

# 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  | _____                      |

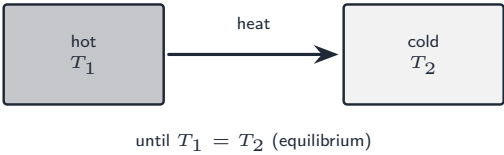
## Recall

**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

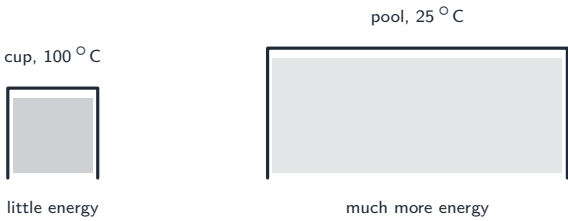


When two bodies touch, heat flows from the higher **temperature** 温度 to the lower

until they are equal — **thermal equilibrium** 热平衡. Then there is no net flow.

*Worked example.* A hot metal block at 80 °C is dropped into cool water at 20 °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 °C (closer to 20 if there is a lot of water).

### ■ 2 Temperature is not energy



A small cup of boiling water (100 °C) holds far less **thermal energy** 热能 than a warm swimming pool (25 °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 °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]

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

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**14.6 Challenge.** A spark at over  $1000\text{ }^{\circ}\text{C}$  will not burn you, but bathwater at  $50\text{ }^{\circ}\text{C}$  can scald. Explain why, using the idea that thermal energy depends on more than temperature. [2]

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