

16 Internal energy – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)
internal energy	_____
kinetic energy	_____
intermolecular	_____

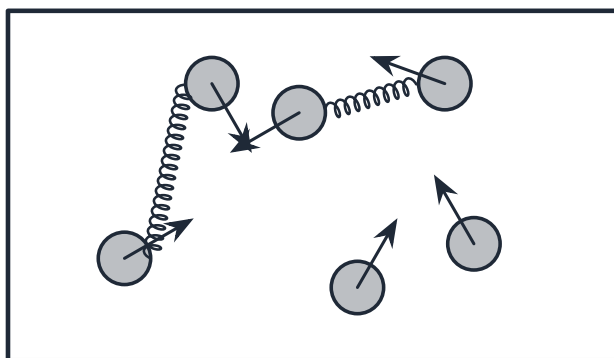
Recall

The **internal energy** U of a system is the energy stored in its molecules – not the energy of the whole object moving along.

New ideas

Read these first. Each idea has a short worked example. Then do the Practice.

■ 1 What internal energy is

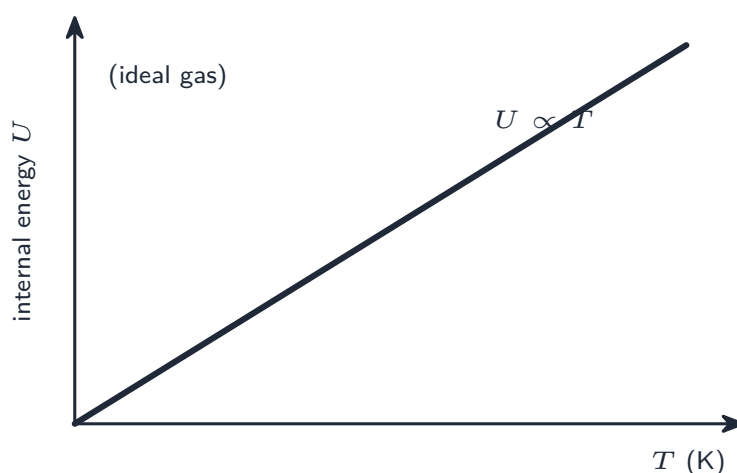


arrows = kinetic energy springs = potential energy

Internal energy is the sum of the molecules' random **kinetic energy** (they move) plus the **potential energy** of the **intermolecular** forces between them.

Worked example. In an ideal gas the molecules are far apart, so we ignore the forces between them. The potential energy is then zero, and the internal energy is just the total random kinetic energy of all the molecules.

■ 2 Temperature and U



Raising the temperature raises the molecules' kinetic energy. For an ideal gas $U \propto T$ (in kelvin) – doubling T doubles U .

Worked example. An ideal gas at 300 K is heated to 600 K. Since $U \propto T$ and T doubles, the internal energy doubles too.

Watch out: internal energy is the *random* energy of the molecules – not the kinetic energy of the whole object moving. A flying cricket ball has lots of kinetic energy of

flight, but that is not its internal energy.

Practice

Try these in order.

16.1 What two energies make up *internal energy*? [2]

16.2 In the ideal-gas model, what is the molecular potential energy? [1]

16.3 Raising the temperature raises which molecular energy? [1]

16.4 For an ideal gas, U is proportional to what? [1]

16.5 An ideal gas at 200 K is heated to 800 K. By what factor does its internal energy rise? Explain. [2]

16.6 Challenge. A cricket ball is thrown across a field. Explain why its internal energy is *not* the same as its kinetic energy of flight. [2]
