

Name _____

Class _____

Date _____

By the end of this worksheet I can...

- ☐ calculate heat energy using $E_h = cm\Delta T$
- ☐ find the change in temperature ΔT
- ☐ rearrange the formula to find a final temperature
- ☐ use the specific heat capacity from the data booklet

I DO**Key ideas and worked example** Read this first **$E_h = cm\Delta T$** Heat energy = specific heat capacity $\times$ mass $\times$ change in temperature

- Specific heat capacity c in J/kg K (water = 4180 J/kg K)
- Mass m in kilograms (kg); 1 litre of water = 1 kg
- Change in temperature ΔT in $^{\circ}\text{C}$ (or K)
- Energy E_h in joules (J)

Remember

ΔT is the change: final temperature – starting temperature. Water boils at 100°C . If c is given in kJ/kg K, multiply by 1000 to get J/kg K.

A hot water tank holds 200 litres of water at 18°C .

Example Calculate the energy needed to heat the water to 50°C .

Worked answer set out every step like this

$$m = 200 \text{ kg}, \Delta T = 50 - 18 = 32^{\circ}\text{C}$$

$$E_h = cm\Delta T = 4180 \times 200 \times 32$$

$$E_h = 26\,752\,000 \text{ J} = 27 \text{ MJ}$$

Why marks are not awarded

✗ Using the final temperature instead of the change in temperature

WE DO**Guided practice** Follow the steps to help you

1.75 kg of water at 18°C is heated until it begins to boil.

1 Calculate the heat energy needed. (3 marks)

Steps

1. Boiling point is 100°C , so $\Delta T = 100 - 18 = \dots$
2. Substitute into $E_h = 4180 \times 1.75 \times \dots$
3. Round to two significant figures and give the unit

YOU DO**On your own** Give answers to two significant figures. Show your working.

2 A kettle holds 1.5 litres of water at 5 °C. Calculate the heat energy needed to raise its temperature to each value.

Final temperature	ΔT (°C)	Working	E_h
50 °C			
40 °C			
80 °C			
100 °C			

3 57 kJ of heat energy is supplied to 1.7 kg of oil with a specific heat capacity of 2.7 kJ/kg K. The oil starts at 3 °C. Calculate its final temperature. (4 marks)

4 Calculate the energy needed to raise the temperature of 750 g of water from 34 °C to 91 °C.

5 An electric heater supplies 13 500 J to a 0.5 kg metal block, raising its temperature from 20 °C to 80 °C. Calculate the specific heat capacity of the metal.

Check and reflect

Mark your answers with the answer sheet. Which “I can” statement above still needs work? Look back at the notes for that topic on the site.
