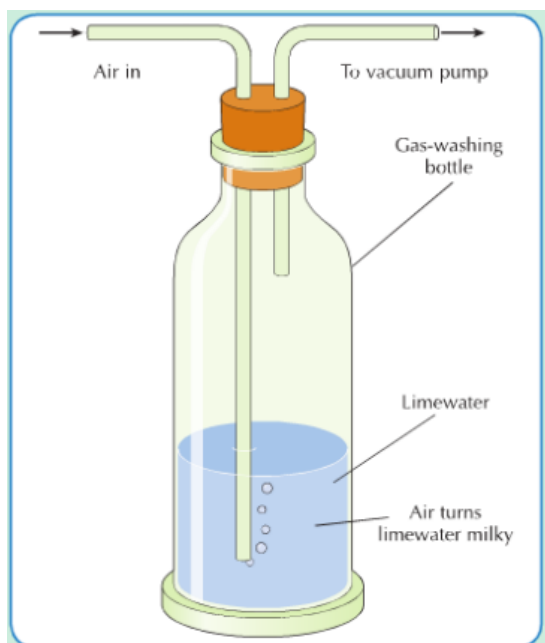
Can you think of ways to show that these gases are in the air?

Oxygen = Light a **Candle** and see how much water moves up.

Carbon Dioxide = **Limewater** turns from **Clear** → **Cloudy/Milky**

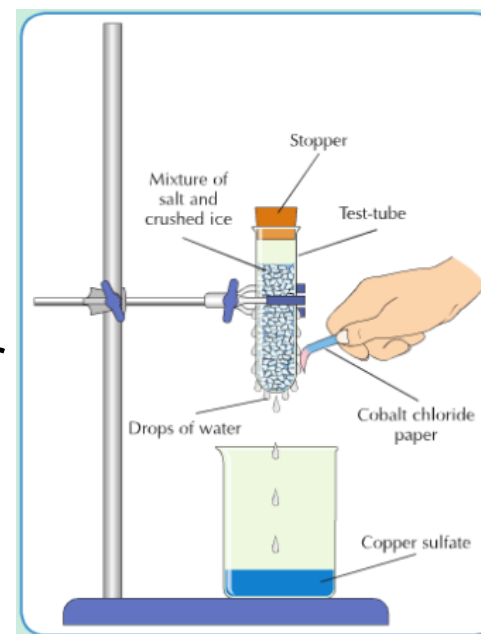
Water Vapour = **Cobalt Chloride** paper turns from **Blue** → **Pink**

1. To show **Oxygen** is present in air



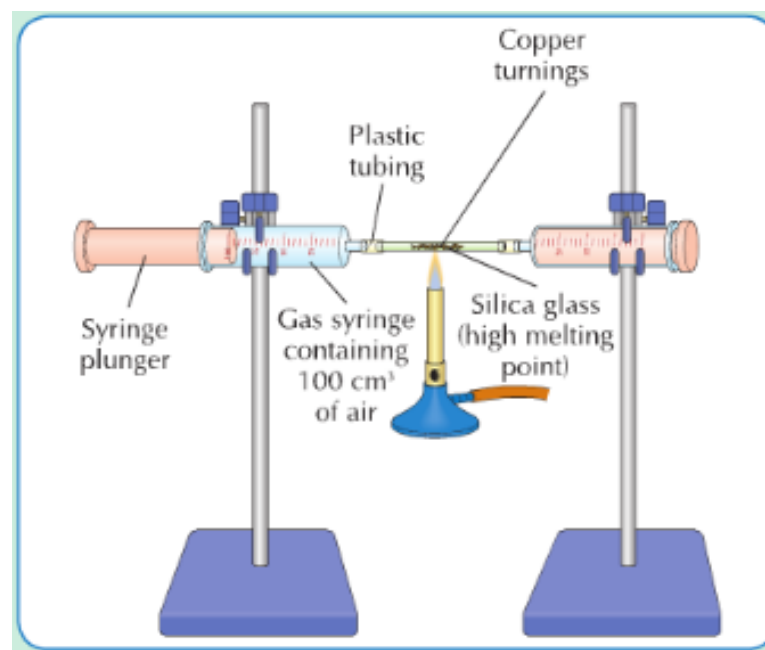
2. To show **Carbon Dioxide** is present in air

3. To show **Water Vapour** is present in air



To show Air has 21% Oxygen

Set up the apparatus as shown and slowly **push the air** from the right syringe into the left syringe across the copper and note what happens.



In this experiment we heat some pieces of copper metal (copper turnings). These react with the Oxygen in the air and it attaches to the metal. The syringe shows that 21% of the air is missing - so we know that 21% of the air is Oxygen.

Making Oxygen

To prepare Oxygen we use a chemical called **Hydrogen Peroxide**.

It's formula is H_2O_2 .

What 2 chemicals do you think this could break down into?

It naturally turns in to  over time.

This takes too long so we add a chemical to speed up the reaction.

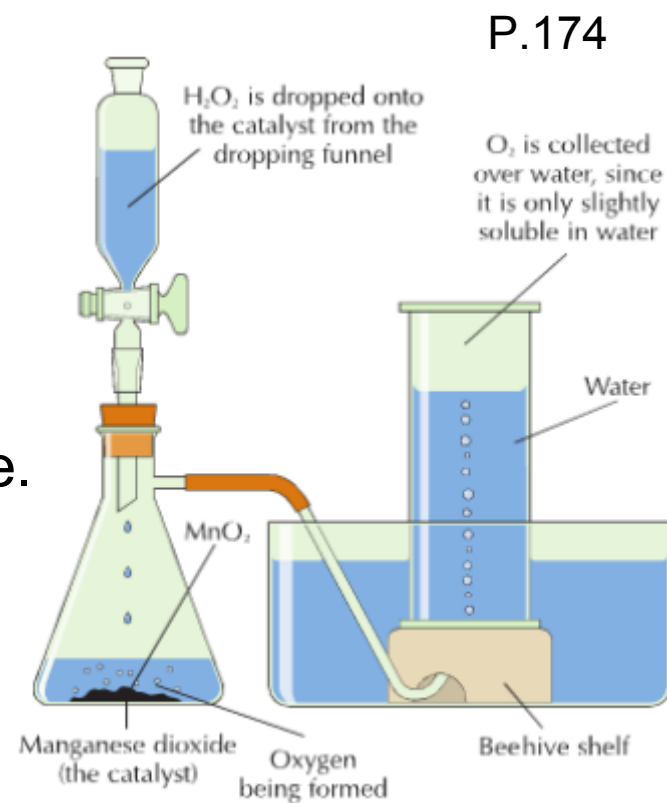
A catalyst is a substance that changes the speed of a chemical reaction but is not used up in the reaction itself.



MnO_2 - **Manganese Dioxide** is the Catalyst.

Making Oxygen

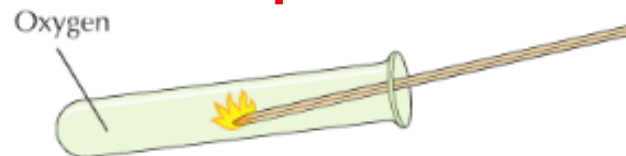
1. Set up the apparatus as shown.
2. Add the H_2O_2 **carefully**.
3. Allow air to escape and then...
4. Collect the Oxygen in a test tube.





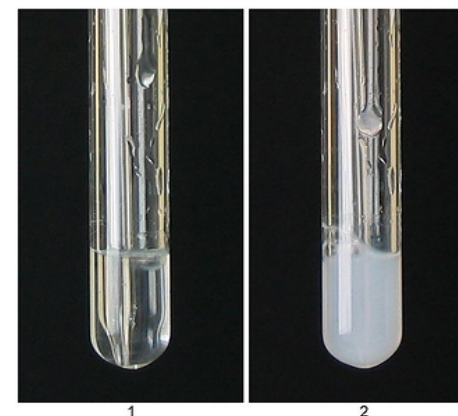
Properties of Oxygen

A. Place moist blue and red litmus paper in a test tube with Oxygen.
Result = Oxygen is **Colourless**, **Odourless** and **pH Neutral**.

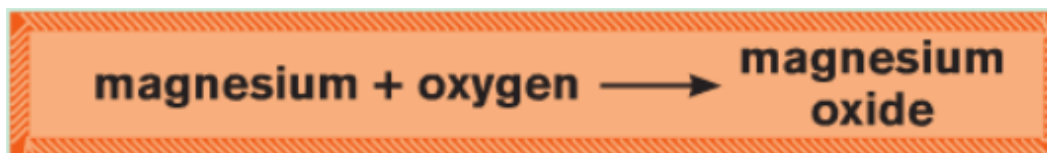


B. Place a glowing splint into a test tube of Oxygen.
Result = the splint **relights** as Oxygen supports **combustion**.

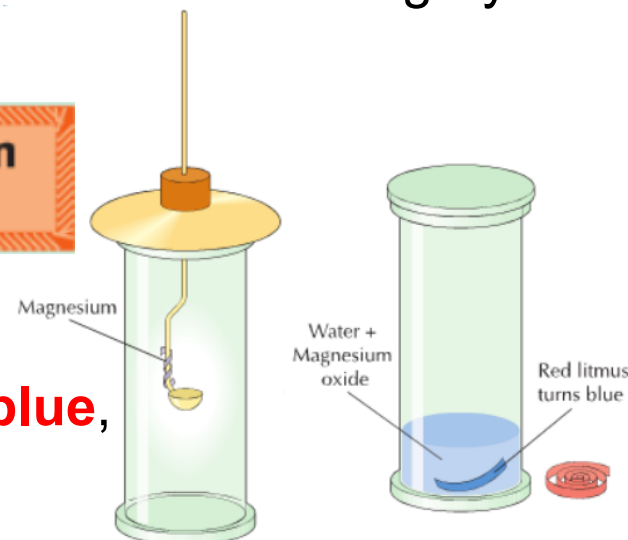
C. Burn a sample of **carbon** in a test tube of O_2 .
Result = the carbon burns and forms a gas.
Add **limewater** and it turns **milky**, so the gas must be **Carbon Dioxide**.
Add moist blue litmus paper and it turns red,
so the **Carbon Dioxide** is acidic.



- D. Burn a sample of **Magnesium** metal in a test tube of O_2 . The sample burns with a bright white flame and forms a grey powder.



- E. Add moist red litmus paper and it turns **blue**, so the **Magnesium oxide** is a **base**.



Conclusion - we can make Oxygen (O_2) using Hydrogen Peroxide (H_2O_2) and Manganese Dioxide (MnO_2).

We proved the gas was Oxygen by relighting a glowing splint.

We did other tests on oxygen to show it was pH Neutral, colourless and odourless.

Properties of Oxygen

Properties are what something looks like, smells like, reacts with etc.

Example - Gold is a shiny metal that can be shaped easily.

PHYSICAL PROPERTIES	CHEMICAL PROPERTIES
1. Colourless, odourless, tasteless gas.	1. Supports combustion – substances which burn in air, burn more vigorously in oxygen
2. Slightly soluble in water	2. Reacts with most elements to form oxides
3. Slightly heavier than air.	3. No effect on litmus

Uses of Oxygen

1. **Breathing** - Used in respiration, for hospitals, runners and divers
2. **Burning and Welding** - Acetylene torches burn with oxygen for welding
3. **Space Rockets** - Hydrogen and Oxygen are mixed as fuel

