

Answer on Question #46529, Physics, Mechanics | Kinematics | Dynamics

Question:

A helium-filled balloon escapes a child's hand at sea level and 20.0C. When it reaches an altitude of 3600, where the temperature is 5.0C and the pressure only 0.68 atm, how will its volume compare to that at sea level?

Answer:

The ideal gas law:

$$PV = nRT$$

where P is the absolute pressure of the gas, V is the volume of the gas, n is the amount of substance of gas (measured in moles), R is the ideal, or universal, gas constant, and T is the absolute temperature of the gas.

For initial and final states:

$$P_0 V_0 = n R T_0$$

$$P_1 V_1 = n R T_1$$

Therefore:

$$\frac{V_1}{V_0} = \frac{P_0 T_1}{P_1 T_0} = 1.4$$

Answer: $\frac{V_1}{V_0} = 1.4$