

PHYSICAL KINETIC MOLECULAR THEORY

Learning Objectives

- to identify the most important differences in behaviour between particles in the three states of matter and to understand the reasons for these differences in behaviour in each state of matter and the processes of the phase transitions theory
- to identify the most important differences between the three states of matter
- to represent quantitatively the three states of matter in a simple way

Module 1: Representation of states in different phases

The following figure shows the representation of the three states of matter in a simple way.



Figure 1: Representation of the three states of matter in a simple way

Modern science has shown that the three states of matter are not as simple as they seem. There are many more states of matter than the three shown in the figure.

Key Concepts

- There are three states of matter: solid, liquid and gas. The particles in each state are arranged differently. In the solid state, the particles are packed closely together. In the liquid state, the particles are more spread out. In the gaseous state, the particles are very far apart. The particles in each state are moving all the time.

Table 1: Representation of the three states of matter

	SOLID STATE	LIQUID STATE	GASEOUS STATE
How the particles are arranged:	The particles are packed closely together. They are in a regular arrangement.	The particles are more spread out. They are in a disordered arrangement.	The particles are very far apart. They are in a disordered arrangement.
How the particles move:	The particles are vibrating. They are not moving from one place to another.	The particles are moving. They are moving from one place to another.	The particles are moving. They are moving from one place to another.

Lw Pogil Kinetic Molecular Theory Key

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Applications of the Kinetic Theory to Gases, Vapors, Pure Liquids, and the Theory of Solutions William Pingry Boynton, 1904 Molecules and the Molecular Theory of Matter Allan Douglas Risteen, 1895 **Kinetic Theory** S. G. Brush, 2016-07-04 Kinetic Theory Volume I The Nature of Gases and of Heat deals with kinetic theory and the nature of gases and heat A comprehensive account of the life works and historical environment of a number of scientists such as Robert Boyle and Hermann von Helmholtz is presented This volume is comprised of 11 chapters and begins with an overview of the caloric theory the principle of conservation of energy the virial theorem and atomic magnitudes The discussion then turns to the qualitative atomic theory of the spring of the air proposed by Robert Boyle Isaac Newton's repulsion theory Daniel Bernoulli's theory on the properties and motions of elastic fluids especially air and George Gregory's theory on the existence of fire Subsequent chapters focus on Robert Mayer's theory on the forces of inorganic nature James Joule's theory on matter living force and heat Hermann von Helmholtz's theory on the conservation of force and Rudolf Clausius's theory on the nature of heat James Clerk Maxwell's dynamical theory of gases is also examined This book is written primarily for students and research workers in physics as well as for historians of science *Irreversible Processes* Stephen G. Brush, 2013-10-22 Kinetic Theory Volume 2 Irreversible Processes deals with the kinetic theory of gases and the irreversible processes they undergo It includes the two papers by James Clerk Maxwell and Ludwig Boltzmann in which the basic equations for transport processes in gases are formulated together with the first derivation of Boltzmann's H theorem and a discussion of this theorem along with the problem of irreversibility Comprised of 10 chapters this volume begins with an introduction to the fundamental nature of heat and of gases along with Boltzmann's work on the kinetic theory of gases and statistical mechanics Energy dissipation the statistical nature of the second law of thermodynamics and the eternal return and the recurrence paradox are also considered The first chapter examines the dynamical theory of gases and its application to the explanation of various properties of gases the known chemical relation between the density of a gas and its equivalent weight commonly called the Law of Equivalent Volumes and the diffusion of one gas through another Subsequent chapters focus on the thermal equilibrium of gas molecules the three body problem and the equations of dynamics the mechanical theory of heat and the relation of a general mechanical theorem to the second law of thermodynamics A mechanical explanation of irreversible processes is also offered This book will be useful for students of physics at the advanced undergraduate or beginning postgraduate level **Kinetic Molecular Theory** Charles Proteus Steinmetz, American Electrochemical Society. Meeting, 1908* *Kinetic Theory*, 1921 **Kinetic Theory** J.M Pendlebury, 1985-09-01 The theory of the motions of atoms and molecules in a fluid provides the key to understanding thermodynamics yet many students find difficulty in evaluating and using the basic expressions of kinetic theory This book is designed to lead such students through the fundamental assumptions underlying the theory and to build up a clear physical understanding of the distribution of molecular speeds

within a gas The bulk of the text outlines the relationship between molecular motions and the macroscopic properties of gases including the equation of state for a perfect gas and for a van der Waals gas and derives a variety of transport coefficients and thermodynamics relations *Foundations of the Molecular Theory* Dalton,1893 **Applications of the Kinetic Theory** William Pingry Boynton,2015-06-25 Excerpt from Applications of the Kinetic Theory To Gases Vapors Pure Liquids and the Theory of Solutions This book presupposes a moderate acquaintance with the fundamentals of physics and chemistry and a mathematical equipment involving familiarity with the differential calculus and at least the notation of the integral calculus It embodies a course of lectures given at the University of California during the academic years 1898 1901 but includes for the sake of greater completeness of treatment some matter not given in the lectures For detailed information regarding many of the topics mentioned as for instance osmotic pressure and electrolysis and for a statement of the experimental basis for the theories presented the reader is referred to the standard texts which treat of these topics in extenso The intent in this volume is not so much to discuss these facts and theories by themselves as to present their possible or probable relations to each other in the light of the kinetic theory About the Publisher Forgotten Books publishes hundreds of thousands of rare and classic books Find more at www.forgottenbooks.com This book is a reproduction of an important historical work Forgotten Books uses state of the art technology to digitally reconstruct the work preserving the original format whilst repairing imperfections present in the aged copy In rare cases an imperfection in the original such as a blemish or missing page may be replicated in our edition We do however repair the vast majority of imperfections successfully any imperfections that remain are intentionally left to preserve the state of such historical works *Kinetic Theory of Bimolecular Chemical Reaction, Diffusive Drag, and Other Processes in a Gas Mixture* Richard A. Hord,1967 For two gas species with a temperature difference and a bulk velocity difference neither of which is necessarily small in magnitude the kinetic theory of gases has been used to derive explicit expressions for the collision frequency diffusive drag force molecular translational energy transfer rate and the bimolecular chemical reaction frequency The derivations which are based upon hypothesized mutual collision diameters activation energies and steric factors are of interest in connection with theoretical studies of low pressure gas mixtures with large departures from equilibrium A binary temperature concept is introduced as an aid in condensing and interpreting the expressions derived from the kinetic theory The expression derived for the diffusive drag force is used to give a more definite form to the equations of motion of the individual species in a mixture of several interdiffusing gases **Foundations of the Molecular Theory** John Dalton,Joseph Louis Gay-Lussac,Amedeo Avogadro,1893 *Kinetic Processes in Gases and Plasmas* A Hochstim,2012-12-02 Kinetic Processes in Gases and Plasmas provides a survey of studies on transport and chemical kinetic processes in high temperature gases and plasmas The book is concerned with conditions produced by the interaction of an object with the atmosphere at hypersonic velocities The text also provides a foundation for the flow field equations which include chemical reactions and other transport processes and to

present in some detail the microscopic considerations underlying these calculations Chapters are devoted to the discussion of topics such as the molecular theory of transport equations transport processes in ionized gases and inelastic energy transfer processes and chemical kinetics Aerospace engineers physicists chemists and astrophysicists will find the book a good reference material

An Introduction to Molecular Kinetic Theory Joel Henry Hildebrand, 1963 *Molecular Theory of Gases and Liquids* Joseph Oakland Hirschfelder, 2003-01 *Foundations of the Molecular Theory* John Dalton, Joseph Louis Gay-Lussac, Amedeo Avogadro, 1906 Topics in Kinetic Theory Thierry Passot, Catherine Sulem, P. L. Sulem, 2005 This book covers a variety of topics related to kinetic theory in neutral gases and magnetized plasmas with extensions to other systems such as quantum plasmas and granular flows A comprehensive presentation is given for the Boltzmann equations and other kinetic equations for a neutral gas together with the derivations of compressible and incompressible fluid dynamical systems and their rigorous justification Several contributions are devoted to collisionless magnetized plasmas Rigorous results concerning the well posedness of the Vlasov Maxwell system are presented Special interest is devoted to asymptotic regimes where the scales of variation of the electromagnetic field are clearly separated from those associated with the gyromotion of the particles This volume collects lectures given at the Short Course and Workshop on Kinetic Theory organized at the Fields Institute of Mathematical Sciences in Toronto during the Spring of 2004 *Foundations of Molecular Theory, Comprising Papers and Extracts* John Dalton, Joseph Louis Gay-Lussac, Amedeo Avogadro, 1961 Foundations of the Molecular Theory, 1893 *The Molecular Theory of Gases and Liquids* Joseph O. Hirschfelder, Charles F. Curtiss, R. Byron Bird, 1964-01-15 An essential cross disciplinary reference for molecular interactions Molecular Theory of Gases and Liquids offers a rigorous comprehensive treatment of molecular characteristics and behaviors in the gaseous and fluid states A unique cross disciplinary approach provides useful insight for students of chemistry chemical engineering fluid dynamics and a variety of related fields with thorough derivations and in depth explanations throughout Appropriate for graduate students and working scientists alike this book details advanced concepts without sacrificing depth of coverage or technical detail

Foundations of the Molecular Theory John Dalton, Joseph Louis Gay-Lussac, Amedeo Avogadro, 1950

Reviewing **Lw Pogil Kinetic Molecular Theory Key**: Unlocking the Spellbinding Force of Linguistics

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