GAS LAWS

Experiment 1 – Boyle’s Law

Introduction

Robert Boyle (1627–1692) was an Anglo-Irish natural philosopher, noted for his work in physics and chemistry. Although his research and personal philosophy clearly has its roots in the alchemical tradition, he is largely regarded today as the first modern chemist. Among his works The Sceptical Chymist is seen as a cornerstone book in the field of chemistry.

In 1659 Boyle completed construction of his “pneumatic engine”, and in 1660 he published the results of a series of experiments under the title New Experiments Physico-Mechanical. It is from this publication that Boyle’s law—relating the pressure and volume of a gas—was enunciated.

Objective

In this experiment you will examine the effect of pressure on the volume of a gas at constant temperature and formulate the relationship between the two.

Procedure

1. The experimental setup includes a closed cylinder with a moveable piston containing a sample of gas (air), some 1-kg weights to place on the piston, and a pressure gauge and ruler to measure the pressure (in torr) and height of the piston (in cm) in the cylinder. (We will assume that the gas in the cylinder is at room temperature.)

2. Open the worksheet for Experiment 1. (You may want to enter the data within Excel, so that the graph can be created, then print out the results afterward.)

3. Click anywhere on the apparatus to start the lab. (If you are using Internet Explorer, you will have to click once to activate the control, then click again to start the lab.)

4. The piston itself has a mass of 1 kg. Click on the pressure gauge to see a close-up of the measuring devices. Record the pressure and height of the piston in the appropriate cells in the worksheet.

5. Click on the stack of weights to move one onto the piston.

6. Record the values in the next row of the worksheet.

7. Repeat steps 5 and 6 to record the pressure and height of the piston with increasing numbers of weights. You may click on either the stack of weights on the bench to move one up to the piston, or the stack on the piston to return one to the bench.

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