

Energy Transfers

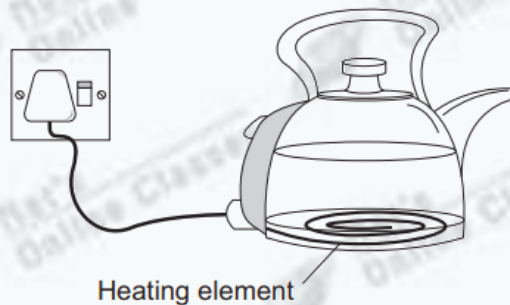
(Conduction, Convection & Radiation)

Total Mark – 15

Question: 1

5 **Figure 8** shows an electric kettle being used to heat some water.

Figure 8



5 (a) Complete the following sentences to describe how the water in the kettle is warmed by convection.

[4 marks]

When the kettle is switched on, the temperature of the water near the heating element increases.

As the temperature of the water increases, the water _____ and becomes less _____.

The heated water _____ towards the top of the kettle.

The movement of the water sets up a convection _____.

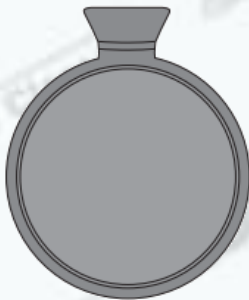
5 (b)

Three different designs of hot water bottle are each filled with water at 90 °C from the kettle.

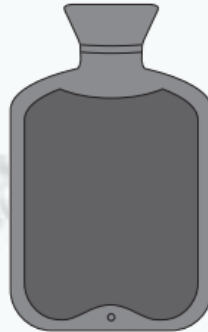
Figure 9 shows the three different designs. Each hot water bottle is made from a different material but holds the same amount of water.

Figure 9

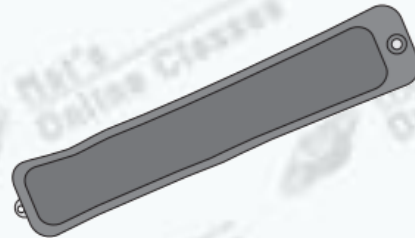
Design A



Design B



Design C



State **two** factors that would affect the time it would take the hot water bottles to cool down to room temperature.

[2 marks]

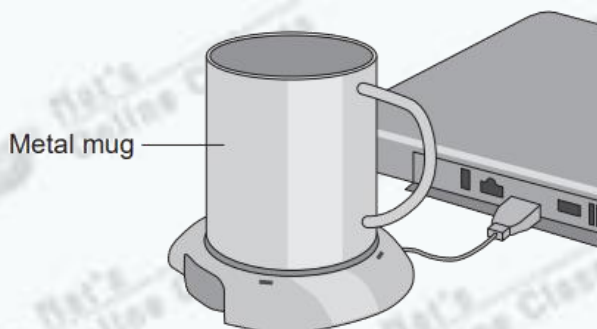
- 1 _____
- 2 _____

Question: 2

- 5 A heater uses energy from a laptop computer to keep a drink hot.

Figure 9 shows a metal mug on the heater.

Figure 9



- 5 (a) The laptop computer is operating on battery power.
How would connecting the heater affect the amount of time the laptop computer would operate for, before needing to be recharged?

[1 mark]

Tick (✓) **one** box.

	Tick (✓)
it would decrease the time	
it would not affect the time	
it would increase the time	

- 5 (b) The power output from the heater is 12 W.

Calculate the energy transferred to the metal mug in 60 seconds.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

Energy = _____ joules

- 5 (c) The heater causes a convection current in the liquid inside the mug.

Complete the sentences to explain how.

[3 marks]

The liquid at the bottom of the mug heats up and becomes less _____.

The hot liquid _____ and the cooler liquid at the top of the mug _____.

- 5 (d) **Table 2** lists changes that may affect the energy transfer per second from the heater to the liquid.

Tick (✓) **one** box to show the effect of **each** change.

[3 marks]

Table 2

Change	Energy transfer per second to the liquid		
	increases	decreases	does not change
use a mug with a smaller base			
use a lower power heater			
use a plastic mug instead of a metal mug			