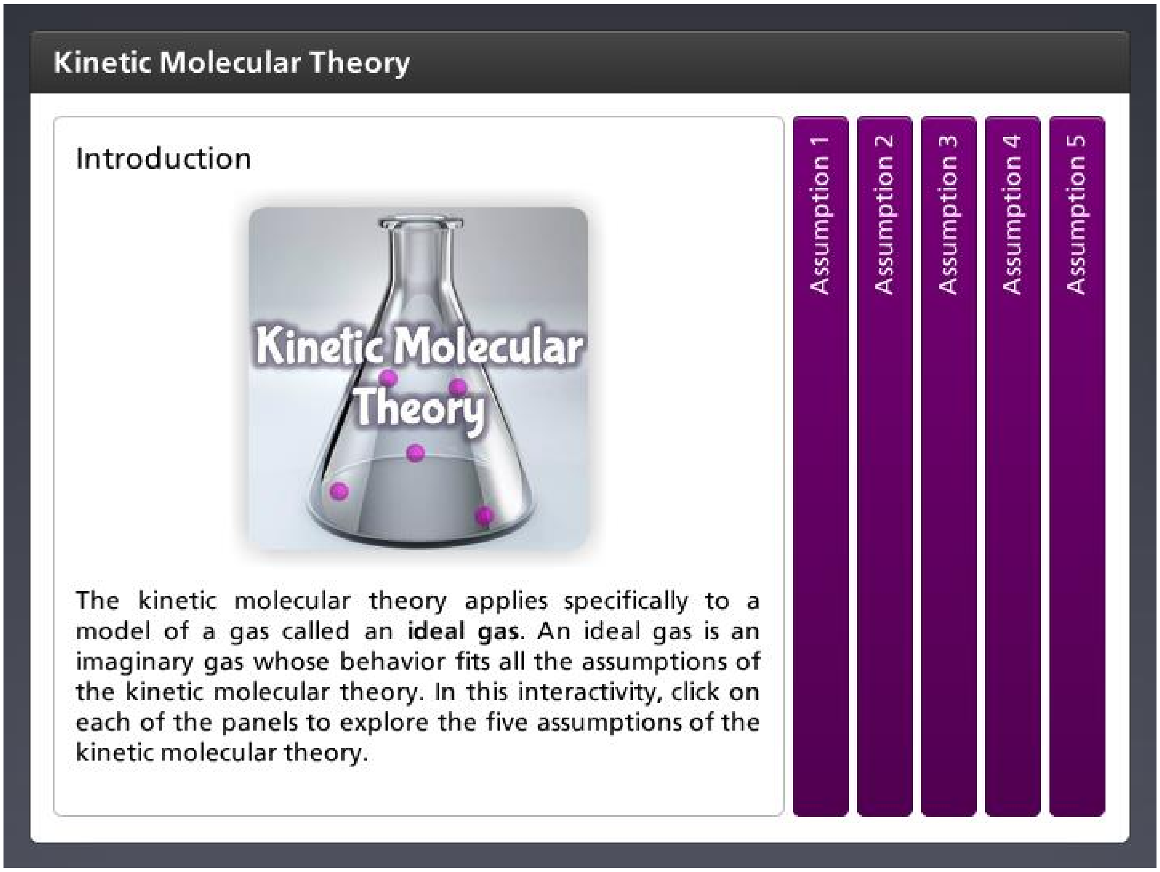
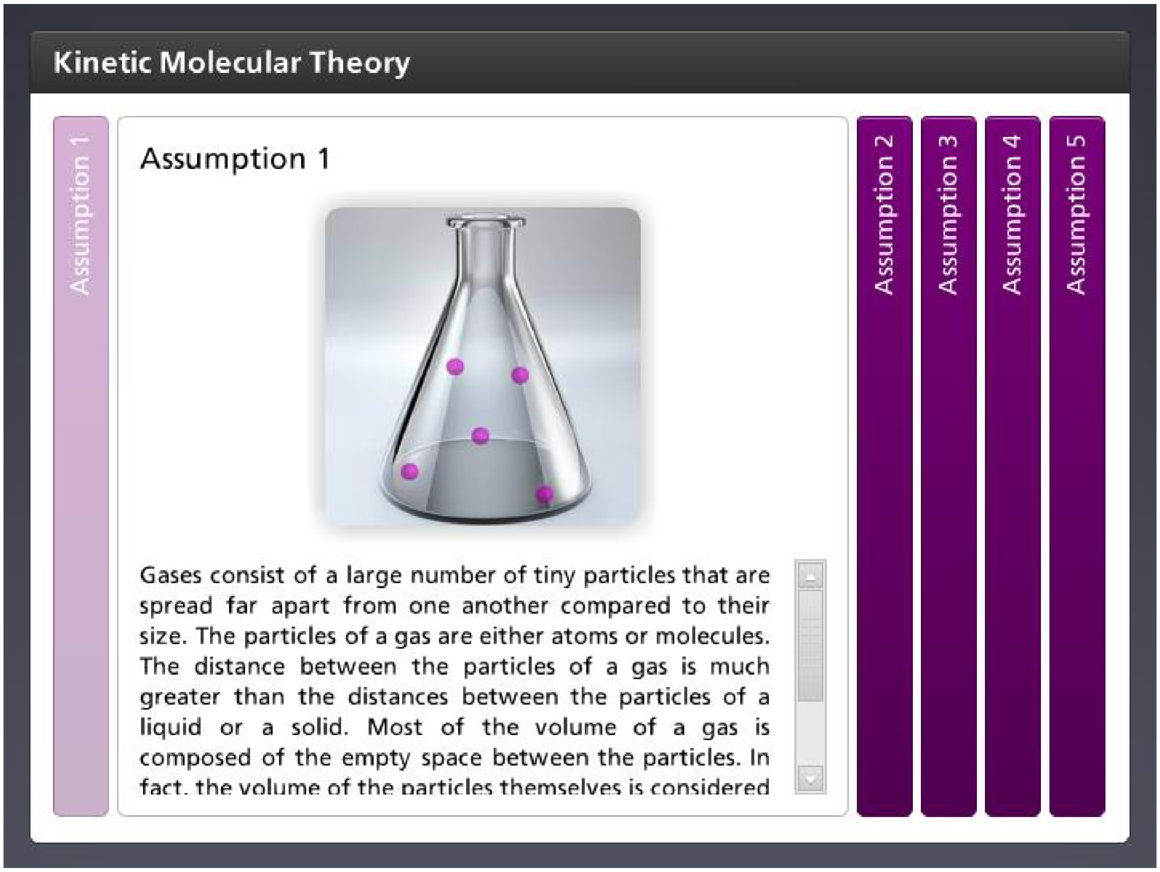
Module 9: States of Matter and Gas Laws
Topic 1 Content: Kinetic Molecular Theory Notes

Introduction



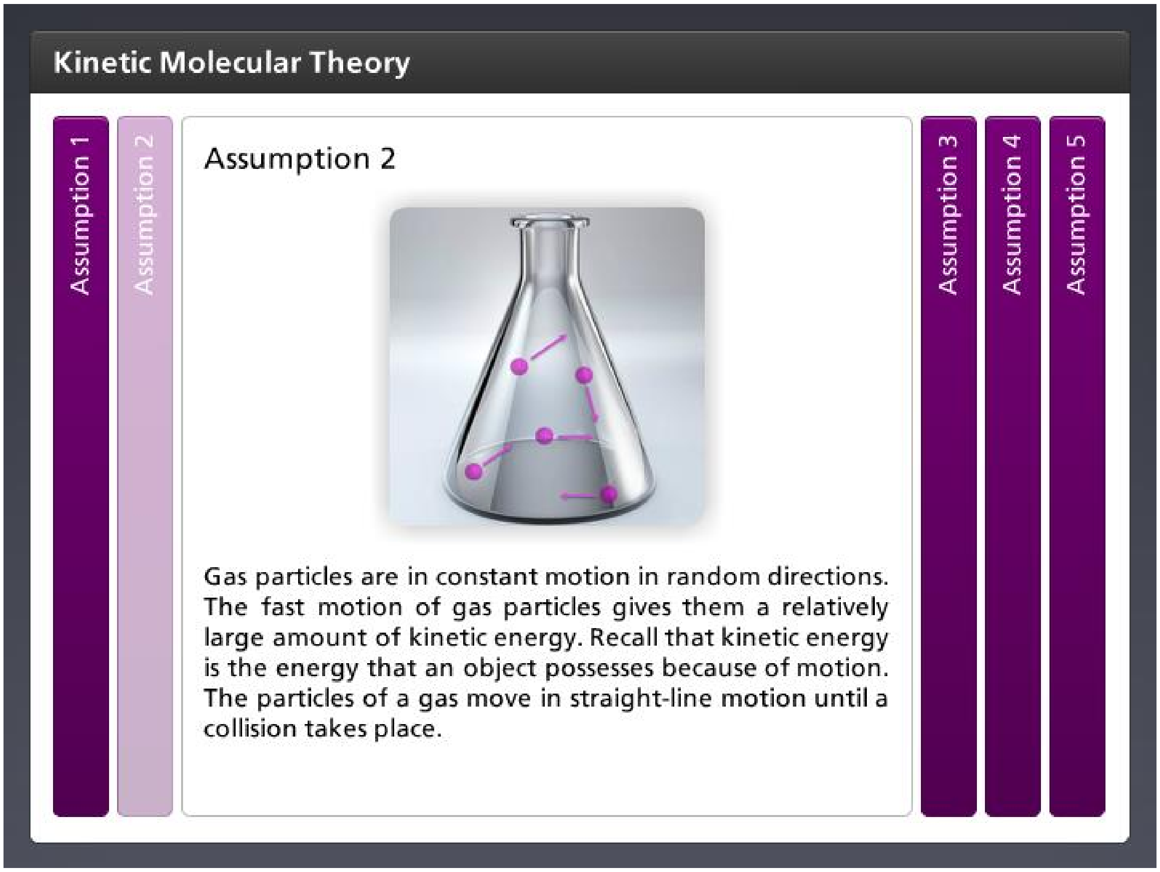
The kinetic molecular theory applies specifically to a model of a gas called an **ideal gas**. An ideal gas is an imaginary gas whose behavior fits all the assumptions of the kinetic molecular theory. In this interactivity, click on each of the panels to explore the five assumptions of the kinetic molecular theory.

Assumption 1



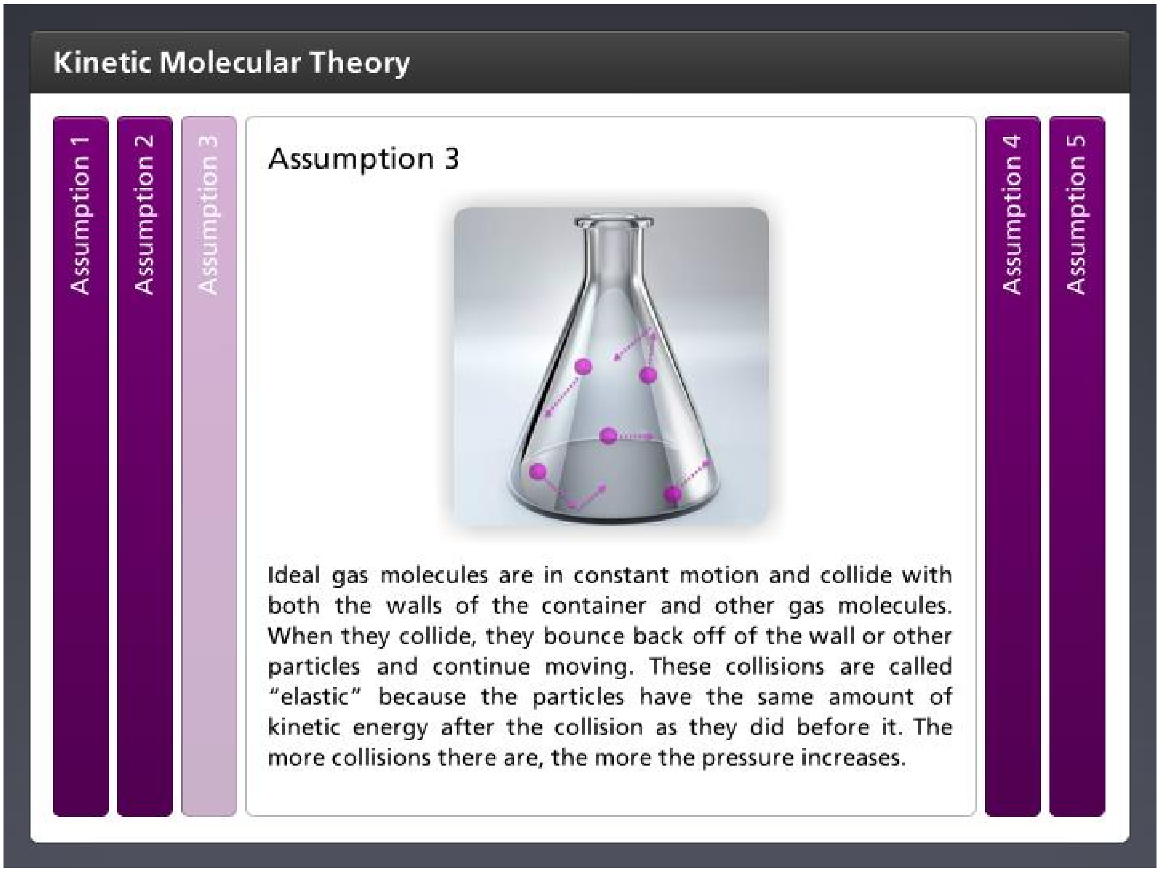
Gases consist of a large number of tiny particles that are spread far apart from one another compared to their size. The particles of a gas are either atoms or molecules. The distance between the particles of a gas is much greater than the distances between the particles of a liquid or a solid. Most of the volume of a gas is composed of the empty space between the particles. In fact, the volume of the particles themselves is considered to be insignificant compared to the volume of the empty space. As shown in this image, the particles of gas are spread out in the flask and the majority of the flask is empty space.

Assumption 2



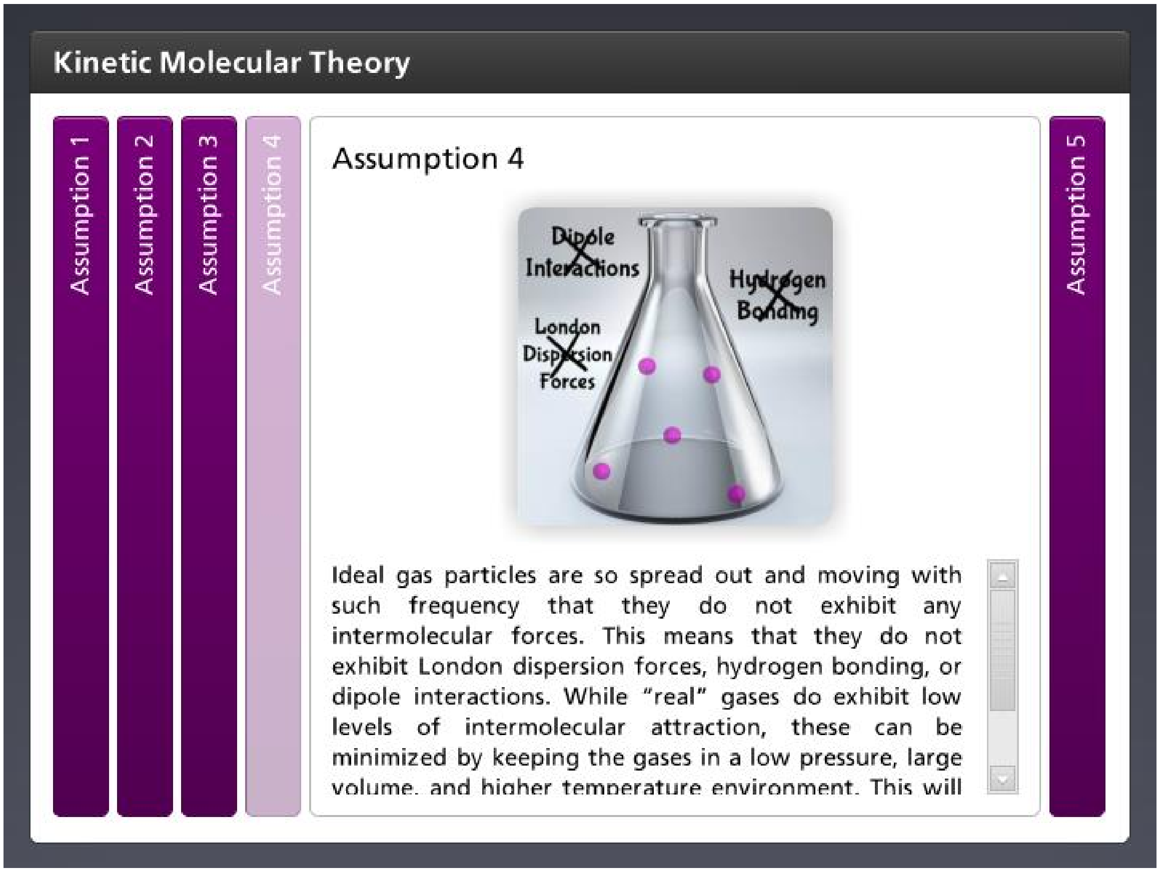
Gas particles are in constant motion in random directions. The fast motion of gas particles gives them a relatively large amount of kinetic energy. Recall that kinetic energy is the energy that an object possesses because of motion. The particles of a gas move in straight-line motion until a collision takes place.

Assumption 3



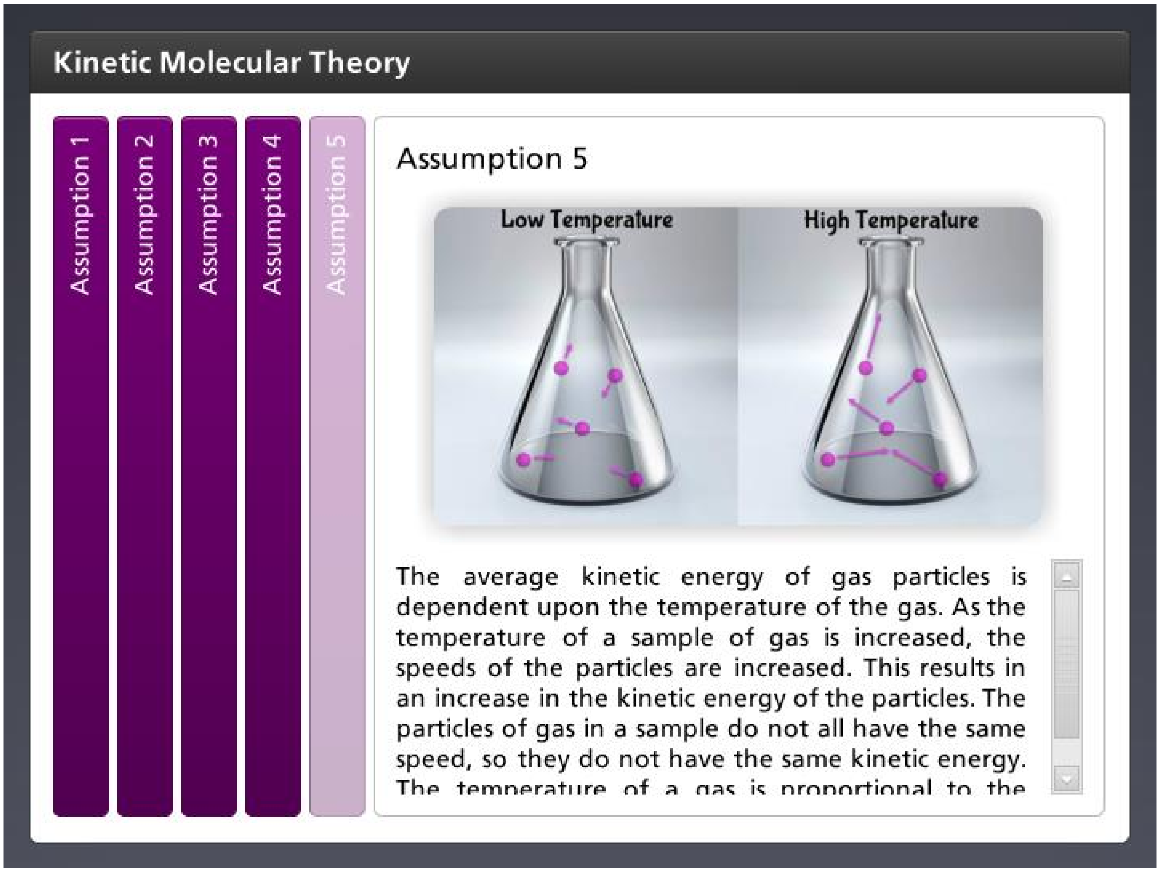
Ideal gas molecules are in constant motion and collide with both the walls of the container and other gas molecules. When they collide, they bounce back off of the wall or other particles and continue moving. These collisions are called "elastic" because the particles have the same amount of kinetic energy after the collision as they did before it. The more collisions there are, the more the pressure increases.

Assumption 4



Ideal gas particles are so spread out and moving with such frequency that they do not exhibit any intermolecular forces. This means that they do not exhibit London dispersion forces, hydrogen bonding, or dipole interactions. While "real" gases do exhibit low levels of intermolecular attraction, these can be minimized by keeping the gases in a low pressure, large volume, and higher temperature environment. This will minimize the interactions between the particles by keeping them moving and by providing enough room that they do not hit each other as frequently.

Assumption 5



The average kinetic energy of gas particles is dependent upon the temperature of the gas. As the temperature of a sample of gas is increased, the speeds of the particles are increased. This results in an increase in the kinetic energy of the particles. The particles of gas in a sample do not all have the same speed, so they do not have the same kinetic energy. The temperature of a gas is proportional to the average kinetic energy of the gas particles.