

Ideal Gas Law Simulator

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/ideal-gas/>

Name: _____ Date: _____

Learning objectives

- Relate pressure, volume, temperature, and amount of gas.
- Connect macroscopic gas behavior to molecular motion.
- Apply the ideal gas law.

Variables to change

- Temperature
- Volume
- Number of particles
- Pressure

Procedure

1. Hold temperature fixed and reduce the volume; watch the pressure (Boyle's law).
2. Hold volume fixed and raise the temperature; watch the pressure (Gay-Lussac's law).
3. Add more particles at fixed volume and temperature; watch the pressure.

Observations

Record how pressure responds to each change, keeping the other quantities fixed.

Questions

1. At constant temperature, what happens to pressure when volume decreases?
2. At constant volume, what happens to pressure when temperature rises?

3. Write the ideal gas law.
4. Microscopically, why does raising temperature raise pressure at fixed volume?
5. Why must temperature be in kelvin for these relationships?

Answer key (instructors)

- **1.** Pressure increases — P and V are inversely proportional (Boyle's law).
- **2.** Pressure increases in proportion to absolute temperature (Gay-Lussac's law).
- **3.** $PV = nRT$ (or $PV = NkT$).
- **4.** Molecules move faster and strike the walls harder and more often, increasing force per area.
- **5.** The gas laws are proportional to absolute temperature; kelvin starts at absolute zero, where ideal-gas pressure would be zero.

The ideal gas law $PV = nRT$ ties pressure, volume, temperature, and amount together. Microscopically, pressure comes from molecular collisions with the walls; hotter gas means faster molecules and more forceful, frequent collisions.