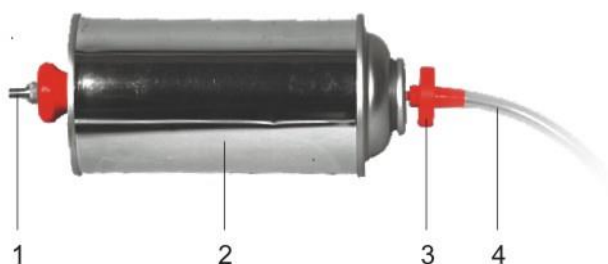# 3B SCIENTIFIC® PHYSICS

...going one step further

Pressure capsule for determining weight of air 1000796

Instruction sheet
09/15 ALF

1 Inlet valve
2 Pressure capsule
3 Outlet valve
4 Hose

1. Description

The pressure capsule is designed for demonstrating the weight of air and determining its density by means of comprerssion.

It is a metal capsule with a cycle valve so that air can be pumped in and an outlet valve at the other end.

2. Technical data

Dimension: 190 mm x 60 mm Ø
Mass: 100 g approx.

3. Operation

The following additional equipment is required to complete the experiment:

1   Bicycle pump
1   Electronic scales 1003428
1   500 ml measuring cylinder
1   Glass tube
1   Glass tubing, right angled
2   Rubber stoppers with hole
1   Rubber stopper without hole
1   Stand base 1001044
1   Universal clamp 1002833
1   Universal sleeve 1002830
1   Stand rod 1002938

- Mass m_1 weigh the pressure capsule using scales before starting the experiment.
- Fill the pressure capsule with air, pumping the piston 5-7 times.
- Mass m_2 weigh the capsule again after it has been filled.
- The difference $m_2 - m_1$ gives the mass m of the air that has been pumped in.
- Set up an experiment as in Fig. 1 to determine the volume of air.
- Close the glass test tube by means of a rubber stopper with a right-angled length of glass tubing passed through its hole.
- Plug the other end of the glass tube with the other stopper and connect a hose to the capsule through it.
- Completely fill the glass tube with water.
- Close the end of the right-angled tubing using a stopper with no hole in it.
- Clamp the glass tube to the stand at a slight angle and adjust the height so that the tube points into a measuring cylinder placed beneath it.
- Take the bung out of the right-angle tube and let any excess water drain out of it so that the water level only comes up as far as the bend. Empty this water out of the measuring cylinder.
- Slowly open the outlet valve until all the air has escaped from the capsule.
- The escaping air forces water out of the glass tube. You should collect this water in the measuring cylinder and measure its volume.

The water so collected has the same volume V as the air that has escaped from the capsule.

- Use the values you have obtained to calculate the density of air using the formula

$$\rho = \frac{m}{V}$$

Perform the experiment several timesto obtain an average value for ρ.

- From the value of ρ you have measured, make corrections to extrapolate its value for standard atmospheric conditions (0°C and 1013.3 mbars pressure). For this you will need to measure the room temperature and the air pressure extant at the time the experiment is being performed.
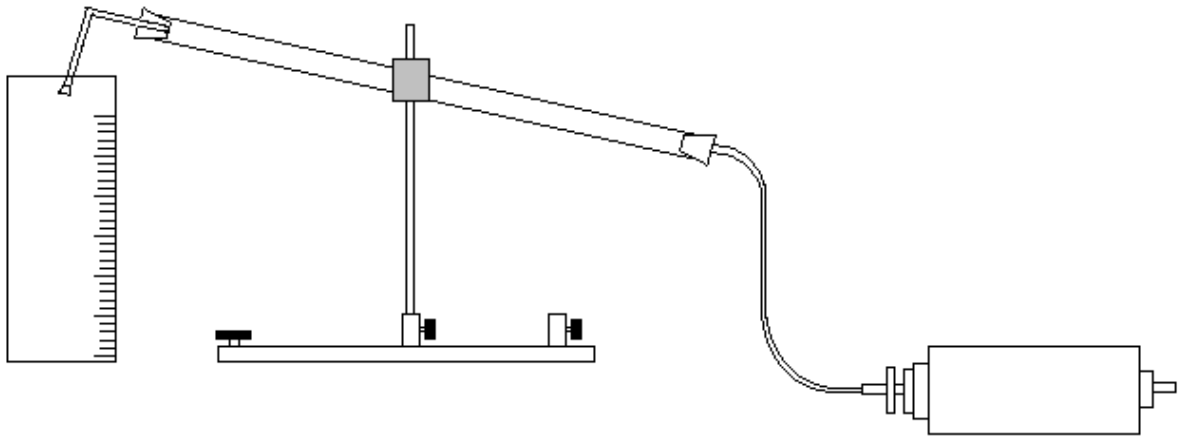

Fig. 1 Measuring the volume of the escaped air