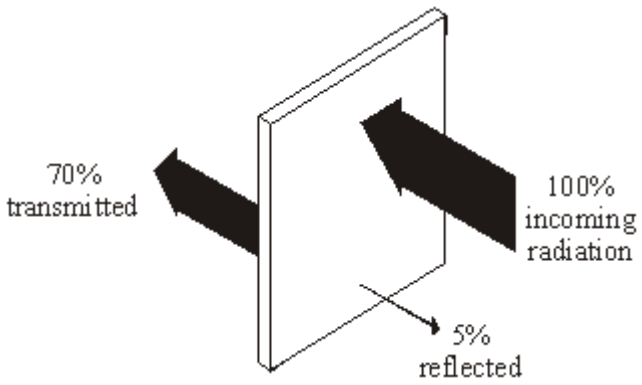
Q1. (a) Infra red radiation can be reflected, absorbed and transmitted by glass.



(i) What percentage of infra red is absorbed by the glass?

.....

(1)

(ii) Complete the following sentence by drawing a ring around the correct word or phrase.

Theabsorbed infra red	increases does not change decreases	the temperature of the glass.

(1)

(b) **Two** of the following statements are true. **One** of the statements is false.

Tick (✓) the boxes next to the **two** true statements.

All objectsabsorb infra red radiation.	
Blacksurfaces are poor emitters of infra red radiation.	
A hot objectemits more infra red than a cooler object.	

(1)

(c) The following statement is false.

Blacksurfaces are good reflectors of infra red radiation.

Change **one** word in this statement to make it true.

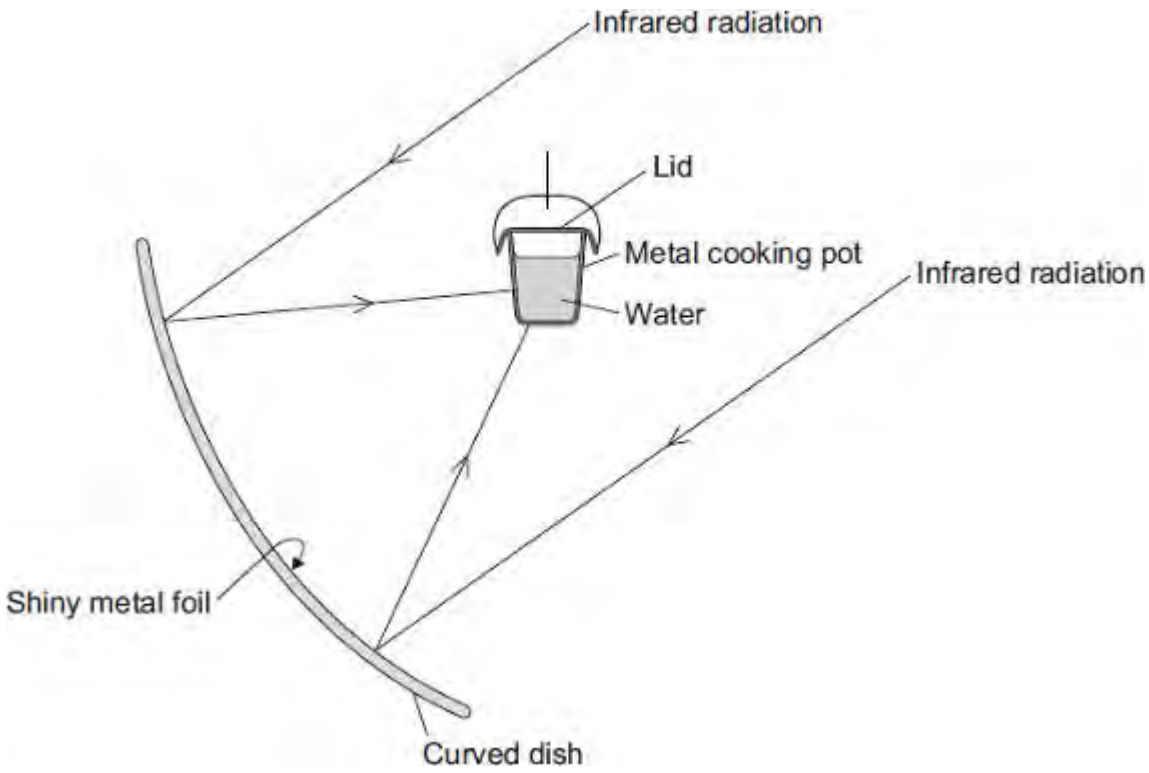
Write down your **new** statement.

.....

.....

(1)
(Total 4 marks)

Q2. 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.

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.....

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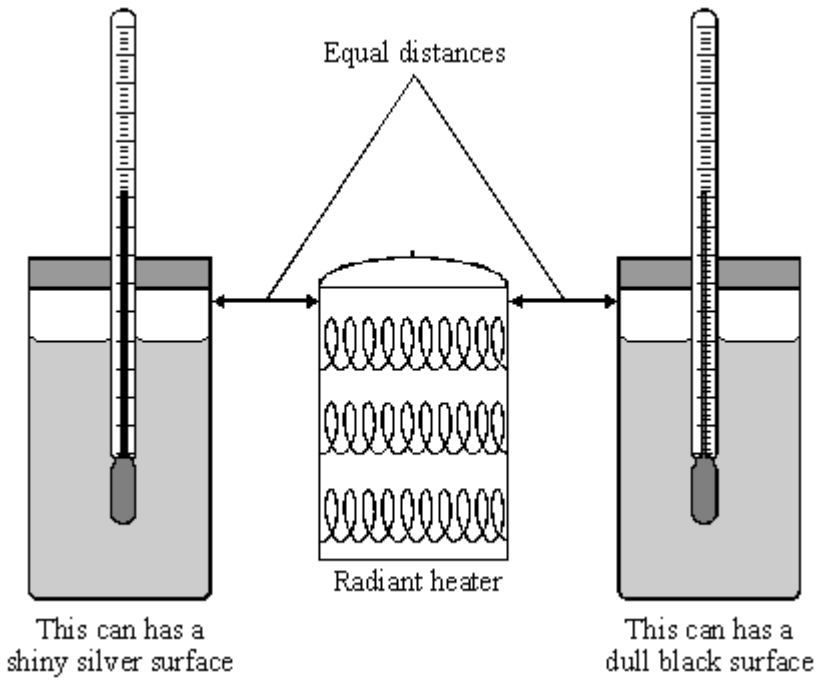
Energy = ... J

(2)
(Total 6 marks)

Q3. A student did two experiments on radiation. The apparatus he used is shown in the diagram.



Experiment 1

- The student put the same volume of cold water into the two cans.
- He then switched on the heater.
- Ten minutes later the water in the can with the dull black surface was much hotter than the water in the other can.

Experiment 2

- The student filled both cans with boiling water.
- This time he left the heater off.
- Ten minutes later the water in the can with the dull black surface was much cooler than the water in the other can.

Use words from the box to complete the sentences.

absorber	conductor	emitter	reflector

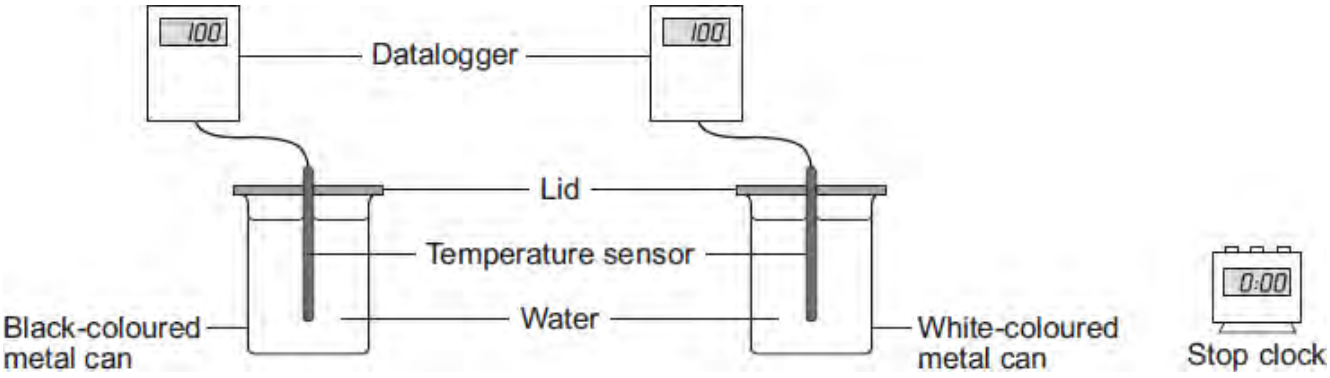
Experiment 1 shows that the dull black surface is a good ..... of radiation and that

the shiny silver surface is a good ..... of radiation.

Experiment 2 shows that the dull black surface is a good ..... of radiation.

(Total 3 marks)

Q4. The diagram shows the equipment a student used to investigate how the colour of a surface affects how fast it emits (gives out) heat.



An equal volume of boiling water was poured into each metal can. The student then recorded the temperature of the water in each can every minute for ten minutes.

(a) (i) Which of the following was a control variable in this investigation?

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

The volume of boiling water. ☐

The decrease in temperature of the water. ☐

The outside colour of the metal can. ☐

(1)

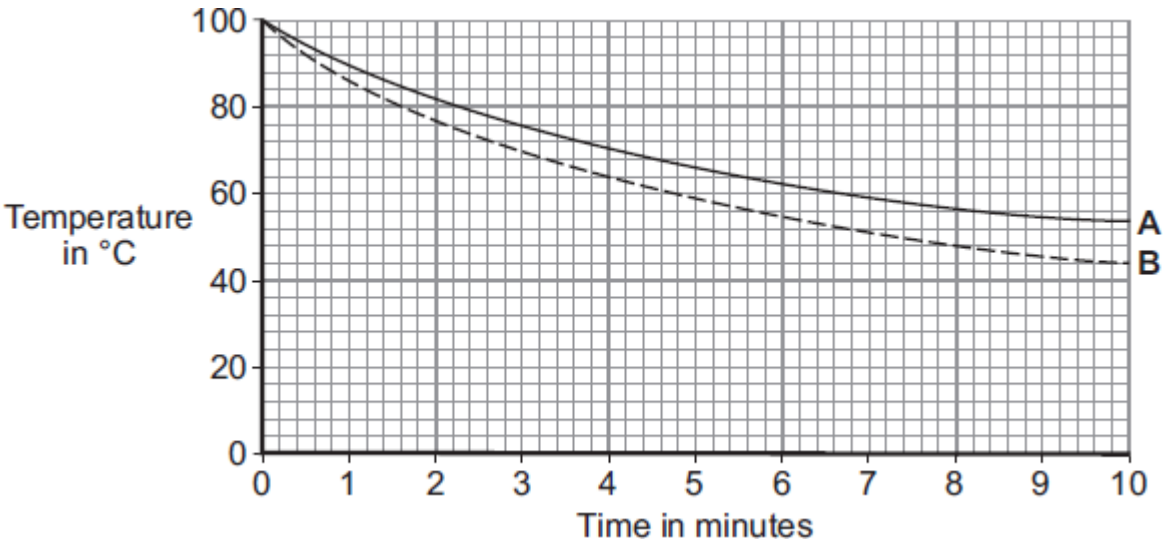
(ii) Give **one** advantage of using a temperature sensor and datalogger rather than a thermometer to measure the temperature of the water.

.....

.....

(1)

(b) The student's results for both cans are plotted on the graph.



Which line, **A** or **B**, shows how the temperature of the water inside the black-coloured metal can changed?

Draw a ring around your answer. **A** **B**

Explain the reason for your answer.

.....

.....

.....

.....

(2)

(c) Some gardeners make soil darker by digging black soot into the soil. Other gardeners use straw to protect plants from the cold.

(i) Complete the following sentence by drawing a ring around the correct line in the box.

On a warm day, the temperature of darker coloured soil will increase

slower than
as fast as
faster than

the temperature of lighter coloured soil.

(1)

(ii) Give a reason for your answer to part (c)(i).

.....

.....

(1)

(iii) The statement in the box is **false**.

Straw keeps plants warm by trapping air. | This is because air is a good conductor. |

Change **one** word in the statement to make the statement **true**.

Write down your **new** statement. The answer has been started for you.

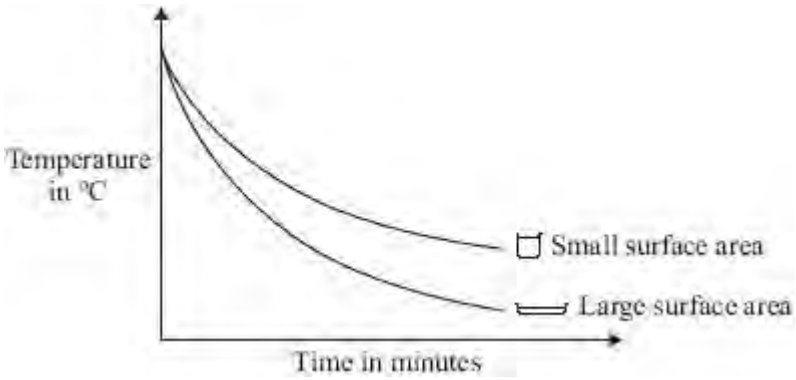
This is because air is a .....

(1)

(Total 7 marks)

Q5. (a) The graph compares how quickly hot water cooled down in two glass beakers with different surface areas.

The volume of water in each beaker was the same.



Describe how the surface area of the water affected how fast the water cooled down.

.....

.....

(1)

(b) Some foxes live in a hot desert environment.

This type of fox has very large ears.

Explain how the size of the fox's ears help it to keep cool in a hot desert.

.....

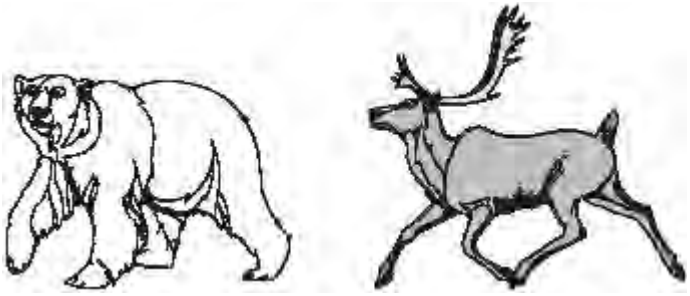
.....

.....

.....

(2)

(c) Polar bears and reindeer are adapted to live in cold environments.



Use the words in the box to complete the following sentences.

conduction	**convection**	**radiation**

(i) The white colour of a polar bear's fur helps to keep the polar bear warm by

reducing the heat lost by ..... .

(1)

(ii) The hairs of a reindeer are hollow. The air trapped inside the hairs reduces the

heat lost by ..... .

(1)
(Total 5 marks)

Q6. (a) Use the words from the box to complete the following sentences.

conduction	convection	radiation

(i) The transfer of thermal energy (heat) by the movement of hot liquids

is called ..... .

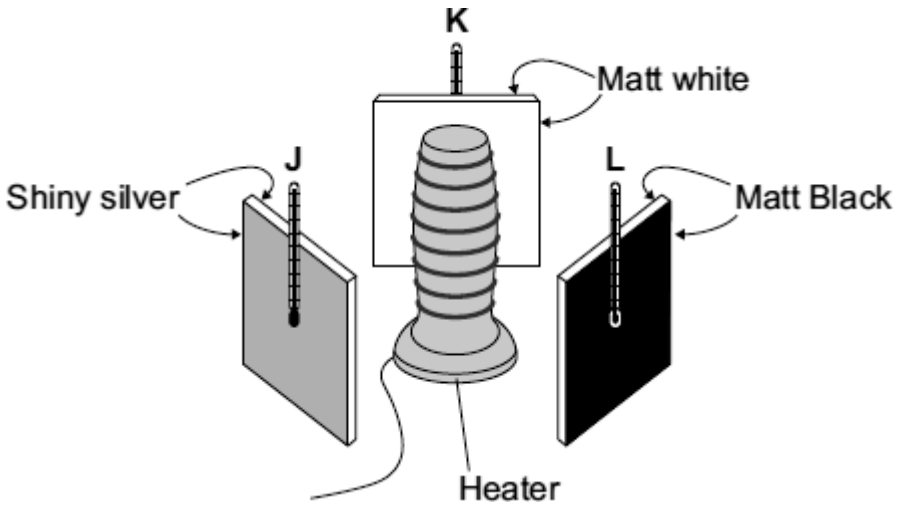
(1)

(ii) The transfer of thermal energy (heat) from one particle to another

is called ..... .

(1)

(b) A student set up the following equipment. The 3 metal plates are the same distance from the heater. The surfaces of each of the 3 metal plates are different colours.



The student switched the heater on for 10 minutes. The thermometers were read before the heater was switched on. The thermometers were read again just after the heaters were switched off.
The readings are shown in the table.

	Temperature before switching on in °C	Temperature after switching on in °C
1	19	21
2	19	29

3	19	23

(i) Which set of readings, **1**, **2** or **3**, is most likely to have been taken from the thermometer labelled **L**?

.....

Give a reason for your answer.

.....

.....

(2)

(ii) Which **one** of the following was **not** a control variable in this experiment?

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

the distance between the heater and the metal plates ☐

the power of the heater ☐

the temperature before the heater was switched on ☐

the colour of the metal plates ☐

(1)

(iii) Suggest **one** advantage of using a temperature sensor, data logger and computer, rather than a thermometer to carry out this experiment.

.....

.....

(1)

(c) The picture shows a fire fighter putting out a forest fire. The fire fighter's clothing has thick thermal padding inside and a light coloured, fire proof, shiny layer outside.

(i) What is the main way that heat is transferred through the air from the fire to the fire fighter?

.....

.....

(1)

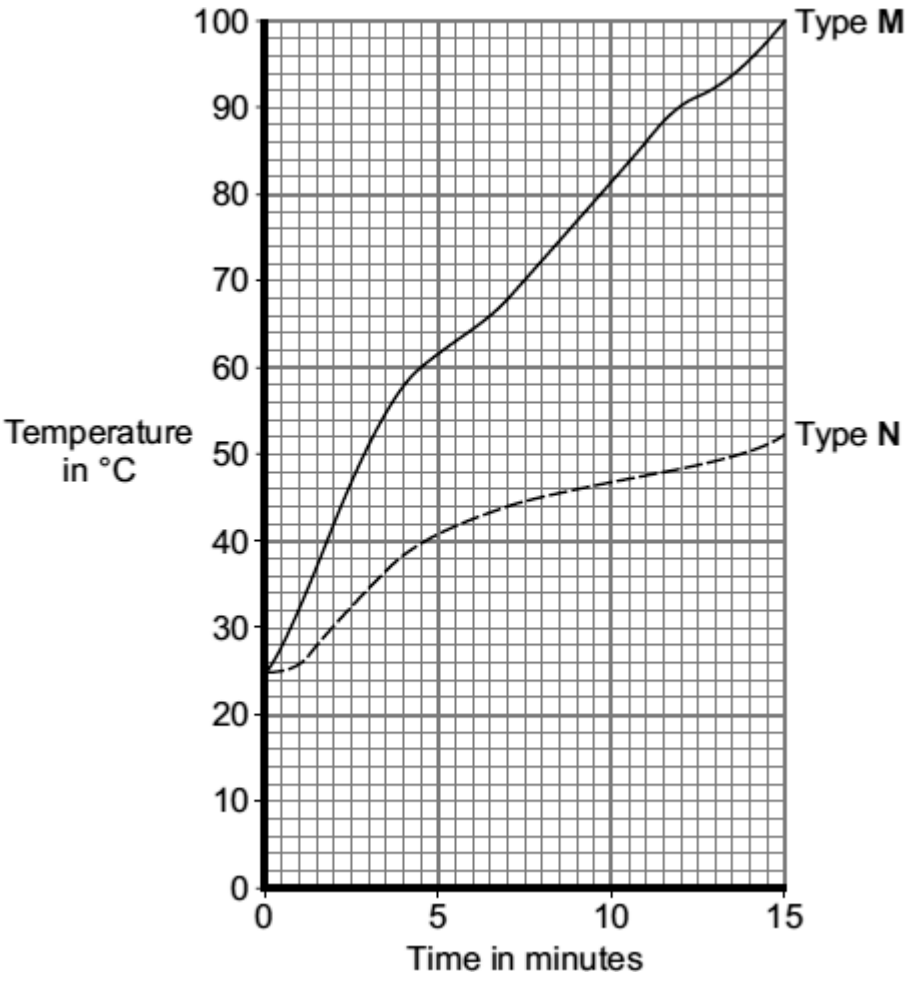
(ii) Why is the outside layer of the clothing shiny?

.....

.....

(1)

(d) The graph shows the result of a laboratory test on two types of thermal padding. Each type of padding was put onto a very hot metal surface and the temperature inside the padding was taken every minute.



Which type of padding, **M** or **N**, would it be best to use inside the fire fighter's clothing?

.....

Give a reason for your answer.

.....

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(1)
(Total 9 marks)