AP CHEMISTRY • EXERCISE SHEET

6.3 Heat Transfer and Thermal Equilibrium

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS thermal equilibrium 热平衡 • heat 热量 • specific heat 比热容

Objective

Build the skills to answer exam questions on **heat transfer and thermal equilibrium**.

You must be able to:

- state that heat flows from **hot to cold** until **thermal equilibrium** 热平衡
- apply conservation of energy ($q_{\text{lost}} = q_{\text{gained}}$)
- reason about the final temperature

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Heat flows hot to cold

When two objects touch, heat flows from the **hotter** to the **cooler** one until they reach the **same temperature** — thermal equilibrium. Then net heat flow stops.

■ Conservation of energy

In an isolated system, the heat **lost** by the hot object equals the heat **gained** by the cold object:

$$q_{\text{lost}} = q_{\text{gained}} \quad \text{(equal magnitudes, opposite signs).}$$

■ A worked direction

Drop a hot metal into cool water: the metal cools (loses heat), the water warms (gains the same heat), and both settle at one final temperature between the two starting values.

■ Where the final temperature lands

The final temperature is **closer** to the object with the larger heat capacity (more mass or higher specific heat) — it changes temperature less for the same heat.

2 Practice

Now apply the methods above.

2.1 In which direction does heat flow between a hot and a cold object? [1]

2.2 What is thermal equilibrium? [1]

2.3 If a hot metal loses 500 J to water (isolated), how much does the water gain? [1]

3 Exam-style questions

3.1 Two objects reach thermal equilibrium when they have the same [1]

A B
C D

A mass
B temperature
C heat capacity
D volume

3.2 A 200 g block of hot metal is placed in 200 g of cool water.

(a) State the direction of heat flow. [1]

(b) Explain why the final temperature is closer to the water's starting temperature (water has a higher specific heat). [2]

3.3 Write the energy-conservation equation relating the heat lost by the metal to the heat gained by the water. [2]