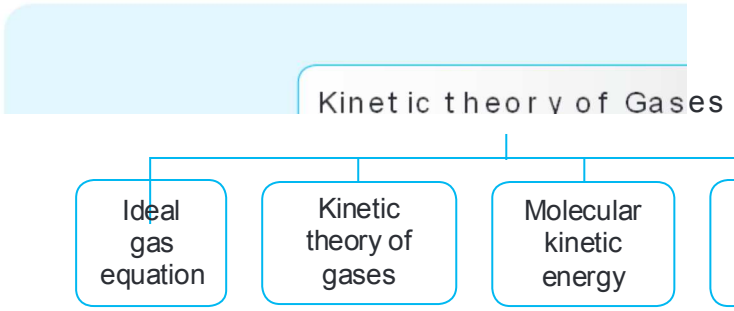
Kinetic Theory of Gases

14

INTRODUCTION

Kinetic theory of gases, assumes that the molecules are very small relative to the distance between molecules. The molecules are in constant, random motion and frequently collide with each other and with the walls of the container. The individual molecules possess the standard physical properties of mass, momentum, and energy. Molecules are very tiny and it is very difficult to measure the properties of each individual molecules. In kinetic theory we describe the physical properties in terms of the measurable physical quantities of the gas a whole.

CHAPTER OVERVIEW



14.1 Ideal Gas Equations

LEARNING OUTCOMES

You should be able to:

- Sketch:
  - p-V graph at constant temperature.
  - V-T graph at constant pressure.
  - P-T graph at constant volume.
- Use the ideal gas equation $pV = nRT$.

The amount of gas

- A volume of gas contains a large number of molecules.
- The number of molecules in a gas is measured in units of mole.
- 1 mole of gas is equivalent to 6.02×10^{23} molecules.
- The mass of 1 mole of gas is called its molar mass.
- Each molecule of monatomic gas consists one atom, diatomic gas consists of two atoms, and polyatomic gas consists of many atoms.

Physical nature of a gas

- The number of molecules in a gas are very large.
- Each individual molecules are moves randomly inside the container of the gas.
- Each individual molecules has momentum and kinetic energy.
- As the molecules collide with the wall of the container, they impart their momentum as a force on the container. The amount of force is measured as the force per unit area or the pressure of the gas.
- The random motion of the molecules is dependent on its temperature. The higher the temperature, the greater the motion will be. The mean kinetic energy of the gas is associated with the temperature of the gas.
- The nature (state) of a gas is measured by its volume, pressure and temperature.

Gas laws

Boyle's law • Relates the volume, V and pressure, p of a gas at constant temperature T.	