Thermal Properties and Temperature – 2019 Nov IGCSE

1. 0625/33/O/N/19/No.5

(a) The arrows on Fig. 5.1 represent changes of state.

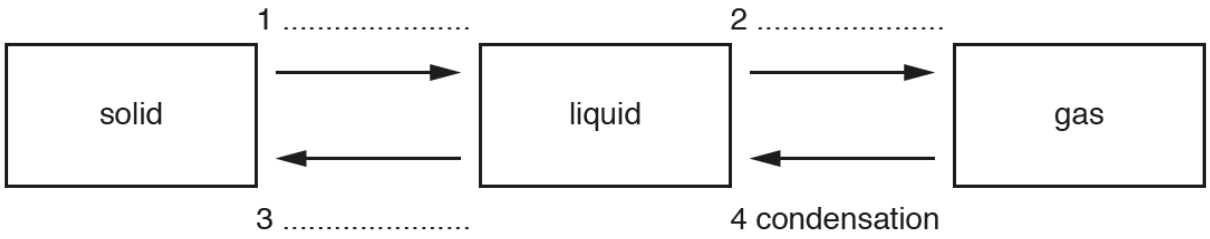

Fig. 5.1

One of the arrows is labelled. Label each of the other arrows with the correct change of state. Write the change of state on the dotted lines next to each arrow. [3]

(b) A beaker contains some liquid with a low boiling point. The beaker is placed onto a small amount of water, as shown in Fig. 5.2.

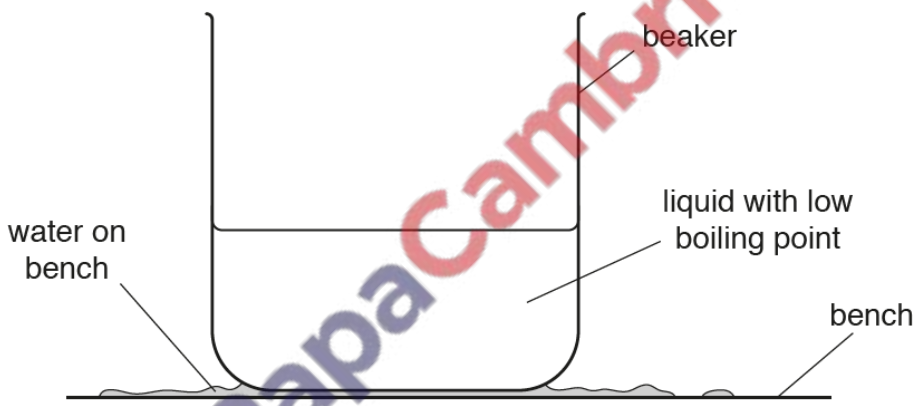

Fig. 5.2

The liquid in the beaker evaporates quickly. The water on the bench cools and turns to ice.

Explain why the water cools.

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.....

.....

.....

..... [3]

[Total: 6]

2. 0625/33/O/N/19/No.7

(a) Complete the sentences. Add the missing word to each of the blank spaces.

The unit of temperature is called the ..... .

The physical property that varies with temperature in a liquid-in-glass thermometer is the ..... of the liquid.

[2]

(b) A student has a thermometer without a marked scale.
To produce a scale for the thermometer, the student must use two fixed points.
Give the temperature value for each fixed point and describe what happens to water at each of these temperatures.

Lower fixed point .....

.....

Upper fixed point .....

.....

[4]

[Total: 6]

3. 0625/41/O/N/19/No.6

Fig. 6.1 shows a shower that takes in cold water. The water passes through an electric water heater and emerges from the showerhead at a higher temperature.

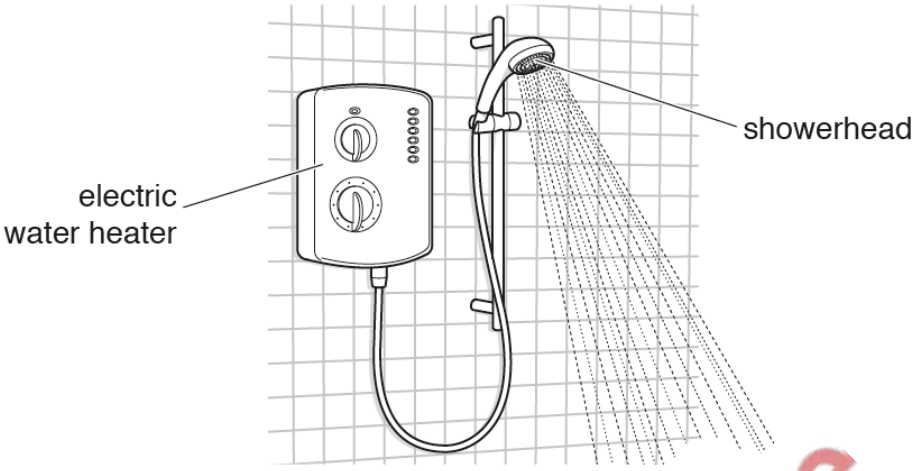

Fig. 6.1

The power of the heater is 9000 W.

(a) The shower is powered by a 230 V electricity supply.

(i) Calculate the current in the heater when it is switched on.

current = ... [2]

(ii) Suggest a suitable rating for the fuse in the heater circuit.

fuse rating = ... [1]

(b) The specific heat capacity of water is 4200 J / (kg °C). The initial temperature of the cold water is 16 °C.

Determine the maximum mass of water that can be heated to a temperature of 35 °C in 1.0 s.

mass = ... [4]

(c) A safety control in the shower switches off the shower when the water becomes dangerously hot. The control uses a thermocouple thermometer to measure the temperature of the heated water.

(i) Describe the structure of a thermocouple thermometer. Include a diagram in your answer.

.....

.....

..... [2]

(ii) Suggest **one** reason why a thermocouple thermometer is suitable for this purpose.

.....

..... [1]

[Total: 10]

4. 0625/42/O/N/19/No.4

(a) A student carries out an experiment to determine the thermal capacity of a metal block. The block is heated by an electric heater for 23 minutes. The current in the heater is 3.0 A at a potential difference (p.d.) of 12 V.
The temperature of the block rises from 20 °C to 70 °C.

Calculate the thermal capacity of the block.

thermal capacity = ... [4]

(b) **1.** Two metal spheres of different diameters are heated to 900 °C in a hot oven. The two spheres are removed from the oven.

State and explain any difference in the initial rates of emission of radiation of thermal energy between the two spheres.

.....

.....

.....

2. One hot sphere is now heated in a hotter oven.

State and explain any effect on the rate of emission of radiation of thermal energy from that sphere when it is removed from the hotter oven.

.....

.....

[3]

[Total: 7]

5. 0625/43/O/N/19/No.5

An electric kettle contains water at a temperature of 19 °C. The kettle has a power rating of 3.0 kW and is switched on for 3.5 minutes.

(a) Calculate the energy supplied to the kettle by the electricity supply.

electrical energy = ... [3]

(b) At 3.5 minutes, the temperature of the water reaches 100 °C. The volume of the water in the kettle is 1700 cm^3 and its density is 1.0 g/cm^3. The specific heat capacity of water is 4200 J/(kg °C).

Calculate the thermal energy gained by the water.

thermal energy = ... [5]

(c) Calculate the efficiency of the kettle.

efficiency = ... [2]

[Total: 10]