

- 1 A hot water bottle is a container filled with hot water and sealed with a stopper. It used for applying heat to a specific part of the body.



### Hot water bottle

Specific heat capacity of water =  $4200 \text{ J/Kg/}^\circ\text{C}$

Boiling point of water =  $100 \text{ }^\circ\text{C}$

- 1 (a) (i) Water has a high specific heat capacity.

Why does this fact make water a suitable substance to use in a hot water bottle?

**[2 marks]**

Large amount of energy needed [1]

to raise the temperature (by  $1^\circ\text{C}$ ). [1]

Large amount of heat energy released [1] for each  $^\circ\text{C}$ . [1]

- 1 (a) (ii) A hot water bottle is filled up with  $0.75 \text{ kg}$  of water at  $90^\circ\text{C}$ . It is used for 30 minutes over which time the temperature reduces to  $30^\circ\text{C}$ .

Calculate the energy released from the water over 30 minutes.

Use the information from the question, the diagram and the correct equation from the equation sheet.

Give the correct unit.

Remember to show working.  
Correct equation is:  
 $E = m \times c \times \Theta$

**[3 marks]**

$0.75 \times 4200 \times 60$

Energy released =  $189\,000$  [2] J or joules [1] or  $189 \text{ kJ}$  [3]

- 1 (b) (i) Vegetable oil has a specific heat capacity of  $1670 \text{ J/Kg/}^\circ\text{C}$  and is quicker to heat than water.

Use this information and your own knowledge to suggest why vegetable oil should not be used in a hot water bottle.

**[2 marks]**

Not as much energy released as water (per  $^\circ\text{C}$ ). [1]

Higher boiling point than water. [1]

Danger of burning. [1]

More expensive. [1]

**(Total 7 marks)**

**End**