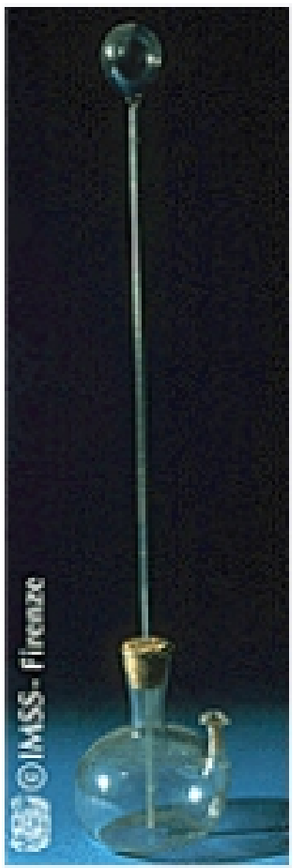
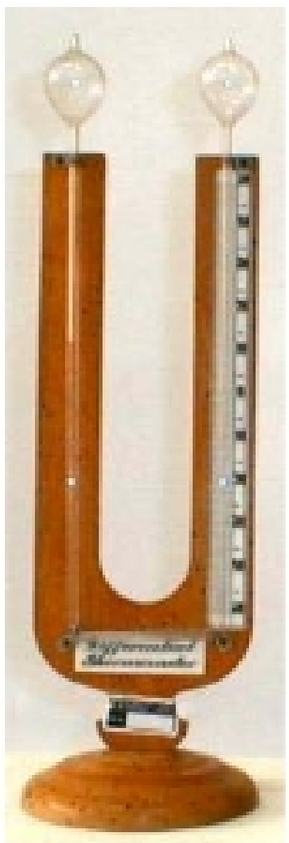
Chapter 14

Kinetic Theory

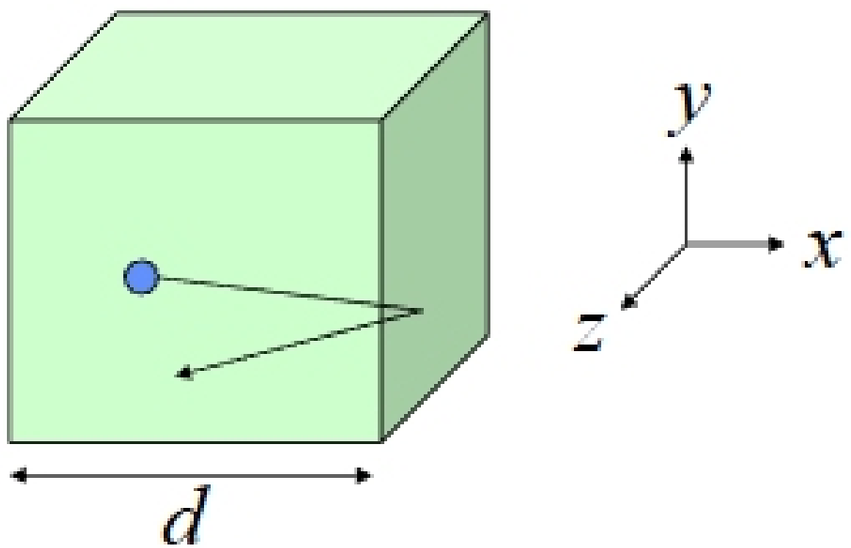


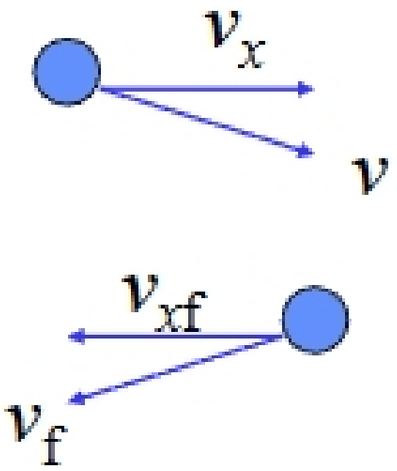


Kinetic Theory of Gases

A remarkable triumph of molecular theory was showing that the macroscopic properties of an ideal gas are related to the molecular properties. This is the kinetic theory of gases.

Consider the "*x*" motion of a gas molecule in a box to determine the gas pressure on the side of the box.





$$v_{xf} = -v_x$$

$$\Delta p_x = m(v_{xf} - v_x) = -2mv_x$$

The average force on the wall is:

$$F'_x = \Delta p_x / \Delta t = -2mv_x / \Delta t$$

The molecule will collide with the right wall in twice the time it takes to traverse the length of the box, *d*. Also, the force on the wall is equal and opposite to the force on the molecule. So the force on the wall is given by

$$F_x = 2mv_x / \Delta t = 2mv_x / (2d/v_x) = mv_x^2 / d$$