

14 Thermal equilibrium – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
Heat	热量	_____
temperature	温度	_____
thermal equilibrium	热平衡	_____
thermal energy	热能	_____

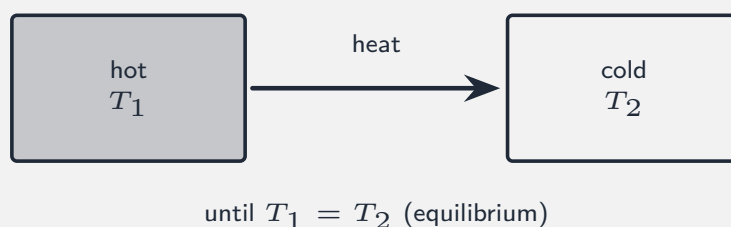
Recall

Heat 热量 (thermal energy) flows from hot to cold. It is temperature, not the amount of energy, that sets the direction —which is why an ice cube cools your drink rather than the drink warming the ice.

New ideas

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

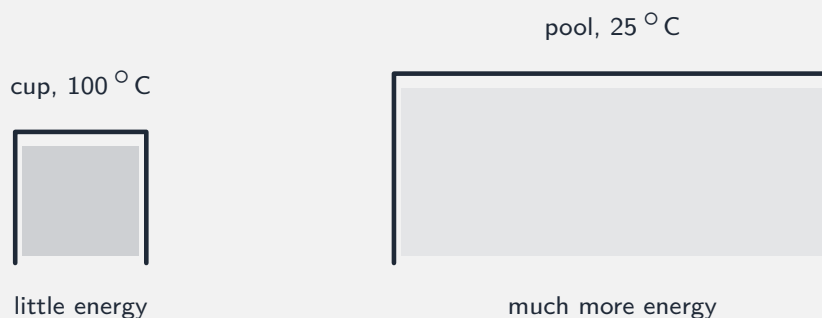
■ 1 Thermal equilibrium



When two bodies touch, heat flows from the higher **temperature** 温度 to the lower until they are equal —**thermal equilibrium** 热平衡. Then there is no net flow.

Worked example. A hot metal block at $80\text{ }^{\circ}\text{C}$ is dropped into cool water at $20\text{ }^{\circ}\text{C}$. Heat flows from the block into the water: the block cools, the water warms, and they meet at one final temperature between 20 and $80\text{ }^{\circ}\text{C}$ (closer to 20 if there is a lot of water).

■ 2 Temperature is not energy



A small cup of boiling water ($100\text{ }^{\circ}\text{C}$) holds far less **thermal energy** 热能 than a warm swimming pool ($25\text{ }^{\circ}\text{C}$) —but heat still flows *from* the cup into anything cooler, because flow depends on temperature, not on total energy.

Worked example. A single spark from a sparkler can be over $1000\text{ }^{\circ}\text{C}$, yet it barely warms your skin: it is so tiny that it carries very little energy, even though its temperature is huge.

Watch out: temperature sets the *direction* of heat flow, but the *amount* of energy a body holds also depends on its mass and material.

Practice

Try these in order.

14.1 Which way does heat flow? [1]

14.2 What is *thermal equilibrium*? [1]

14.3 At equilibrium, what is the net flow of energy? [1]

14.4 A hot stone is dropped into a bucket of cool water. Describe what happens to the

temperature of each until equilibrium is reached. [2]

14.5 Does a higher temperature always mean more thermal energy? Explain with an example. [2]

14.6 Challenge. A spark at over 1000 °C will not burn you, but bathwater at 50 °C can scald. Explain why, using the idea that thermal energy depends on more than temperature. [2]
