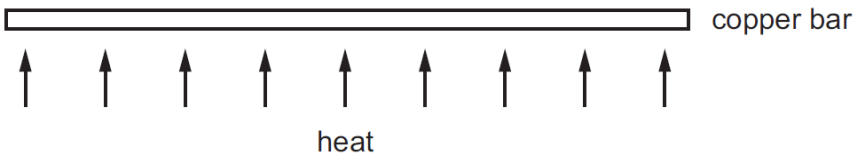
The Properties and Temperature – 2021 IGCSE 0625

1. Nov/2021/QPaper_11,12 &13/No.14

A long, thin bar of copper is heated gently and evenly along its length.



What happens to the bar?

A It becomes less heavy.

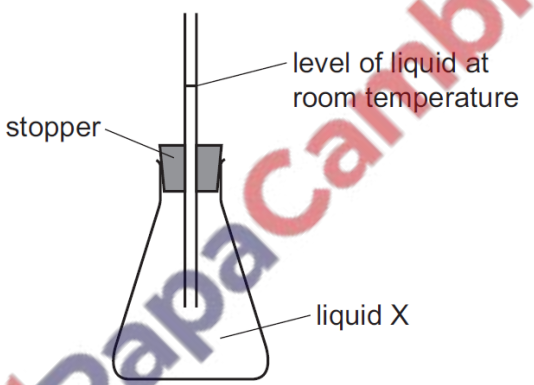
B It becomes longer.

C It becomes shorter.

D It bends at the ends.

2. Nov/2021/QPaper_11/No.15

The diagram shows a flask which has been filled with liquid X at room temperature.



When the flask is placed in warm water, the liquid rises higher up the tube. When the flask is put in cold water, the liquid drops below the original level in the tube.

The experiment is repeated using an identical flask but a different liquid Y. The initial level of the liquid in the tube is the same as that in the original experiment.

Liquid Y expands more, per degree increase in temperature, than liquid X.

Which row is correct for the level of the liquid?

	rises most in warm water	falls most in cold water
A	X	X
B	X	Y
C	Y	X
D	Y	Y

3. Nov/2021/QPaper_12,13,21,22&23/No.12

A liquid is evaporating. The liquid is not boiling.

Which statement about the liquid is correct at an instant in time?

A Any molecule can escape, and from any part of the liquid.

B Any molecule can escape, but only from the liquid's surface.

C Only molecules with enough energy can escape, and only from the liquid's surface.

D Only molecules with enough energy can escape, but from any part of the liquid.

4. Nov/2021/QPaper_12/No.13

The temperature of the gas in a sealed container of constant volume decreases from 20 °C to 12 °C.

Which row is correct?

	pressure of the gas in the container	average speed of the molecules of gas
A	decreases	decreases
B	stays the same	increases
C	increases	stays the same
D	stays the same	decreases

5. Nov/2021/QPaper_12/No.15

A teacher makes the statement, 'Object P has a higher thermal capacity than object Q.'

What does this statement mean?

A Object P has a higher melting point than object Q.

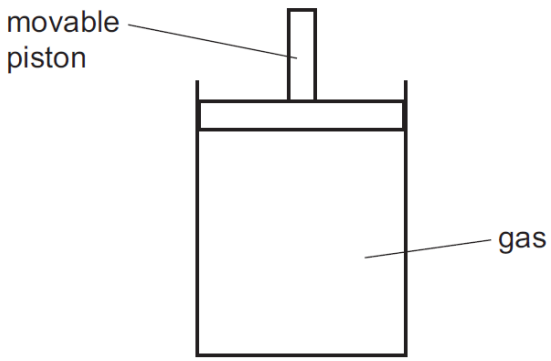
B Object P has a lower melting point than object Q.

C The increase in temperature of object P is greater than that of object Q for the same increase in internal energy.

D The increase in temperature of object P is smaller than that of object Q for the same increase in internal energy.

6. Nov/2021/QPaper_13/No.13

The diagram shows a sealed gas cylinder with a movable piston.



The piston is moved slowly downwards and there is no change in temperature of the gas.

What happens to the average distance between the gas molecules and to the pressure of the gas?

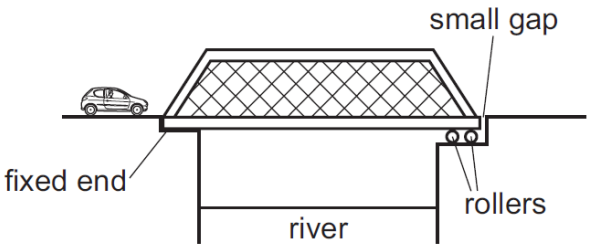
	average distance between gas molecules	pressure of gas in cylinder
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

7. Nov/2021/QPaper_13/No.15

The diagrams show four examples of thermal expansion. In three of the examples, thermal expansion is useful. In one of the examples, expansion is unwanted and has to be allowed for.

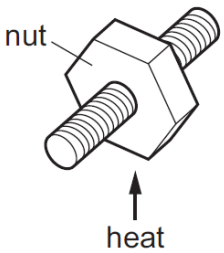
In which example is thermal expansion unwanted?

A



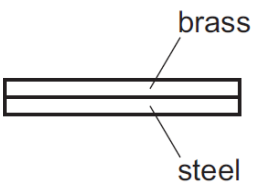
a bridge getting
longer in hot weather

B



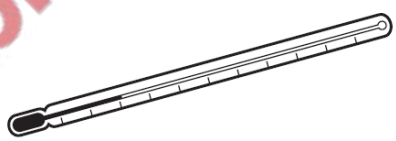
loosening a very
tight nut by heating it

C



a bimetallic strip
to indicate temperature

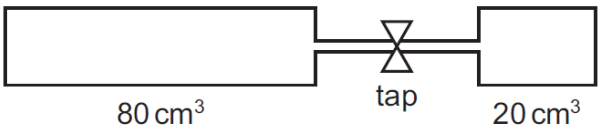
D



liquid-in-glass
thermometer

8. Nov/2021/QPaper_21/No.13

The diagram shows two cylinders connected by a narrow tube fitted with a tap.



One cylinder contains 80 cm^3 of gas at a pressure of 2.0×10^5 Pa. The other cylinder contains a vacuum.

The volume of the evacuated cylinder is 20 cm^3. The tap is opened so that the gas can flow to fill both cylinders.

The temperature of the gas remains constant.

What is the new pressure of the gas?

A 0.50×10^5 Pa

B 1.6×10^5 Pa

C 2.5×10^5 Pa

D 8.0×10^5 Pa

9. Nov/2021/QPaper_21,22&23/No.14

An aluminium block has a mass of 200 g.

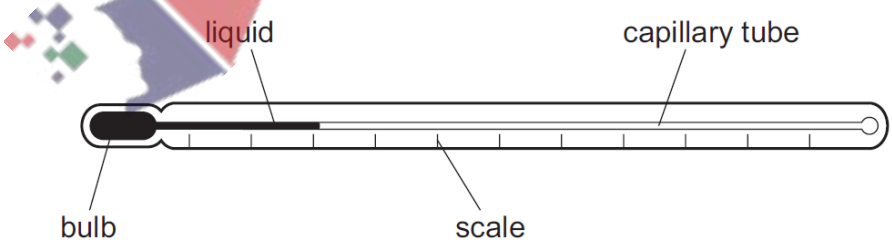
The specific heat capacity of aluminium is 900 J / (kg °C).

How much energy is needed to increase the temperature of the block from 20 °C to 110 °C?

A 2.0 J **B** 2000 J **C** 16 200 J **D** 16 200 000 J

10. Nov/2021/QPaper_21/No.15

The diagram shows a liquid-in-glass thermometer.



Which change to the design would result in a more sensitive thermometer?

A Increase the density of the liquid.

B Increase the diameter of the capillary tube.

C Increase the number of scale markings.

D Increase the volume of the bulb.

11. Nov/2021/QPaper_22/No.13

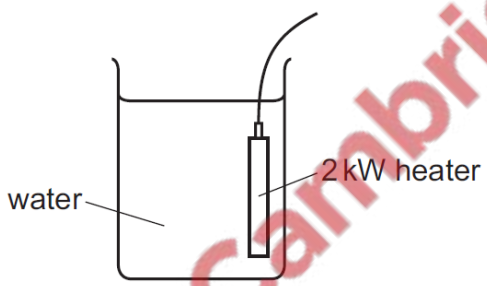
A gas is contained in a sealed container in a laboratory. The temperature of the gas increases.

What happens to the average speed and what happens to the total kinetic energy of the gas molecules?

	average speed	total kinetic energy
A	does not change	does not change
B	does not change	increases
C	increases	does not change
D	increases	increases

12. Nov/2021/QPaper_22/No.15

The diagram shows the apparatus used to measure the specific latent heat of vaporisation of water.



After the water begins to boil, 110 g of water is converted to steam in 120 s.

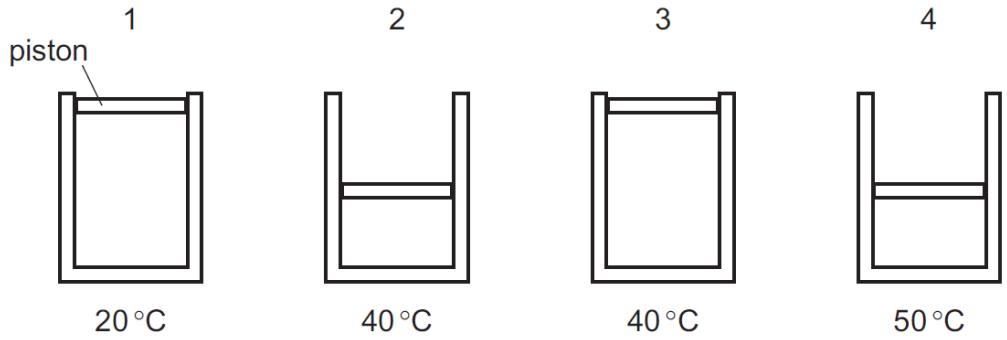
Using these results, what is the value of the specific latent heat of vaporisation of water?

A 1.8 J / kg **B** 1800 J / kg **C** 2200 J / kg **D** 2 200 000 J / kg

13. Nov/2021/QPaper_23/No.13

The same mass of a gas is trapped in four identical cylinders by a piston that can move.

The diagrams show the samples of gas in different conditions of volume and temperature.



Which list gives the pressure of the gas in order from lowest to highest?

A 1 → 2 → 3 → 4

B 1 → 3 → 2 → 4

C 4 → 2 → 3 → 1

D 4 → 3 → 2 → 1

14. Nov/2021/QPaper_23/No.15

A solid and a gas are each given the same increase in temperature. The gas is kept at a constant pressure.

Which row is correct?

	the one which expands most	the reason
A	the gas	molecules in the gas each expand more than the solid molecules
B	the gas	the molecules in the solid are held strongly together
C	the solid	molecules in the solid each expand more than the gas molecules
D	the solid	all the molecules in the gas are separate from one another

15.

16. Nov/2021/QPaper_31/No.4

(a) A substance cools from 50 °C to 5.0 °C. Its melting point is 20 °C. The substance takes 30 minutes to cool from 50 °C to its melting point.

The substance takes a total time of 80 minutes to cool from 50 °C to 5.0 °C.

On Fig. 4.1, sketch a graph that shows how the temperature of the substance varies with time as it cools from 50 °C to 5.0 °C.

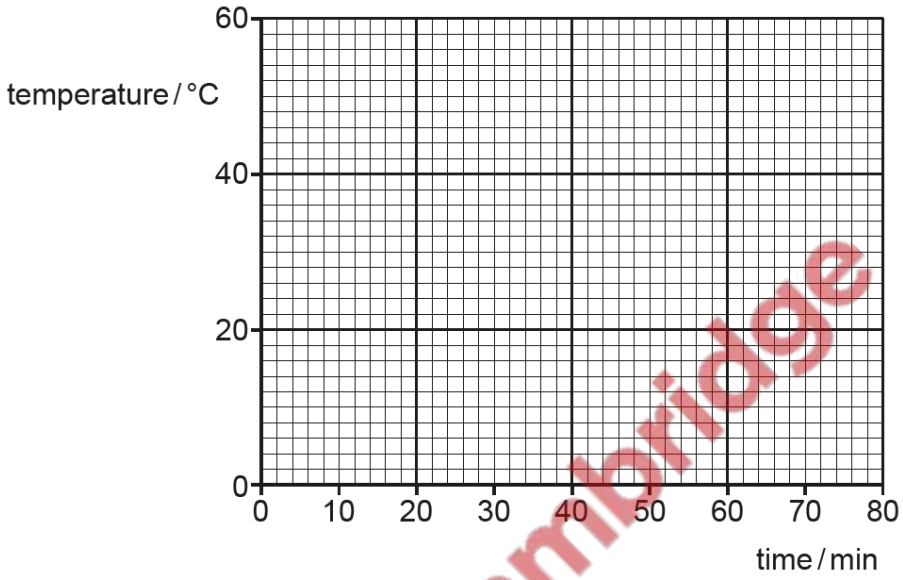


Fig. 4.1

[4]

(b) Describe the arrangement and motion of the molecules in the substance when they are in the solid state.

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..... [2]

[Total: 6]

17. Nov/2021/QPaper_32/No.7

(a) Fig. 7.1 shows a candle underneath a thin, metal fan.

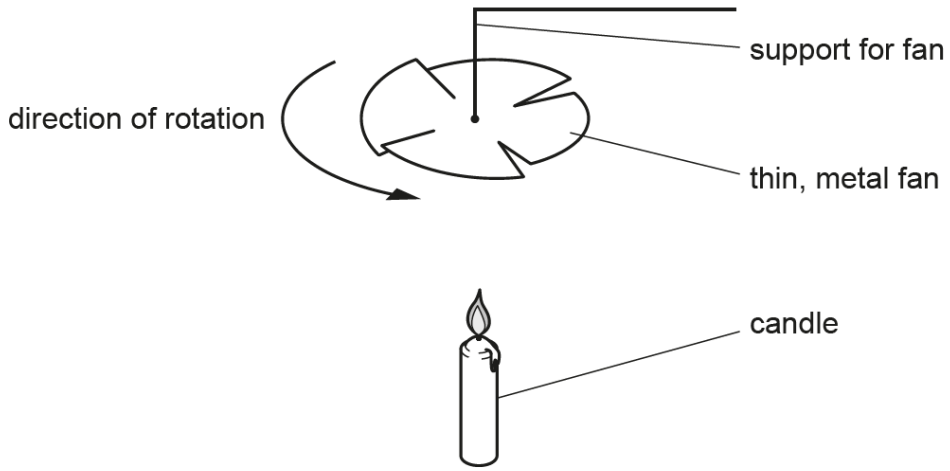

Fig. 7.1

When the candle starts to burn, the fan starts to rotate around its support.

Explain what causes the fan to rotate.

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..... [3]

(b) Fig. 7.2 shows a bimetallic strip. It is made of two metals, steel and copper, fastened together.

The bimetallic strip is straight when the temperature is 25 °C.

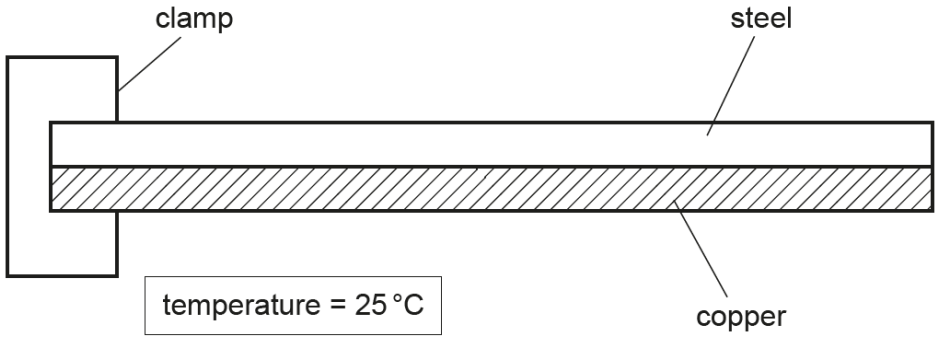

Fig. 7.2

Fig. 7.3 shows the bimetallic strip when the temperature is 40 °C.

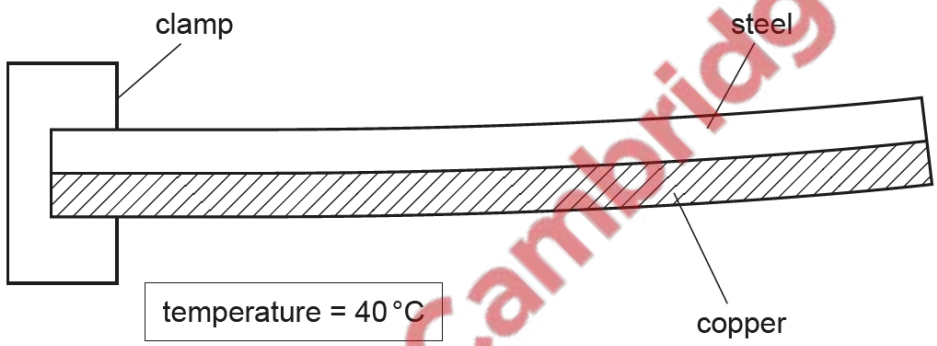

Fig. 7.3

(i) Draw the bimetallic strip when the temperature is 10 °C.

[1]

(ii) The bimetallic strip is used in a circuit, as shown in Fig. 7.4. The circuit is in a room.

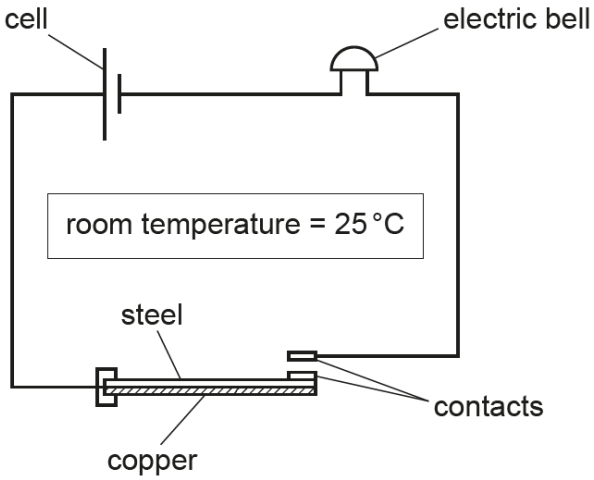

Fig. 7.4

The room temperature is 25 °C.

State and explain any changes in the circuit as the temperature of the room rises above 40 °C.

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..... [2]

[Total: 6]

18. Nov/2021/QPaper_33/No.6

(a) In Fig. 6.1, the circles represent molecules. The diagram shows the arrangement of the molecules in a liquid.

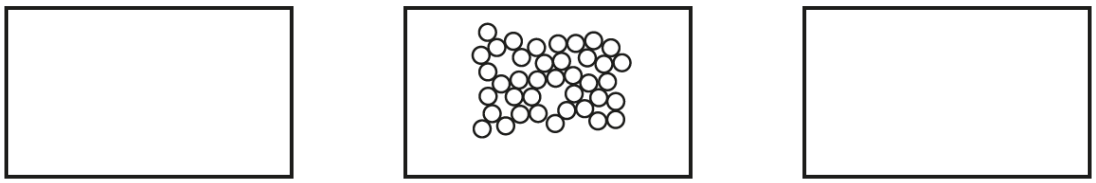

Fig. 6.1

(i) Show the arrangement of the molecules in a solid.

Draw a diagram in the box above the word 'solid' in Fig. 6.1. Draw at least **10** molecules. [2]

(ii) Show the arrangement of the molecules in a gas.

Draw a diagram in the box above the word 'gas' in Fig. 6.1. Draw at least **10** molecules. [2]

(iii) State the name of the process by which a solid changes into a liquid.

..... [1]

(iv) State the name of the process by which a gas changes into a liquid.

..... [1]

(b) Fig. 6.2 shows a microscope used for viewing smoke particles in a small glass box. A bright light shines into the box.

The box contains smoke particles and air molecules.

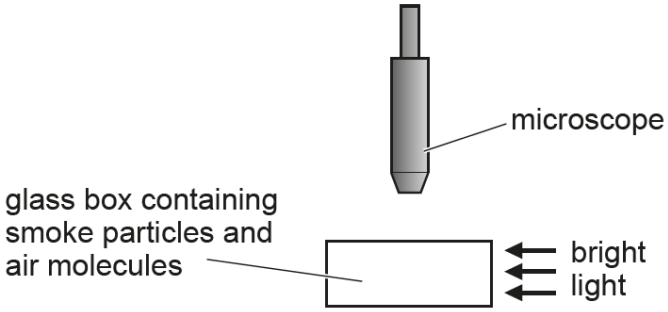

Fig. 6.2

A student views the smoke particles through the microscope.

The smoke particles are moving.

(i) State the name given to the movement of the smoke particles.

..... [1]

(ii) Fig. 6.3 shows a smoke particle as seen with the microscope.

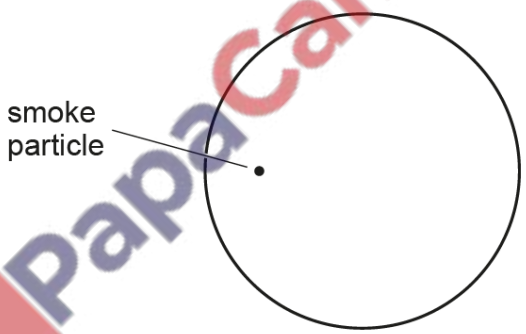

Fig. 6.3

Show how the smoke particle moves by drawing a series of lines on Fig. 6.3. [2]

(iii) The temperature in the glass box decreases.

Describe any changes in the movement of the smoke particles.

..... [1]

[Total: 10]

19. Nov/2021/QPaper_41/No.2

A student carries out an experiment using a plastic beaker that contains 0.24 kg of water at 17 °C. The thermal capacity (heat capacity) of the beaker is negligible.

(a) Define *thermal capacity*.

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.....

..... [2]

(b) Several ice cubes are at a temperature of 0 °C. The ice cubes are dropped into the water and the internal energy of the water decreases.

(i) Give a simple molecular account of this decrease in internal energy.

.....

.....

..... [2]

(ii) The specific heat capacity of water is 4200 J / (kg °C).

Calculate the decrease in the internal energy of the water as its temperature decreases from 17 °C to 0 °C.

decrease in internal energy = ... [2]

(c) As the temperature of the water decreases, some of the ice melts.

(i) Explain why this ice melts.

.....

.....

..... [2]

(ii) Describe how to determine the specific latent heat of fusion of ice using this experiment. State any other measurements that the student needs to make.

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.....

.....

..... [3]

[Total: 11]

20. Nov/2021/QPaper_41/No.3

Fig. 3.1 shows a balloon inflated with air.

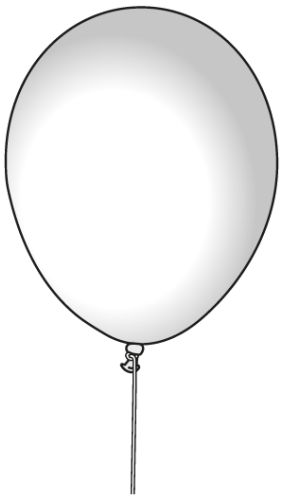

Fig. 3.1

The pressure of the air at the inner surface of the balloon keeps the rubber stretched.

(a) Explain, in terms of the momentum of the molecules, why there is a pressure at the inner surface of the balloon.

.....

.....

.....

..... [3]

(b) The volume of the air in the balloon is 630 cm^3 and the pressure of the air in the balloon is 1.0×10^5 Pa.

The balloon is tied to a heavy stone and dropped into a lake. The balloon is pulled down quickly and the temperature of the air inside does **not** change.

(i) Calculate the volume of the air when the pressure of the air is 1.4×10^5 Pa.

volume = ... [2]

(ii) The balloon and stone stop moving when the stone hits the bottom of the lake. The temperature of the air now begins to decrease.

Explain why the volume of the air in the balloon decreases as the temperature decreases.

.....

.....

.....

..... [2]

[Total: 7]

21. Nov/2021/QPaper_42/No.5

(a) A thermocouple thermometer is used to determine the temperature difference between a mixture of ice and water and liquid mercury at approximately 600 °C.

Complete Fig. 5.1 with a labelled diagram to show how the thermocouple thermometer can be used in this way.

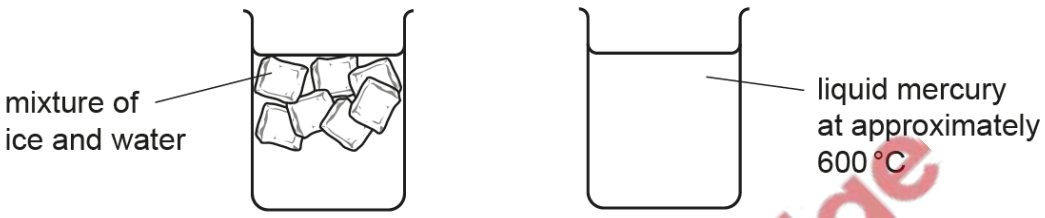

Fig. 5.1

[3]

(b) State **two** other physical properties that can be used to measure temperature.

1 .....

2 .....

[2]

(c) State **two** benefits of using a thermocouple thermometer instead of a liquid-in-glass thermometer.

1 .....

2 .....

[2]

[Total: 7]

22. Nov/2021/QPaper_43/No.5

(a) An aluminium saucepan and a steel saucepan have the same dimensions. Table 5.1 shows the values of the specific heat capacity and the density of aluminium and of steel.

Table 5.1

metal	specific heat capacity / J/(kg °C)	density / kg/m^3
aluminium	0.91	2600
steel	0.50	7600

The mass of the aluminium saucepan is 0.41 kg.

(i) Calculate the mass of the steel saucepan.

mass = ... [2]

(ii) Calculate the thermal capacity of the aluminium saucepan.

thermal capacity = ... [2]

(iii) Water is heated in the steel saucepan. The initial temperature of the water and the saucepan is 20 °C.

Calculate the energy transfer needed to raise the temperature of the steel saucepan to 100 °C.

energy = ... [2]

(b) Explain why metals are better thermal conductors than non-metals.

..... [2]

[Total: 8]