Example of essay on physics

Health & Medicine, Stress

Experiment 1: Boyle's Law

Introduction:

Boyle's law is very important to know characteristics of gases. Scientist Robert Boyle expressed how volume of a gas changes with change of pressure in a given temperature. In this lab report Boyle's Law has been discussed with an experiment carried out in laboratory. Objective of this experiment was to measure the number of moles (n) of air enclosed in a tube using Boyle's law.

Theory:

As per Boyle's law, pressure P of a given amount of gas (n moles) is inversely proportional to it volume V when temperature T remains a constant.

The universal gas law is PV = nRT

P = nRT/V

A graph of P against 1/V will be a straight line and its slope gives the value of nRT.

Procedure:

A cylinder, graduated in mL, was used in this experiment. It was fitted to a wooden base at the closed end and a piston at the other end. The piston was fitted with a platform on which loads was added to increase the pressure of the enclosed air. A set of 500 g-weights was used. Diameter of the piston was 2. 2 cm. Following is the sketch of apparatus-

At first reading corresponding to the bottom end of the piston was taken. This reading was recorded as the volume of the air when the load on the platform was zero. The corresponding pressure was approximated to be the

atmospheric pressure (1. 01 x 105 Pa) for this experiment. Then a 500 g mass was loaded on the platform and the volume of the air was measured. This load on the piston was increased by 500 g = 0. 5 × 9. 8 = 4. 9 N. This procedure was repeated 5 more times by loading masses in steps of 500 g. Each time volume of the air and its pressure was measured.

Experimental data and data analysis:

The diameter of the piston = 2. 2 cm. = 0. 022 m.

So, area of piston, A = 3. 14/4 x 0. 022 ^2 = 0. 01727 m2

The increase in pressure on the air inside was P= 4. 9/0. 01727 = 283. 73 N/m2

The actual pressure of the air inside is (1. 01 × 105 + 9. 8/0. 01727) = 1015678. 5 Pa.

7. Questions.

(i)A sample of gas collected in a 350 cm3 container exerts a pressure of 103 kPa. What would be the volume of this gas at 150 kPa of pressure? (Assume that the temperature remains constant.)

Solution

Say, for initial case : V1 = 350 cm3 , P1 = 103 kPa

Later case : P2 = 150 kPa , and V2

As, PV = nRT , where R and T constant ; so P1V1 = P2V2

Or, 350 x 103 = 150 x V2

Or, V2 = 240. 33 cm3 (Ans:)

(ii)A sample of neon has a volume of 239 cm3 at 2. 00 atm of pressure.

What would the pressure have to be in order for the gas to have a volume of 5. 00 x 102 cm3 when temperature is a constant?

Solution

Say, for initial case : V1 = 239 cm3 , P1 = 2 atm of pressure

Later case : P2 , and V2 = 500 cm3

As, PV = nRT , where R and T constant ; so P1V1 = P2V2

Or, 239 x 2 = 500 x P2

Or, P2 = 0. 956 atm of pressure (Ans:)

(iii)Under a pressure of 172 kPa, a gas has a volume of 564 cm3. The pressure is decreased, without changing the temperature, until the volume of the gas is equal to 8. 00 x 102 cm3. What is the new pressure?

Solution

Say, for initial case : V1 = 564 cm3 , P1 = 172 kPa

Later case : P2 , and V2 = 800 cm3

As, PV = nRT , where R and T constant ; so P1V1 = P2V2

Or, 564 x 172 = 800 x P2

Or, P2 = 121. 26 kPa (Ans:)