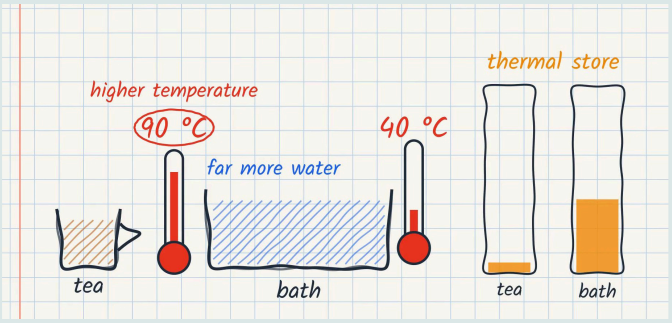
Specific heat capacity

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

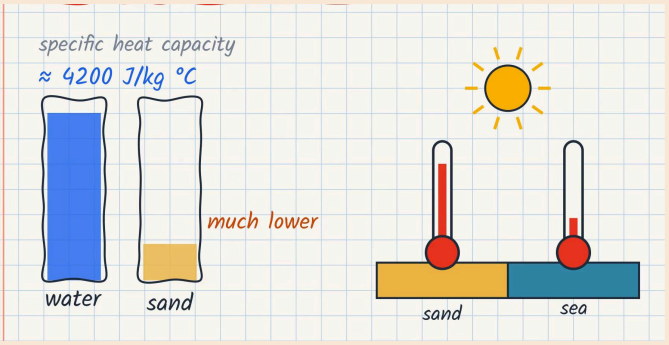
sansara academy
Summary sheet

1 Temperature and thermal energy



- Heating moves energy into an object's **thermal store**, and its temperature rises.
- **Temperature** is how hot something is. The energy stored also depends on **how much** there is.

2 Specific heat capacity



- **Specific heat capacity** (c) is the energy needed to raise the temperature of 1 kg of a substance by 1 °C.
- Water's is high (about 4200 J/kg °C), so it warms up slowly. Sand's is much lower.

3 The equation

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

ΔE	change in energy	joules (J)
m	mass	kilograms (kg)
c	specific heat capacity	J/kg °C
$\Delta\theta$	temperature change	degrees Celsius (°C)

- Δ means **change in**. Δθ = final temperature − starting temperature.
- Kettle: ΔE = 1.5 × 4200 × 80 = 504 000 J = 504 kJ

4 An exam-style question

Exam-style

$\Delta E = 18$ kJ · $m = 2$ kg · $\Delta\theta = 10$ °C · $c = ?$

$18\ \text{kJ} \times 1000 = 18\ 000$ J — *convert first*

$c = \Delta E \div (m \times \Delta\theta)$

$c = 18\ 000 \div (2 \times 10)$

$c = 18\ 000 \div 20 = 900$ J/kg °C

- **Convert first**: kJ × 1000 = J and g ÷ 1000 = kg.
- Rearranged: c = ΔE ÷ (m × Δθ)

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

change in thermal energy = mass × specific heat capacity × temperature change

ΔE	change in thermal energy	joule (J)
m	mass	kilogram (kg)
c	specific heat capacity	J/kg °C
$\Delta\theta$	temperature change	degree Celsius (°C)

Rearrange: $c = \Delta E \div (m\ \Delta\theta)$ and $m = \Delta E \div (c\ \Delta\theta)$

Exam tip
The equation is on your equation sheet. The marks come from using it well: find Δθ first, and convert kJ and g first.

Check yourself

1. How much energy warms 0.5 kg of water by 10 °C? (c = 4200 J/kg °C)
2. True or false? A bath at 40 °C has less thermal energy than a cup of tea at 90 °C.

Answers: 1. ΔE = 0.5 × 4200 × 10 = 21 000 J 2. False: the bath has far more water, so more thermal energy.