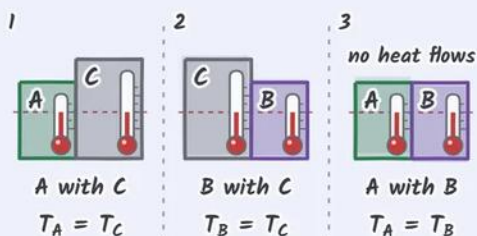


temperature is the average kinetic energy of a body's particles, heat is what flows to equalise it

Temperature, heat, and thermal equilibrium

- temperature measures a body's degree of hotness
- heat is energy in transit between two bodies at different temperatures
- two bodies in contact exchange heat until no net transfer remains
- that state is thermal equilibrium
- zeroth law: A and B each in equilibrium with C means A and B are in equilibrium too
- temperature is the average kinetic energy of a substance's molecules
- not the amount of thermal energy it holds



A settles with C, then B with C; A against B: no heat flows

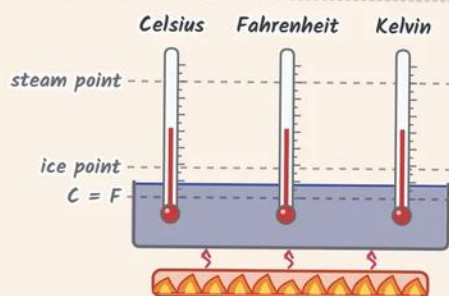
Temperature scales *

the three scales together

$$\frac{T_C}{100} = \frac{T_F - 32}{180} = \frac{T_K - 273.15}{100}$$

kelvin, fixed by the triple point of water

triple point = 273.16 K



one bath, three thermometers, one level: three numbers; the steam point, the ice point and the line where $C = F$ ruled across

celsius uses two fixed points, ice and steam, 32 and 212° F; kelvin needs only one, the triple point, which is why it replaced celsius as the thermodynamic scale

Thermometers, by thermometric property *

Liquid-in-glass

mercury or alcohol expanding up a capillary, cheap and simple, limited range

Constant-volume gas

pressure of a fixed volume of gas, accurate but bulky, the reference standard

Resistance thermometer

a metal wire's resistance change, accurate over -200 to 1200° C, best for steady readings

Thermocouple

an emf generated at a junction of two dissimilar metals, fast, used in research labs

needs a property that varies continuously and monotonically with temperature