

Internal Energy

Physics

What internal energy is, and how it changes.

The change in internal energy equals heat added minus work done by the system.

$$\Delta U = Q - W$$

Heating a gas at constant volume

No work is done.

All the heat raises U

Gas expanding, doing work

Temperature drops.

U falls if no heat is added

Isothermal

Constant temperature.

$$\Delta U = 0, \text{ so } Q = W$$

THE COMMON MISTAKE

✗ Including the object's kinetic energy as it moves

✓ Internal energy is the **RANDOM** energy of particles

A moving cricket ball and a stationary one at the same temperature have the same internal energy.

Sign convention matters: some textbooks write $\Delta U = Q + W$ with W as work done ON the system. Check which is in use.