

10-1 Kinetic Molecular Theory of Gases

Kinetic Molecular Theory – particles of matter are always in motion

Ideal Gas – an imaginary gas that perfectly fits all assumptions of the kinetic-molecular theory

Elastic Collision – a collision without any net loss of kinetic energy

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$$KE = \frac{1}{2}mv^2$$

- Since gas particle mass does not change, energy depends on speed
- All gases at same temperature have same kinetic energy
- Particles with less mass move faster than heavier particles
- Ex. H_2 will move faster than O_2 at the same temperature.

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Real gas – does not behave with completely with kinetic molecular theory

Real gases will differ from ideal gases due to attractive forces. They can act like ideal gases at high temperatures and low pressures.

Gases become less ideal when particles closer

Lower Temperatures

Higher Pressures

Polar compounds become less ideal as a gas

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Kinetic Molecular Theory of Gases

- 1) Gases take up 1000 times the volume of liquid or solid states
- 2) Collisions between particles and walls are **elastic collisions** (without any net loss of kinetic energy)
- 3) Gas particles are in constant, rapid, random motion. The energy from motion is kinetic energy
- 4) There are no forces of attraction or repulsion between particles
- 5) The kinetic energy of a gas depends on its temperature. Higher temperatures give higher speed.

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Expansion – gases quickly expand to fill up any container

Fluidity – gas particles (like liquids) flow past each other and are fluids.

Low Density – density of gases are about 1 / 1000th of solids and liquids

Compressibility – gases can be compressed to a much smaller volume because the particles are so far apart

Diffusion – mixing of particles of different gases from random motion. Lighter gases will typically mix faster.

Effusion – gas under pressure flows through a tiny opening. Lighter gases will effuse faster

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