

5.2 Composition of air



How can we determine the composition of air through an experiment?



At first, air appears to be “nothing”.

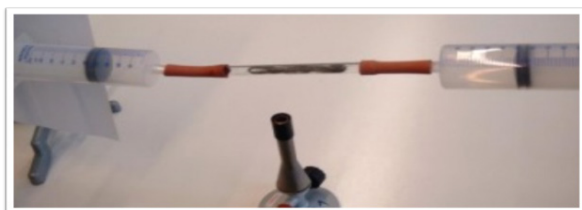
In science class, however, we have learned that air contains oxygen, which is vital for humans and animals. In this experiment we want to investigate how much oxygen air contains and what other gases are also present.

Think about the substances we could use to bind the oxygen in air to determine its volume fraction. What experiment setup would you propose?



Set up:

- 2 syringes 100 ml
- glass tube 200/8 mm
- 2 pieces of tubing 3 cm
- steel wool
- gas burner
- 2 wooden sticks
- aluminium foil



Conducting the experiment:

1. Push about 5 cm of steel wool into the glass tube using a wooden stick.
2. Fill one syringe with 100 ml of air. The second syringe is empty and contains no air.
3. Connect both syringes to the glass tube using two pieces of tubing.
4. Check to see that the system is airtight.
5. Heat the steel wool in the glass tube from all sides with the gas burner.
6. Move the air slowly from one syringe to the other.
7. When the steel wool starts to glow, take the glass tube out of the flame (otherwise it will bend too much) and continue to push the air back and forth.
8. When the steel wool has stopped glowing, let the air cool down and determine the remaining volume of gas.
9. Push the steel wool out of the tube onto a piece of aluminium foil and compare it with the original wool.
10. Expel the remaining gas onto a glowing stick.
11. Repeat the last experiment with fresh air and compare.



Describe your observations.

- How many ml of gas remained?
- What happened to the steel wool?
- What do you call the “used” gas?
- What are the properties of the remaining gas?
- What do you call the remaining gas?



- Calculate the percentage of oxygen in air.
- Nitrogen is used to extinguish burning oil wells. How does it work?



- How would you test the oxygen content of car exhaust?
- How would you test the oxygen content of exhaled air (at rest (1) or after intense exercise (2))?

Space for your sketches