

COMPOSITION OF AIR

Percentage of gases in clean air

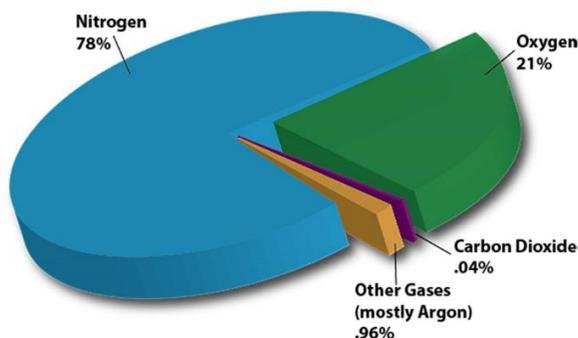
Nitrogen:78%

oxygen gas : 21%

carbon dioxide gas:0.03%

noble gases (Mostly Argon) :0.97%

water vapour:varies on a daily basis



Investigating the percentage of oxygen in air

The percentage of oxygen in the air can be investigated by passing a known quantity of air over a metal

- The oxygen in the air will react with the metal, forming a metal oxide*
- The oxygen will be removed from the air and the volume of the air with the oxygen removed can be measured*

Method:

1)Heat the copper using a Bunsen burner

2)Push the plunger of the syringe containing air, forcing the air into the other plunger until all of the air has transferred

3)Push the air back from the now filled plunger to the other plunger

4)Repeat this several times for about 3 minutes

5)The copper will turn black as copper reacts with the oxygen in the air and copper oxide is produced

6)Allow the apparatus to cool

7)Ensure all the gas is in one syringe and record the volume of gas

8)The percentage of oxygen in the air can be calculated from the results

Worked Example

In the experiment above, the starting volume of air was **50.0 cm³** of air and the final volume of air was **39.5 cm³**

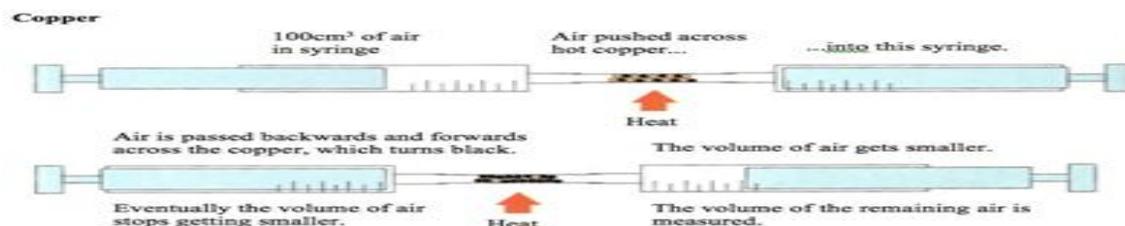
Calculate the percentage of oxygen in the air.

Step 1 - calculate the volume of oxygen in 50.0 cm³ of air

$$\begin{aligned}\text{volume of oxygen in air} &= \text{starting volume} - \text{final volume} \\ &= 50.0 - 39.5 = 10.5 \text{ cm}^3\end{aligned}$$

Step 2 - calculate the percentage of oxygen in air

$$\begin{aligned}\text{Percentage of oxygen in air} &= \text{Volume of oxygen in air} / \text{starting volume of air} \\ &= 10.5 / 50.0 \times 100 \\ &= 21.0 \%\end{aligned}$$



Separating the gases in air

Air is a mixture of gases and the gases have **different boiling points and densities**. The mixture is liquefied and then each gas is **separated by fractional distillation**.

Air is liquefied using low temperature and high pressure and then the different components are separated by fractional distillation.

A different method of separating a mixture of gases is **diffusion through a porous tube**. The gas with the lowest density diffuses into the tube at **higher rate** than the other gas resulting in separation.