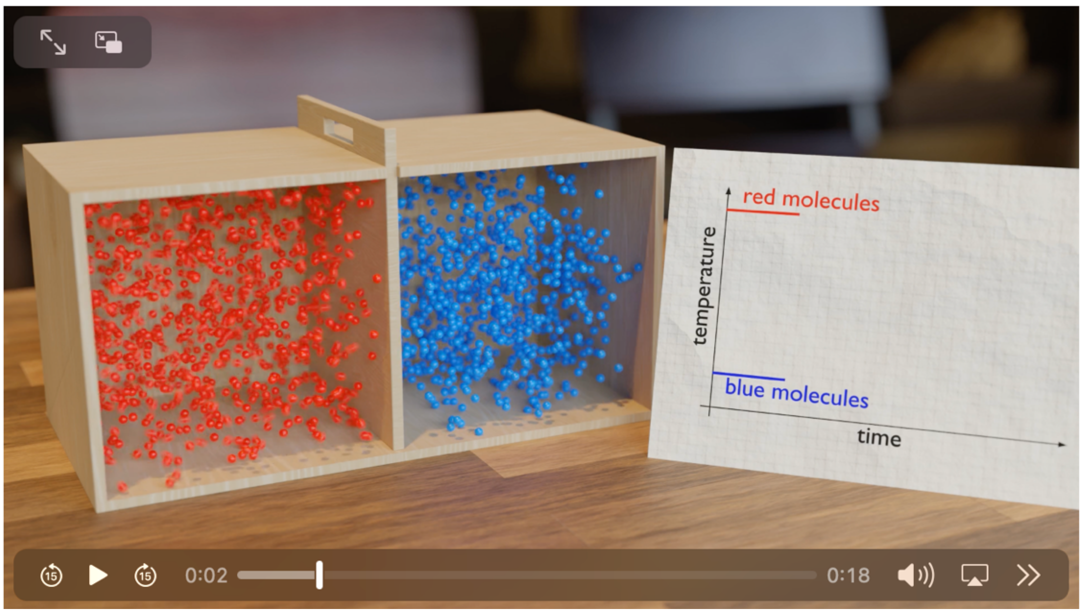
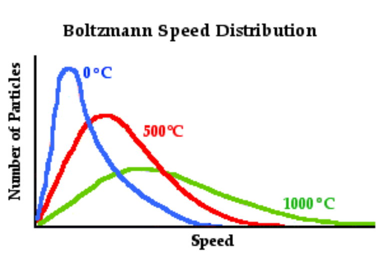
Mixing of gases at different temperatures

An animation of gas particle behavior illustrating a model of the transfer of kinetic energy. Two chambers are initially separated from each other by a dividing wall. The left chamber has balls, representing atoms of a gas – i.e. helium- that move relatively fast. In the right chamber, the balls of a different color, representing a gas, move relatively slowly. The balls in the left chamber represent a gas with high temperature and the balls in the right chamber represent a gas with low temperature.

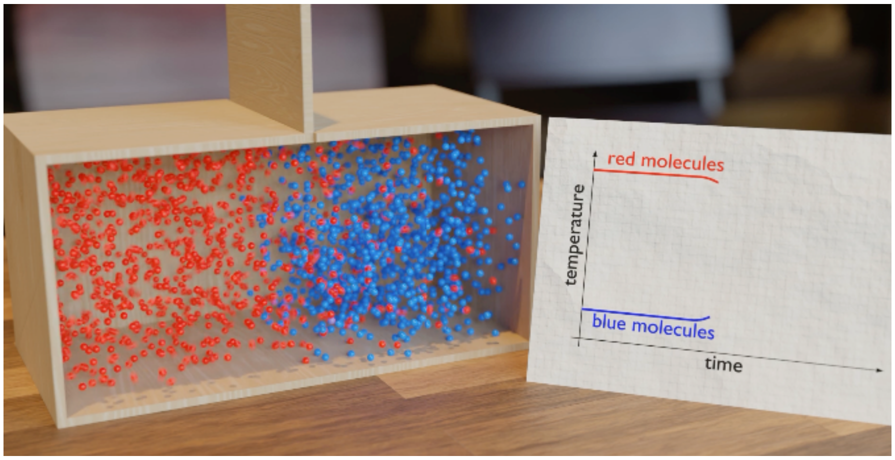


Note: atoms in a sample of gas at a specific temperature do not have same speed because of the Boltzman Distribution. At a specific temperature, a sample of gas has an average kinetic energy.

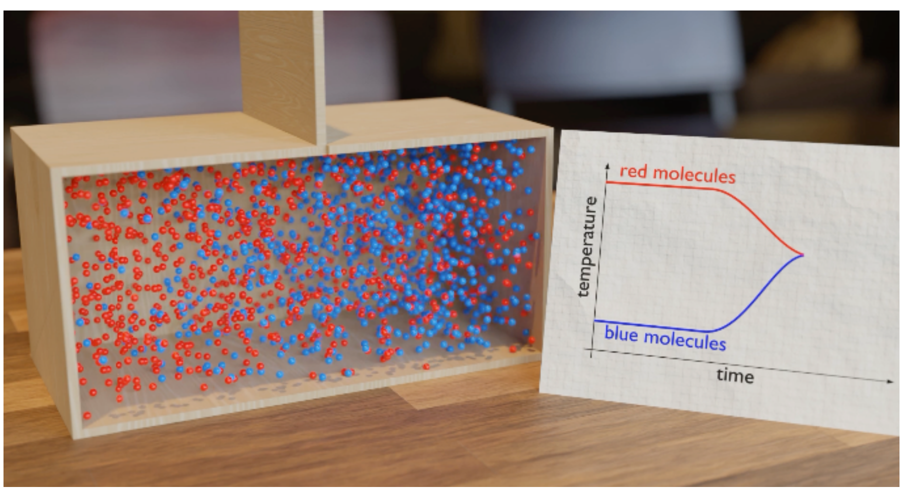


For any given temperature, there is a distribution of speeds with which particles within the sample can move. As the temperature is increased, there is a greater percentage of particles moving at the higher speeds.

The dividing wall, opens the balls of different speeds collide. The collisions between the two different atoms causes the faster balls to transfer part of their kinetic energy to the slower balls. The slower balls move faster.



After a time, the kinetic energies have equalized and a common final temperature has been reached. Both gases have the same temperature because thermal equilibrium has been achieved.



In the model, collisions still take place between the particles even after the final temperature has been reached. However, from a macroscopic point of view, these collisions no longer lead to a (net) exchange of energy. While a particle may become faster again at one point, another particle slows down at another point. From a macroscopic point of view, the *thermal state of equilibrium* is thus maintained.