2 Thermal energy – Part 2

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)
conduction	热传导	
convection	对流	
radiation	热辐射	
infrared	红外线	
Melting	熔化	
boiling	沸腾	
Evaporation	蒸发	

Recall

From Part 1 you know heating makes particles move faster. Here we see how thermal energy **moves** from hot to cold, and what happens during a **change of state**.

- Thermal energy always flows from hotter to colder.
- It moves in three ways: conduction, convection and radiation.

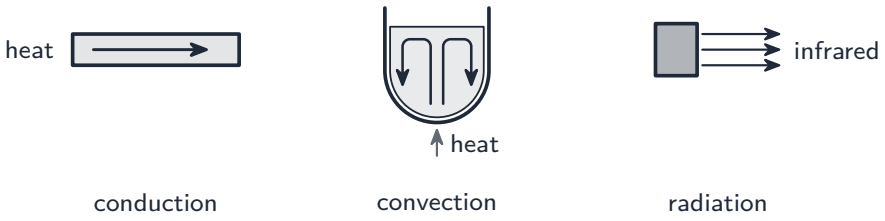
Nothing here is hard – it just names the three ways.

New ideas

Read these first, then do the Practice.

1 Three ways heat moves

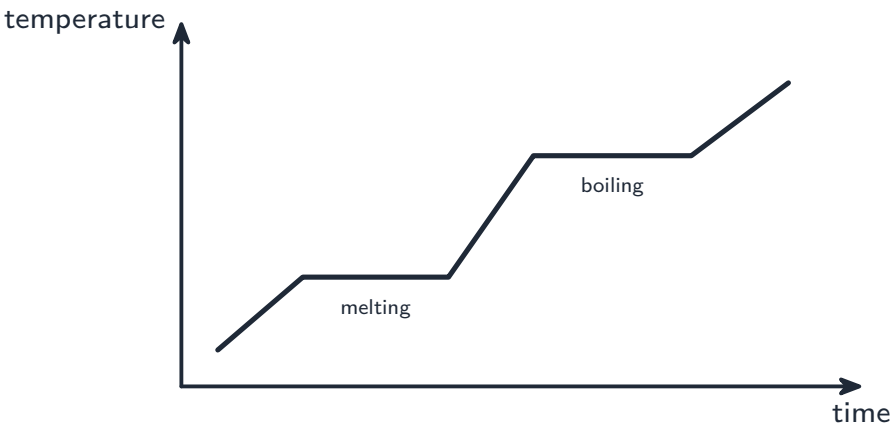
- **conduction** 热传导 – through a solid; vibrating particles pass energy to their neighbours. **Metals** are good conductors (free electrons carry energy).
- **convection** 对流 – in a liquid or gas; heated fluid expands, becomes less dense and **rises**, while cooler fluid sinks (a **convection current**).
- **radiation** 热辐射 – by **infrared** 红外线 waves; needs no material, so it can cross empty space (this is how the Sun's energy reaches us).



A **dull black** surface is a good emitter and absorber of infrared; a **shiny white** surface is a poor emitter and a good reflector.

2 Changes of state

Melting 熔化 and **boiling** 沸腾 need energy, but the **temperature stays the same** while the state changes – the energy breaks the forces between particles.



Evaporation 蒸发 happens at the **surface**, below boiling point. The fastest particles escape, so the average energy of those left falls – the liquid **cools**.

Watch out: while a substance is melting or boiling its temperature stays **constant**, even though energy is still added – the energy breaks the forces between particles. A dull black surface is the best emitter *and* absorber of infrared; a shiny surface is the best reflector.

Practice

Try these in order.

2.1 Name the three ways thermal energy is transferred. [3]

2.2 Why are metals good conductors of heat? [1]

2.3 Explain how a convection current forms when water is heated from below. [3]

2.4 Which type of heat transfer can travel through empty space? [1]

2.5 What happens to the temperature while a solid is melting, even though energy is still added? [1]

2.6 Explain why evaporation cools a liquid. [2]

2.7 Challenge. A vacuum flask keeps a drink hot. Explain how (a) the vacuum gap and (b) the shiny silvered walls each reduce heat loss. [3]