

Heating and Thermal Equilibrium

KS3 Physics · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

A cold can of drink is left in a warm kitchen. Which way does energy flow?

Step 1 · Rule

Energy is transferred from the hotter object to the cooler one.

Step 2 · Apply

The kitchen air is hotter, so energy flows from the air into the can.

Step 3 · Result

The can warms up until it reaches room temperature.

Answer: From the warm air into the cold can

Check: 'Cold' does not flow in; energy flows from hot to cold.

2. Now try one with the steps

Why does a metal spoon in hot soup get hot, but a wooden spoon does not?

Step 1 · Process

Step 2 · Materials

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. In which direction is energy transferred by heating? [1]

2. What instrument measures temperature, and in what unit? [1]

3. Name the three ways energy is transferred by heating. [1]

4. What is thermal equilibrium? [1]

5. A drink cools from 80 °C to 20 °C. By how many degrees has its temperature fallen? [1]

6. Which method of heating can travel through empty space? [1]

7. Explain how warm air from a radiator heats a whole room. [3]

8. Equal masses of water at 70 °C and 10 °C are mixed. Predict the final temperature, in °C, ignoring losses. [2]

9. Why does a duvet keep you warm? [2]

10. Explain the difference between temperature and thermal energy. [2]

11. A bath of water at 40 °C and a cup of water at 40 °C are left in a 20 °C room. Which transfers more energy to the room before reaching thermal equilibrium? [2]

12. 100 g of water at 80 °C is mixed with 300 g of water at 20 °C. Predict the final temperature, in °C, ignoring losses. [3]

13. Plan a fair test to compare how well three materials insulate a beaker of hot water. [4]

14. Explain why a metal bench feels colder than a wooden bench on the same cold morning, even though both are at the same temperature. [2]

4. Before you hand it in

"Cold travels into the drink from the ice."

Energy is transferred from the warmer drink to the colder ice.

"Heat and temperature are the same thing."

A bath at 40 °C stores more thermal energy than a cup at 40 °C.

"Hot air rises because heat rises."

Warm air expands, becomes less dense and rises; this moving fluid is convection.

"The metal bench is colder than the wooden one."

Metal feels colder because it conducts energy away from your hand faster.