



Practical 12 The relationship between the pressure and temperature of a gas



Purpose

The aim of this experiment is to investigate how the pressure of a gas changes when it is heated at a constant volume.



Safety

Wear eye protection if your face is to be close to the hot water.

You will need:

- Round-bottomed flask
- Temperature sensor and probe (or 0–100 °C thermometer)
- Rubber bung with a short length of glass tube fitted through it
- Length of rubber tubing
- Pressure sensor (or Bourdon gauge)
- Bunsen burner, tripod, gauze and mat
- Glass beaker
- Water
- Ice
- Eye protection

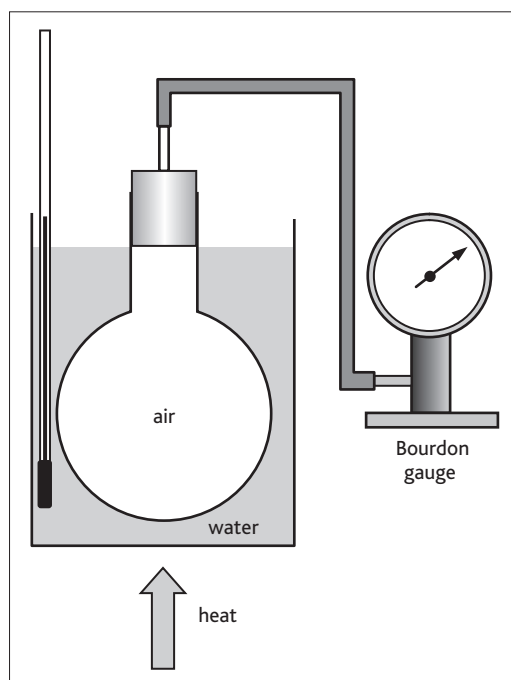


Figure 1: Investigating the relationship between temperature and pressure

Experimental instructions

Set up the apparatus as shown in the diagram with some ice in the water to cool it to near 0 °C.

Record the temperature of the water (effectively the temperature of the air in the flask) and the pressure of the air as shown on the Bourdon gauge.

Light the Bunsen burner and heat the water slowly. Record the pressure and temperature of the air at 10-degree intervals until the water temperature reaches 80 °C. (The temperature sensor may record temperatures at equal time intervals.)

Analysis and conclusions

Plot a graph of the pressure of the trapped air (y -axis) against the temperature of the trapped air (x -axis). (Make sure that the pressure you record is the pressure of the trapped air, not just the excess above atmospheric pressure). It is assumed that the temperature of the trapped air will be the same as that of the water in the beaker.

Draw a second graph with the temperature axis showing minus 300 °C to plus 100 °C and find the intercept on the pressure axis (when the gas has zero pressure). This should be at absolute zero.

Record your value for absolute zero, suggesting any inaccuracies in your experiment and how they might be reduced.