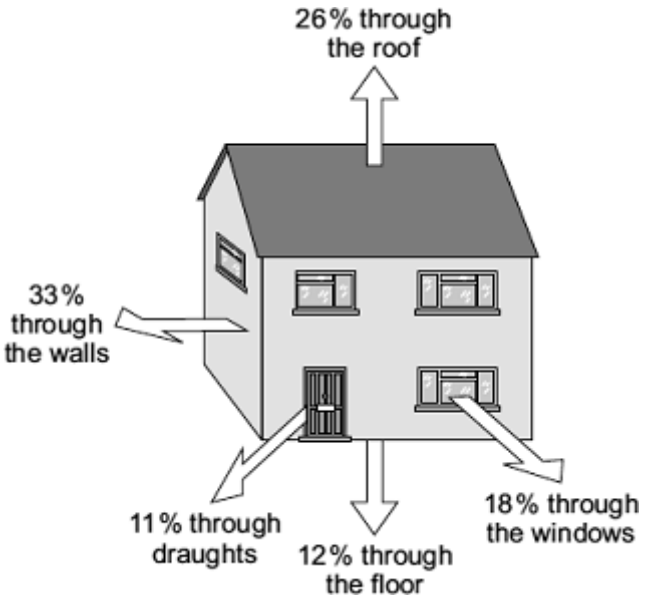
**Q1.** The diagram shows where heat is lost from a house that is **not** insulated.




(a) (i) Through which part of the house is most heat lost?

.....

**(1)**

(ii) How can the heat loss through the windows be reduced?

.....

.....

**(1)**

(b) A homeowner wants to reduce her energy bills and make her home more energy efficient. The table shows five ways this could be done. The table also shows how much money each way would save the homeowner each year.

| | **Cost** | **Money saved each year** |
|---|---|---|
| Installing loft insulation | £175 | £60 |
| Fitting draught-proofing | £45 | £20 |
| Installing cavity wall insulation | £300 | £80 |
| Adding a hot water tank jacket | £15 | £20 |

| | | |
|---|---|---|
| Using energy efficient light bulbs | £60 | £30 |

(i) Which **one** of the five ways of reducing energy bills would reduce the yearly energy bill the most?

.....

**(1)**

(ii) This year the homeowner has only got £60 to spend to improve the energy efficiency of her home.

Use the information in the table to explain what the homeowner should spend this money on.

.....

.....

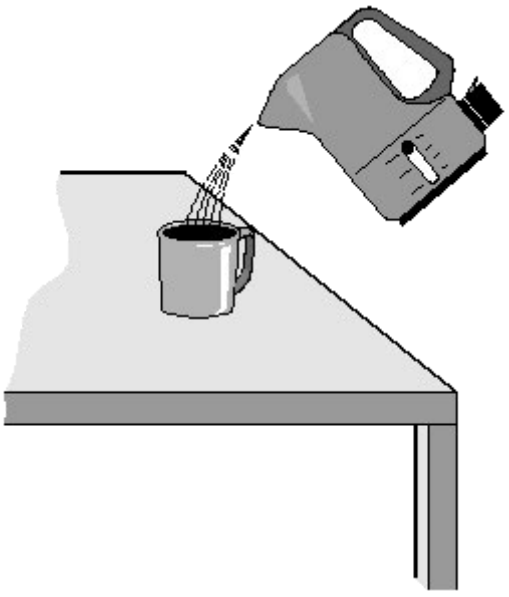
.....

.....

**(2)**

**(Total 5 marks)**

**Q2.** (a) The diagram shows hot water being poured into a mug.



(i) Complete the sentence by choosing the correct words from the box. Each word may be used once or not at all.

| air | mug | table | water |
|---|---|---|---|

Heat energy is being transferred from the ..... to the ..... .

**(1)**

(ii) When will this transfer of heat energy stop?

.....

.....

**(1)**

(b) In the box are the names of four types of fuel used to heat homes.

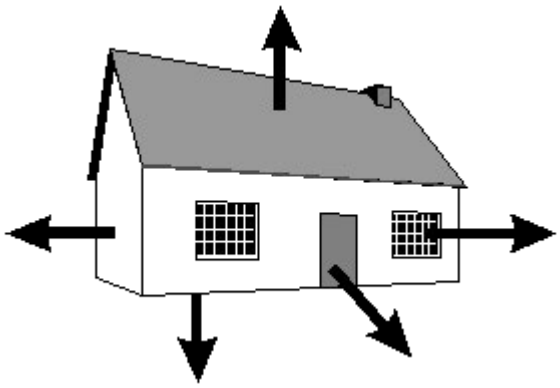
| coal | gas | oil | wood |
|---|---|---|---|

Which **one** of these types of fuel is renewable?

.....

**(1)**

(c) The diagram shows where heat energy is lost from a house.



(i) Complete the sentences by choosing the correct words from the box. Each word may be used once or not at all.

| conduction | conductor | convection | electric | evaporation | insulator |
|---|---|---|---|---|---|

The amount of heat energy lost through the windows by

..... can be reduced by using thick

curtains. The curtains trap a layer of air and air is a good

..... . The curtains will also stop

..... currents pulling cold air

into the room through small gaps in the window.

**(3)**

(ii) Write down **one** other way of reducing heat loss from a house.

.....

.....

**(1)**
**(Total 7 marks)**

**Q3.** People do a number of things to reduce the energy loss from their homes.

(a) Describe **one** thing they may do to cut down the energy loss through:

(i) the roof;

.....

**(1)**

(ii) the outside walls;

.....

**(1)**

(iii) the glass in the windows;

.....

**(1)**

(iv) gaps around the front and back doors.

.....

**(1)**

(b) A house is more difficult to keep warm in cold weather. What other type of weather makes it difficult to keep a house warm?

.....

**(1)**

**(Total 5 marks)**

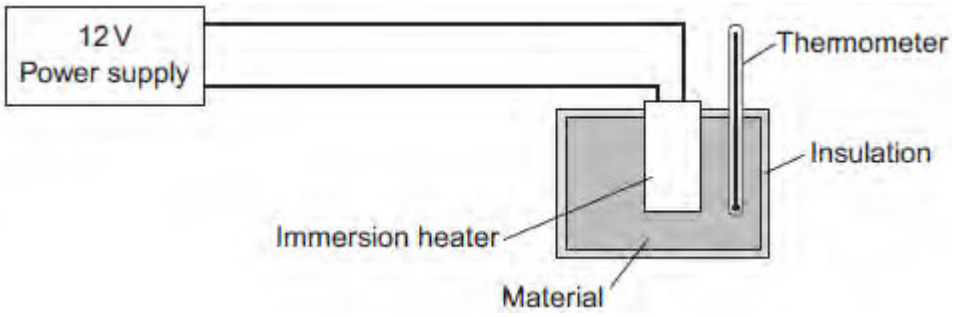
**Q4.** A student used the apparatus in **Figure 1** to compare the energy needed to heat blocks of different materials.

Each block had the same mass.

Each block had holes for the thermometer and the immersion heater.

Each block had a starting temperature of 20 °C.

**Figure 1**




The student measured the time taken to increase the temperature of each material by 5 °C.

(a) (i) State **two** variables the student controlled.

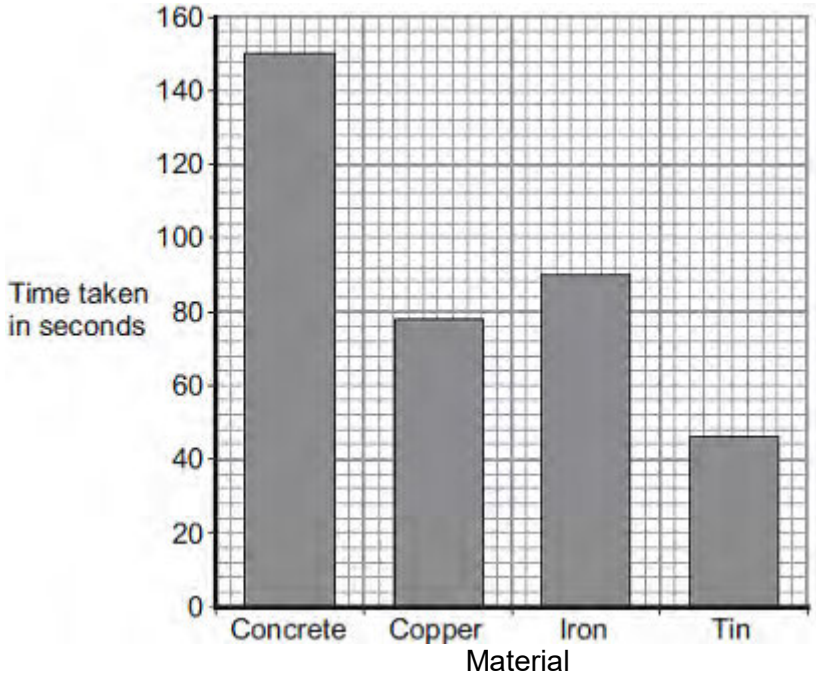
1 .....

2 .....

**(2)**

**Figure 2** shows the student's results.

**Figure 2**



(ii) Why was a bar chart drawn rather than a line graph?

.....

.....

**(1)**

(iii) Which material was supplied with the most energy?

.....

Give the reason for your answer.

.....

.....

**(2)**

(iv) The iron block had a mass of 2 kg.

Calculate the energy transferred by the heater to increase the temperature of the iron block by 5 °C.

The specific heat capacity of iron is 450 J / kg °C.

.....

.....

.....

Energy transferred = ..... J

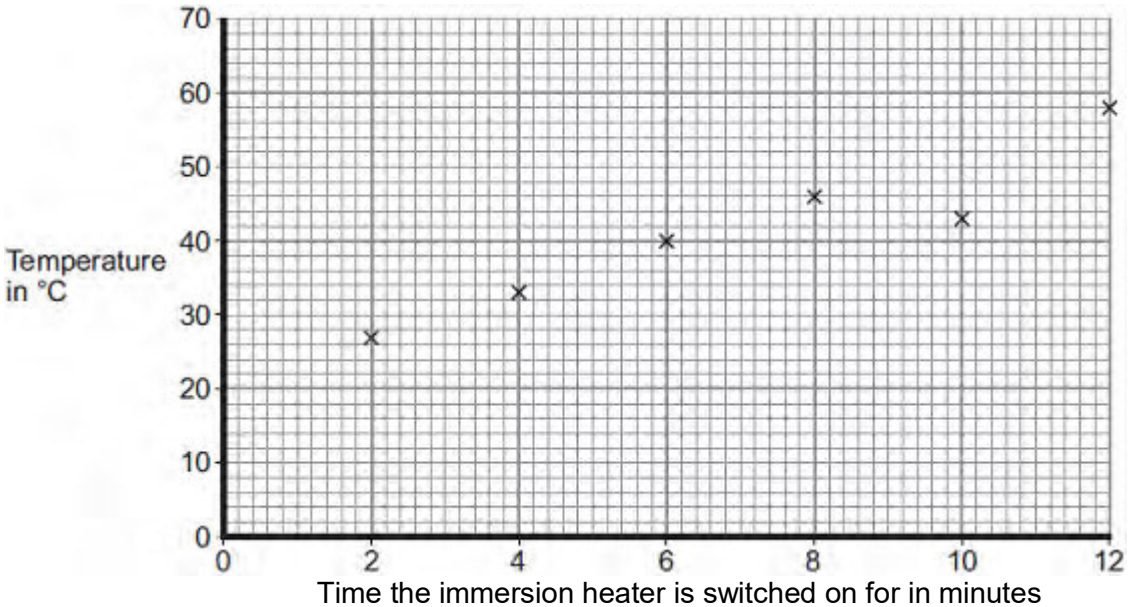
**(2)**

(b) The student used the same apparatus to heat a 1 kg block of aluminium.

He recorded the temperature of the block as it was heated from room temperature.

The results are shown in **Figure 3**.

**Figure 3**




(i) One of the student's results is anomalous.

Draw a ring around the anomalous result.

**(1)**

(ii) Draw the line of best fit for the points plotted in **Figure 3**.

**(1)**

(iii) What was the temperature of the room?

Temperature = ..... °C

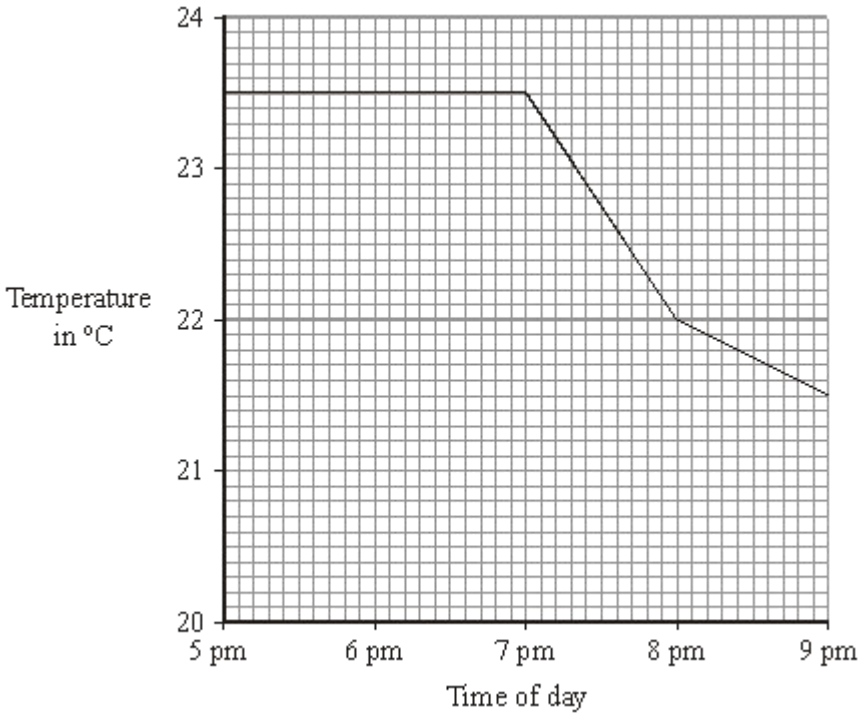
**(1)**

(iv) What was the interval of the time values used by the student?

Interval = ..... minutes

**(1)**
**(Total 11 marks)**

**Q5.** (a) The graph shows the temperature inside a flat between 5 pm and 9 pm. The central heating was on at 5 pm.




(i) What time did the central heating switch off?

.....

**(1)**

(ii) Closing the curtains reduces heat loss from the flat.

What time do you think the curtains were closed?

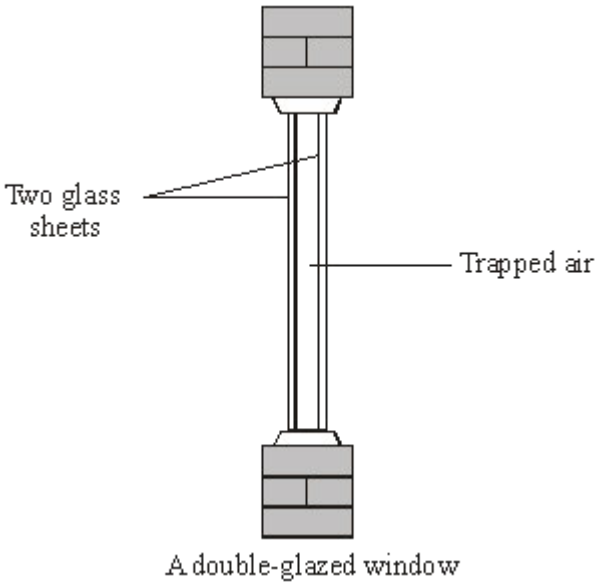
.....

Give a reason for your answer.

.....

**(2)**

(b) Less heat is lost through double-glazed windows than through single-glazed windows.




Complete the following sentences by choosing the correct words from the box. Each word may be used once or not at all.

| | | | | | |
|---|---|---|---|---|---|
| **conduction** | **conductor** | **convection** | **evaporation** | **insulator** | **radiation** |

Air is a good ..... . When trapped between two sheets of glass it reduces heat loss by ..... and .....

**(3)**

(c) The table gives information about three types of house insulation.

| Type of insulation | Cost to install | Money save each year on heating bills | Payback time |
|---|---|---|---|
| Double glazing | £4000 | £200 | 20 years |
| Loft insulation | £300 | £100 | 3 years |
| Cavity wallinsulation | £600 | £150 | |

(i) Use the information in the table to calculate the payback time for cavity wall insulation.

.....

**(1)**

(ii) Explain why people often install loft insulation before installing double glazing or cavity wall insulation.

.....

.....

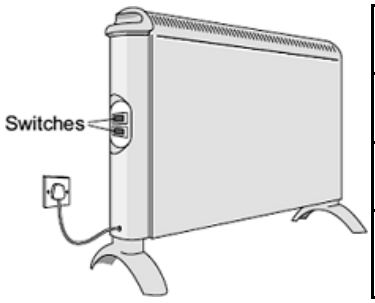
.....

.....

**(2)**

**(Total 9 marks)**

**Q6.** (a) The diagram shows two switches on a room heater. The heater has three power settings. The power produced by two of the settings is given in the table.




| Setting | Power in kW |
|---|---|
| Low | 0.5 |
| Medium | 1.5 |
| High | |

(i) When both switches are on, the heater works at the high power setting.

What is the power of the heater when it is switched to the **high** power setting?

.....

Power = ..... kW

**(1)**

(ii) The heater is used on the **medium** power setting. It is switched on for three hours.

Use the equation in the box to work out the energy transferred from the mains to the heater in three hours.

| | | | | |
|---|---|---|---|---|
| energy transferred (kilowatt-hour, kWh) | = | power (kilowatt, kW) | × | time (hour, h) |

Show clearly how you work out your answer.

.....

.....

Energy transferred = ..... kWh

**(2)**

(iii) Electricity costs 12 pence per kilowatt-hour.

Use the equation in the box to calculate how much the heater costs to use on **medium** power for three hours.

| total cost = number of kilowatt-hours × cost per kilowatt-hour |
|---|

Show clearly how you work out your answer.

.....

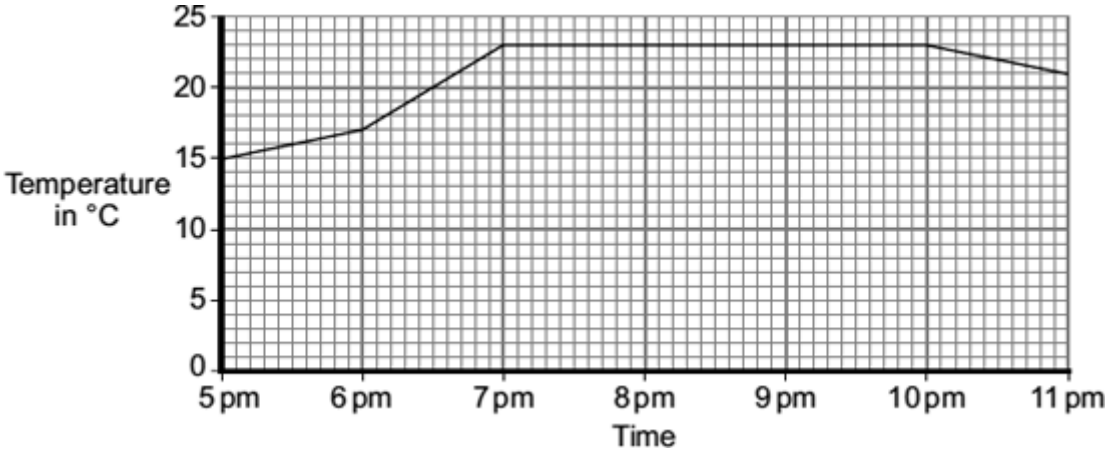
.....

Total cost = ..... pence

**(2)**

(b) The heater is used to warm a room.

The graph shows how the temperature of the room changes from the moment the heater is switched on.




The heater was first used on the medium setting.

(i) At what time was the heater setting changed to the **high** setting?

.....

Give a reason for your answer.

.....

.....

.....

**(2)**

(ii) From 7 pm until 10 pm, the temperature of the room is **not** changing.

Which **one** of the following statements gives the reason why the temperature of the room is **not** changing?

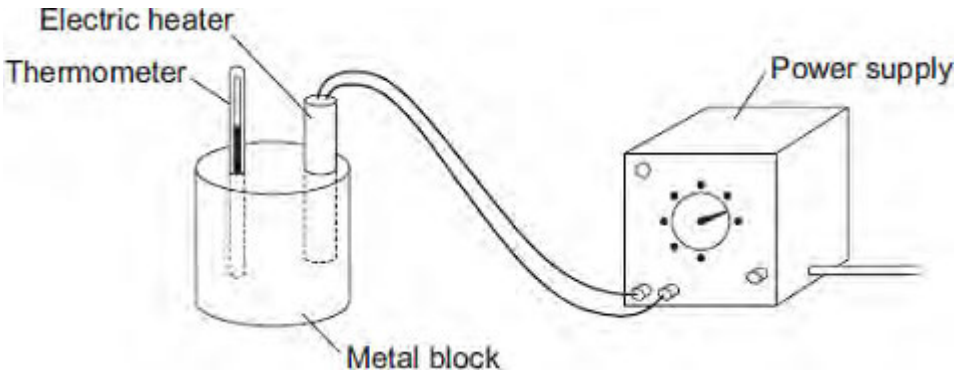
Put a tick (✓) in the box next to your answer.

The room is losing energy as fast as the heater supplies energy. ☐

The room is losing energy faster than the heater supplies energy. ☐

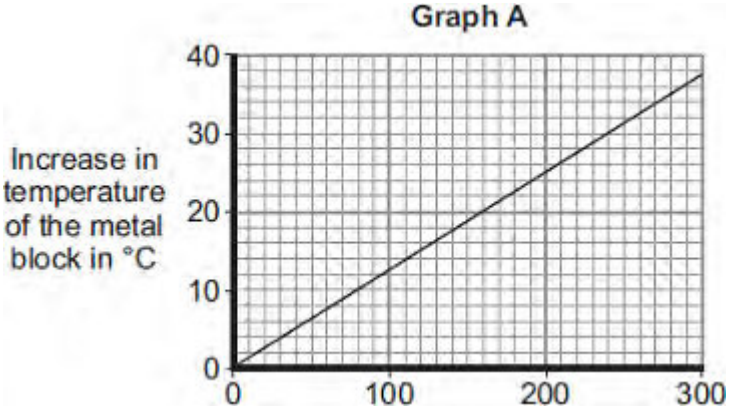
**(1)**
**(Total 8 marks)**

**Q7.**(a) A student used the apparatus drawn below to investigate the heating effect of an electric heater.




(i) Before starting the experiment, the student drew **Graph A**.

**Graph A** shows how the student expected the temperature of the metal block to change after the heater was switched on.




Describe the pattern shown in **Graph A**.

.....

.....

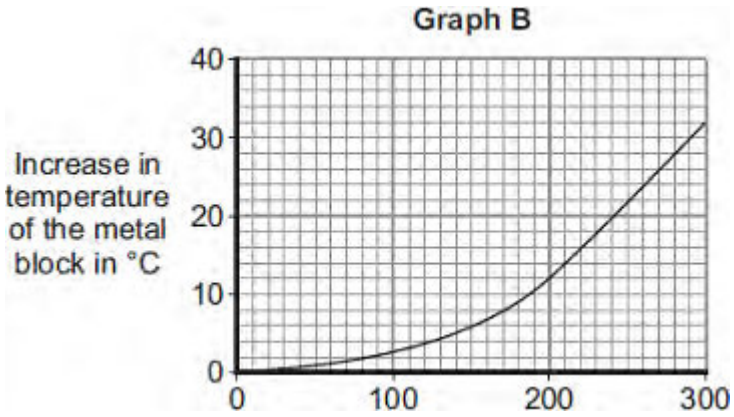
.....

.....

**(2)**

(ii) The student measured the room temperature. He then switched the heater on and measured the temperature of the metal block every 50 seconds.

The student calculated the increase in temperature of the metal block and plotted **Graph B**.




After 300 seconds, **Graph B** shows the increase in temperature of the metal block is lower than the increase in temperature expected from **Graph A**.

Suggest **one** reason why.

.....

.....

**(1)**

(iii) The power of the electric heater is 50 watts.

Calculate the energy transferred to the heater from the electricity supply in 300 seconds.

.....

.....

.....

Energy transferred = ..... J

**(2)**

(b) The student uses the same heater to heat blocks of different metals. Each time the heater is switched on for 300 seconds.

Each block of metal has the same mass but a different specific heat capacity.

| Metal | Specific heat capacity in J/kg°C |
|---|---|
| Aluminium | 900 |
| Iron | 450 |

| | |
|---|---|
| Lead | 130 |

Which **one** of the metals will heat up the most?

Draw a ring around the correct answer.

**aluminium** **iron** **lead**

Give, in terms of the amount of energy needed to heat the metal blocks, a reason for your answer.

.....

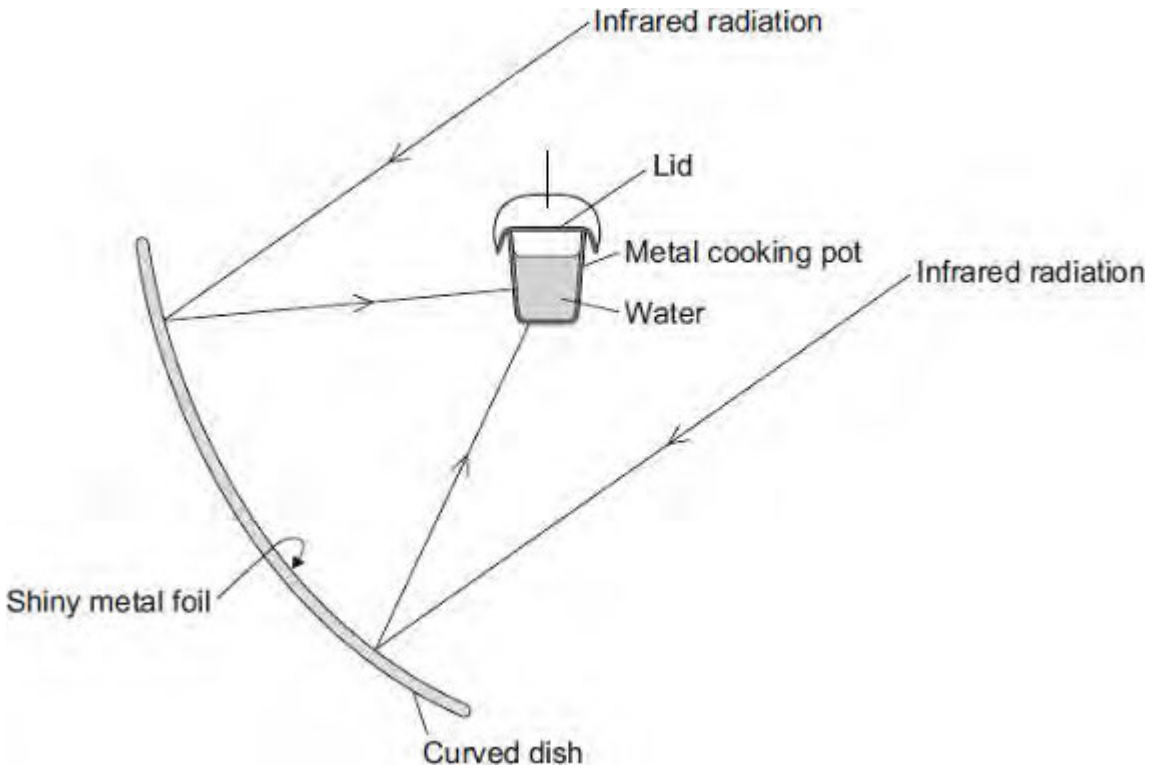
.....

.....

.....

**(2)**
**(Total 7 marks)**

**Q8.** The diagram shows the design of a solar cooker. The cooker heats water using infrared radiation from the Sun.




(a) Why is the inside of the large curved dish covered with shiny metal foil?

.....

.....

**(1)**

(b) Which would be the best colour to paint the outside of the metal cooking pot?

Draw a ring around the correct answer.

**black** **silver** **white**

Give a reason for your answer.

.....

.....

.....

**(2)**

(c) Why does the cooking pot have a lid?

.....

.....

**(1)**

(d) Calculate how much energy is needed to increase the temperature of 2 kg of water by 80 °C.

The specific heat capacity of water = 4200 J/kg °C.

.....

.....

.....

Energy = ..... J

**(2)**
**(Total 6 marks)**