History

Explore the discoverer's biography, including general facts about his life and anecdotes regarding how he made this particular discovery. Also see other significant scientific discoveries built largely on this concept and other real-world applications in history that may not still be relevant.

Discoverer/Developer

Dalton's Law of Partial Pressures from 1801. John Dalton (1766-1844) was born in Eaglesfield, England, in Cumberland. His father was a weaver; his mother came from landowners. Raised as a Quaker, Dalton had the opportunity to work for a Quaker of scientific persuasion, Elihu Robinson, at the age of ten. Robinson introduced Dalton to mathematics. At age twelve, Dalton taught in a village school, and, in 1793, attained a professorship at New College in Manchester, where he taught math and natural philosophy. After the college moved to York, Dalton stayed in Manchester and worked as a private tutor. John Dalton was directly influenced by Newtonian physics and highly fascinated by meteorological sciences. Dalton initiated the chemical atomic theory that still holds ground in modern science, created a new system of chemical symbology, and determined a composition of the atmosphere close to the atmosphere's true composition. Dalton was a member of the Literary and Philosophical Society and theorized on colorblindness, a condition by which he was afflicted. He determined the Law of Partial Pressures by adding water vapor to dry air and observing the effect on pressure.

Use/Application through History

The Law of Partial Pressures contributed directly to Dalton's atomic theory, which he devised to explain the inter-diffusion of gases.

Dalton explained gases in the context of caloric, a supposed physical substance responsible for the heat properties of matter. Dalton reasoned that caloric is mutually repulsive and that gas particles were, in fact, each surrounded by a whole layer of caloric. Thus, the repulsive force responsible for gas pressure emanated directly from the repulsive caloric cover.

Concept Definition

Study the primary definition of this concept, broken into general, basic, and advanced English definitions. Also see the mathematical definition and any requisite background information, such as conditions or previous definitions.

General Science

Pressure is made up of all the individual pressures put together.

Basic

Pressure of a mixed gas is the sum of each individual gas pressure.

Advanced

Total pressure (P) of a mixed gas is the sum of each component pressure (P_i).

Mathematical Definition

Background Information

Ideal Gas

An "ideal gas" is a gas in which:

- All collisions are totally elastic (particles always bounce off each other)
- There are no intermolecular attractions (a particle can only change direction when it collides with another particle)
- The molecule is infinitely small (particles will come all the way together before they collide)

What does this mean? An ideal gas is a collection of bouncy-balls.

Real World Application

Discover processes or disciplines in the natural or man-made worlds that employ the concept.

Dalton's Law is especially important in atmospheric studies. The atmosphere is made up principally of nitrogen, oxygen, carbon dioxide, and water vapors; the total atmospheric pressure is the sum of the partial pressures of each gas. The different partial pressures account for a lot of the weather we experience.

Dalton's Law plays a large role in medicine and other breathing areas. Different proportions of gas have different therapeutic effects, so it is important to know the partial pressures of each gas, in a gas line or gas tank, for example.

Vocabulary

Learn important vocabulary for this concept, including words that might appear in assessments (tests, quizzes, homework, etc.) that indicate the use of this concept.

Important Vocabulary **Term** **Context**

Proportion
- the proportion of [gas1] to [gas2]

Ratio
- the ratio of [gas1] to [gas2]

Component
- partial pressure of the [specific] component

Mixture
- a mixture of gases

Partial Pressure
- the partial pressure of [gas]

Vapor Pressure
- the vapor pressure of [gas]

Computer Animations

Experience computer simulators or animations that illustrate the concept discussed here. Many simulators or animations come with worksheets for use in class.

http://phet.colorado.edu/simulations/sims.php?sim=Gas_Properties
http://intro.chem.okstate.edu/1314F00/Laboratory/GLP.htm

Summary

Read a summary of the concept, indicating the enduring understanding students should retain after class.

Summary

A mixture of different gases in a container will have the total pressure of the sum of each gas in the container, as if it were alone.