

Answer on Question #51671-Physics-Electrodynamics

Discuss Kinetic interpretation of temperature

Answer

The average kinetic energy of the gas molecules is directly proportional to the absolute temperature. Notice that the term “average” is very important here; the velocities and kinetic energies of individual molecules will span a wide range of values, and some will even have zero velocity at a given instant. This implies that all molecular motion would cease if the temperature were reduced to absolute zero.

According to the kinetic molecular theory, the average kinetic energy of an ideal gas is directly proportional to the absolute temperature. Kinetic energy is the energy a body has by virtue of its motion:

$$KE = \frac{mv^2}{2}.$$

As the temperature of a gas rises, the average velocity of the molecules will increase; a doubling of the temperature will increase this velocity by a factor of four. Collisions with the walls of the container will transfer more momentum, and thus more kinetic energy, to the walls. If the walls are cooler than the gas, they will get warmer, returning less kinetic energy to the gas, and causing it to cool until thermal equilibrium is reached. Because temperature depends on the average kinetic energy, the concept of temperature only applies to a statistically meaningful sample of molecules.

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