THE IDEAL GAS

The kinetic theory of gases is one of the fundamental theories of modern physics. Yet, as is the case with most theories, it is possible to detect discrepancies between the predicted behavior of the simpler theoretical models (ideal gases) and the observed behavior of real gases—especially those that make up our atmosphere.

Nevertheless, we shall begin by defining the characteristics of a specific ideal gas—our ideal gas. In more advanced essays, this specific ideal gas will be the one that we mean when we describe how the real atmospheric gases of the free atmosphere differ from an ideal gas.

Definition of Our Ideal Gas: First and foremost, our ideal gas is an imaginary gas. It is not real. It does not exist anywhere in the universe. It is purely a creature of the mind.

That warning established, our ideal gas is a theoretical model of a gas having various postulated characteristics and various parameters derived logically from these postulated characteristics. The behavior of our ideal gas is completely predictable. It has no surprises. Let us postulate the characteristics of our ideal gas:

1. The molecules of our ideal gas are all rigid spheres that are identical to one another in size and mass. Neither the size or the mass of any ideal gas molecule ever changes.

2. Except for collisions with one another and with any exposed surface, these ideal gas molecules are non-reacting. They do not change phase, react chemically, or affect one another in any way except during collisions.

3. Collisions—both with one another and with exposed surfaces—are instantaneous, are perfectly elastic, and follow perfectly the laws of classical mechanics.

4. Our ideal gas molecules have no internal energies: they do not rotate, vibrate, or librate.

5. The only external energy our ideal gas molecules possess is their kinetic energy of translation.

6. An individual ideal gas molecule's kinetic energy or translation may change during collisions, but the total kinetic energy of translation of the ideal gas system remains constant.

7. These ideal gas molecules neither emit photons nor absorb them. They are impervious to all forms of electromagnetic energy.

