

Exercise walk-through

Thermal Energy Transfer and Equilibrium ■ 9.3

eXercise

You must be able to

- describe thermal energy transfer by **conduction** 传导, **convection** 对流, and **radiation** 辐射
- explain that objects in contact reach **thermal equilibrium** 热平衡 at a common temperature
- relate the direction of **heat** 热量 flow to the temperature difference

Method — Three ways heat moves

- **Conduction** — through a solid, by particle collisions passing on energy.
- **Convection** — bulk currents in a fluid, as warm fluid rises and cool fluid sinks.
- **Radiation** — electromagnetic waves; needs **no** medium (how the Sun's energy reaches us).

Method — Thermal equilibrium

Two objects in contact exchange heat until they reach a **common temperature**; then the net heat flow is zero.

Method — Direction of heat flow

Heat always flows from **hotter** to **colder**.

Practice 2.1 ■ 2 marks

Name the three methods of thermal energy transfer.

Solution 2.1

Method: Three ways heat moves

Worked steps

conduction, convection, radiation **B1** **B1** *for any two; for all three.*

Practice 2.2 ■ 1 mark

State the direction heat flows between a hot object and a cold object in contact.

Solution 2.2

Method: Direction of heat flow

Worked steps

from the hot object to the cold object **B1**.

Practice 2.3 ■ 1 mark

Two objects have reached thermal equilibrium. State what is true about their temperatures.

Solution 2.3

Method: Thermal equilibrium

Worked steps

their temperatures are equal **B1**.

Exam-style 3.1 ■ 1 mark

The method of heat transfer that needs no medium is

A conduction

B convection

C radiation

D none of these

Solution 3.1

Method: Three ways heat moves

A conduction

B convection

C radiation



D none of these

Worked steps

C.

Exam-style 3.2 ■ 1 mark

When two objects reach thermal equilibrium, the net heat flow between them is

A from hot to cold

B from cold to hot

C zero

D at its maximum

Solution 3.2

Method: Thermal equilibrium

A from hot to cold

B from cold to hot

C zero



D at its maximum

Worked steps

C.

Exam-style 3.3 ■ 1 mark

A hot metal spoon is placed in a cup of cold water.

- (a) State the direction of the heat flow.
- (b) Name the main method of transfer within the metal spoon.
- (c) Describe the final state of the spoon and water.

Solution 3.3

Method: Direction of heat flow

Worked steps

(a) from the spoon to the water **B1**. (b) conduction **B1**. (c) both reach the same temperature (thermal equilibrium) **B1**.