KINETIC THEORY

LAW OF EQUIPARTITION OF ENERGY

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The "total energy of a gas" refers to all the energy that gas possesses. In the context of gases, this energy primarily comes from the motion of its individual particles, like molecules or atoms.

The phrase "distributed uniformly along all the degrees of freedom" means that this energy is spread out evenly across all the different ways or directions in which the gas particles can move or vibrate. In other words, it's like dividing the total energy equally among all the possible ways the gas particles can "exercise" their energy.

The concept of "equipartition for energy" is a fundamental principle in physics. It basically says that, for systems like gases, each degree of freedom contributes equally to the total energy. In the case of a gas molecule, it can move in three different directions (x, y, and z axes) and also have energy associated with its rotation and vibration. According to the equipartition theorem, all these forms of motion should, on average, have an equal share of the total energy when the gas is in thermal equilibrium.

So, when we talk about the "law of equipartition for energy" in the context of gases, it means that the energy of gas particles is equally distributed among all their possible types of motion, such as translational (movement), rotational (spinning), and vibrational (oscillation). This principle helps us understand how the energy is distributed and how it relates to the temperature and behavior of the gas.

Energy along the degree of freedom $= \frac{1}{2}KT$

1. For monatomic gas

Degree of freedom, $f = 3$

Total energy for each molecule $= \frac{1}{2}KT \times 3 = \frac{3}{2}KT$

2. For diatomic gas

Degree of freedom, $f = 5$

Total energy for each molecule $= \frac{1}{2}KT \times 5 = \frac{5}{2}KT$

3. For a triatomic gas (non-linear)

Degree of freedom, $f = 6$

Total energy for each molecule $= \frac{1}{2}KT \times 6 = \frac{6}{2}KT = 3KT$