Chapter 2: Energy transfer by heating

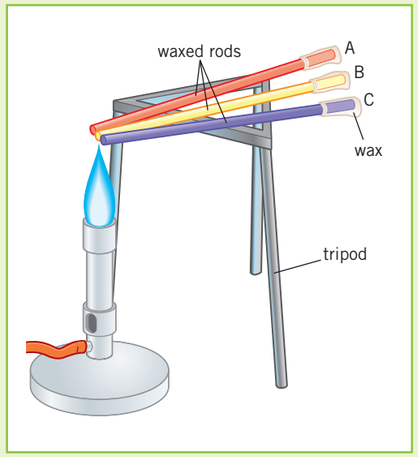
Knowledge organiser

Thermal conductivity

The **thermal conductivity** of a material tells you how quickly energy is transmitted through it by thermal conduction.

You can test the thermal conductivity of rods made of different metals using this experimental set-up. Each rod must have the same diameter and length, and the same temperature difference between its ends.

One end of each rod is covered in wax and the other ends are heated equally. The faster the wax melts, the higher the thermal conductivity of the metal.



Insulating buildings

Heating bills can be expensive so it is important to reduce the rate of heat loss from buildings.

Some factors that affect the rate of heat loss from a building include:

1. the thickness of its walls and roof
2. the thermal conductivity of its walls and roof.

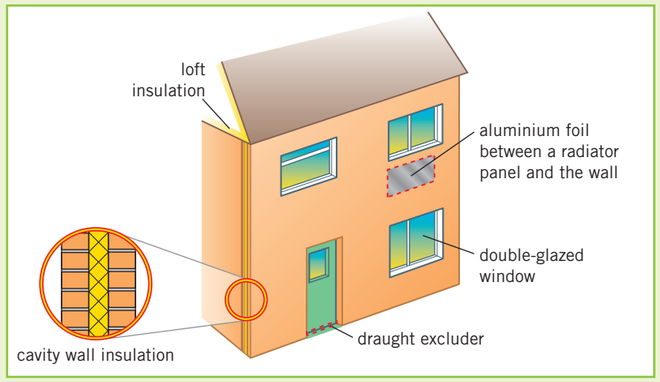
lower thermal conductivity = lower rate of heat loss

The thermal conductivity of the walls and roof can be reduced by using **thermal insulators**.

A thermal insulator is a material which has a low thermal conductivity. The rate of energy transfer through an insulator is low.

The energy transfer per second through a material depends on:

1. the material's thermal conductivity
2. the temperature difference between the two sides of the material
3. the thickness of the material.



Specific heat capacity

When a substance is heated or cooled the temperature change depends on:

- the substance's mass
- the type of material
- how much energy is transferred to it.

Every type of material has a **specific heat capacity** – the amount of energy needed to raise the temperature of 1 kg of the substance by 1 °C.

The energy transferred to the thermal store of a substance can be calculated from the substance's mass, specific heat capacity, and temperature change:

change in thermal energy (J) = mass (kg) × specific heat capacity (J/kg°C) × temperature change (°C)

$$\Delta E = m\, c\, \Delta\theta$$

This equation will be given to you on the equation sheet, but you need to be able to select and apply it to the correct questions.

Key terms

Make sure you can write a definition for these key terms.

absorb *specific heat capacity* *thermal conductivity* *thermal insulator*

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Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	P2 questions	Answers
1	What does a material's thermal conductivity tell you?	how well it conducts heat
2	Which materials have low thermal conductivity?	thermal insulators
3	Give three factors that determine the rate of thermal energy transfer through a material.	thermal conductivity of material, temperature difference, thickness of material
4	What factors affect the rate of heat loss from a building?	thickness of walls and roof, thermal conductivity of walls and roof, the temperature difference between the two sides of the wall/roof
5	Define specific heat capacity.	amount of energy needed to raise the temperature of 1 kg of a material by 1 °C

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