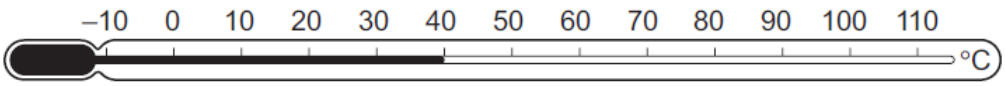
The Properties and Temperature – 2020 IGCSE 0625

1. March/2020/Paper_12/No.16

Which points are the fixed points of the liquid-in-glass thermometer shown?



A the beginning and end points of the column of liquid

B the points marked –10 °C and 110 °C

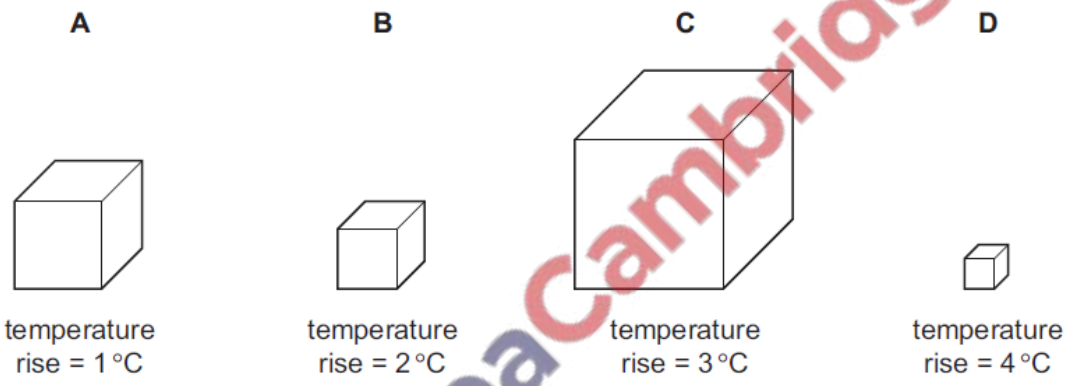
C the points marked 0 °C and 100 °C

D the top and bottom points of the thermometer bulb

2. March/2020/Paper_12/No.17

Four different metal blocks are given the same quantity of thermal energy.

Which block has the greatest thermal capacity?

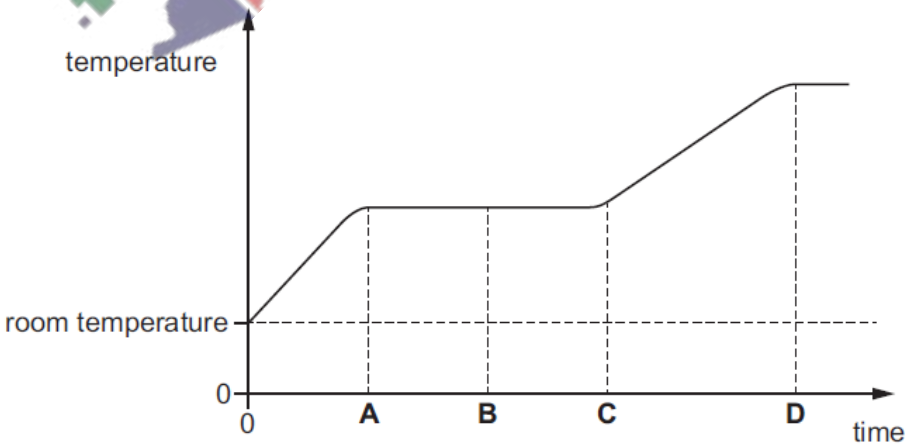


3. March/2020/Paper_12/No.18

A solid is heated from room temperature.

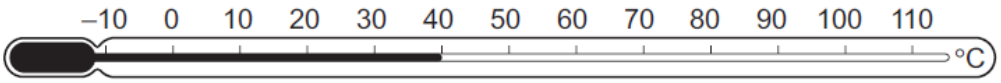
The graph shows how its temperature changes with time as it is heated constantly.

At which time has it just become completely liquid?



4. March/2020/Paper_22/No.18

Which points are the fixed points of the liquid-in-glass thermometer shown?



A the beginning and end points of the column of liquid

B the points marked –10 °C and 110 °C

C the points marked 0 °C and 100 °C

D the top and bottom points of the thermometer bulb

5. March/2020/Paper_22/No.19

The specific heat capacities of aluminium, iron, ethanol and water are given.

substance	specific heat capacity J / kg °C
aluminium	900
iron	450
ethanol	2400
water	4200

1 kg of each metal is put into 5 kg of each liquid.

The starting temperature of each metal is 60 °C. The starting temperature of each liquid is 10 °C.

Which example has the highest final temperature?

	metal	liquid
A	aluminium	ethanol
B	iron	ethanol
C	aluminium	water
D	iron	water

6. March/2020/Paper_32/No.7

(a) Equal volumes of steel, oil and hydrogen are heated from 20 °C to 60 °C.
Their volumes increase by thermal expansion.

State which of these substances has the greatest increase in volume.

..... [1]

(b) Fig. 7.1 shows a liquid-in-glass thermometer.

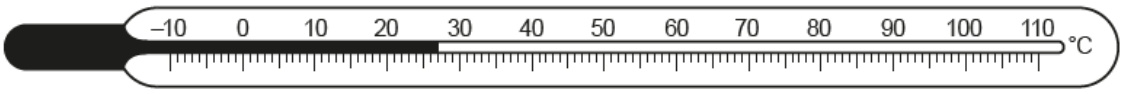


Fig. 7.1

(i) State the temperature **reading** on the thermometer.

..... [1]

(ii) State the temperature **range** of the thermometer.

..... [1]

(iii) State the values of the fixed points of the Celsius scale of temperature.

..... [1]

(c) The liquid-in-glass thermometer uses the thermal expansion of mercury.

State and explain **one** other application or consequence of thermal expansion.

.....

.....

.....

.....

..... [3]

[Total: 7]

7. March/2020/Paper_42/No.4

(a) Define the *specific latent heat of fusion* of a substance.

.....

.....

..... [2]

(b) Small pieces of ice at 0 °C are added to 0.35 kg of water. The initial temperature of the water is 24.5 °C. The temperature of the water decreases to 0 °C. The water loses 35 000 J of thermal energy as it cools. All of the ice added to the water melts.

The specific latent heat of fusion of ice is 3.3×10^5 J/kg.

Calculate:

(i) the specific heat capacity of water

specific heat capacity = ... [2]

(ii) the mass of ice added to the water.

mass = ... [3]

[Total: 7]

8. June/2020/Paper_11/No.16

The thermometer in the diagram has no scale.

Before this thermometer can be used to measure temperature, two standard temperatures known as fixed points are needed. These are labelled X and Y.

Which row describes these fixed points on the Celsius scale?

	X	Y
A	temperature of pure boiling water	normal body temperature
B	temperature of pure boiling water	temperature of pure melting ice
C	normal body temperature	temperature of pure boiling water
D	temperature of pure melting ice	temperature of pure boiling water

9. June/2020/Paper_11/No.17

When a hot gas is left to cool, its internal energy decreases.

What causes this?

A a decrease in the kinetic energy of the gas particles

B a decrease in the gravitational potential energy of the gas particles

C an increase in the average speed of the gas particles

D an increase in the average distance of separation of the gas particles

10. June/2020/Paper_12/No.15

A gas, in a sealed container, is compressed slowly so that its temperature does not change.

What happens to the molecules of the gas as a result of this compression?

A The average speed of the molecules increases.

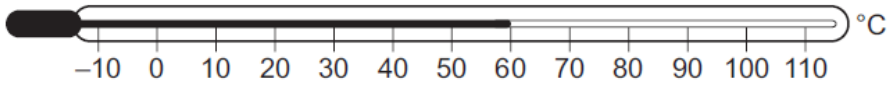
B The average force in a collision between a molecule and the container increases.

C There are more frequent collisions between molecules and the container.

D The volume of each molecule decreases.

11. June/2020/Paper_12/No.16

The diagram shows a liquid-in-glass thermometer.



What is the temperature difference between the two fixed points on the Celsius scale?

A 10 °C **B** 100 °C **C** 110 °C **D** 120 °C

12. June/2020/Paper_12/No.17

A metal block is left overnight in a cool, shady room. In the morning, the metal block is moved into warm surroundings.

Which statement about the metal block is correct in the morning?

A The internal energy of the metal block increases.

B The temperature of the metal block decreases.

C Convection transfers energy throughout the metal block.

D The metal contracts slightly.

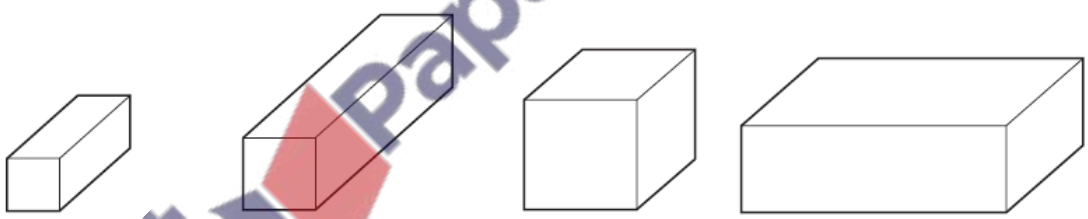
13. June/2020/Paper_12/No.18

The diagrams show four blocks of steel. The blocks are all drawn to the same scale.

The same quantity of thermal energy is given to each block.

Which block shows the greatest rise in temperature?

A **B** **C** **D**



14. June/2020/Paper_12/No.20

Two similar liquid-in-glass thermometers P and Q are placed in direct sunlight.

The bulb of thermometer P is painted white. The bulb of thermometer Q is painted black.

How and why would the thermometer readings differ?

A P would read higher than Q because black is a good absorber of radiation.

B P would read higher than Q because black is a poor absorber of radiation.

C P would read lower than Q because black is a good absorber of radiation.

D P would read lower than Q because black is a poor absorber of radiation.

15. June/2020/Paper_13/No.16

The diagram shows a liquid-in-glass thermometer.

Which row gives the correct labels for the thermometer?

	X	Y
A	water	narrow tube of uniform diameter
B	alcohol	narrow tube of uniform diameter
C	water	this end immersed in substance to be measured
D	alcohol	this end immersed in substance to be measured

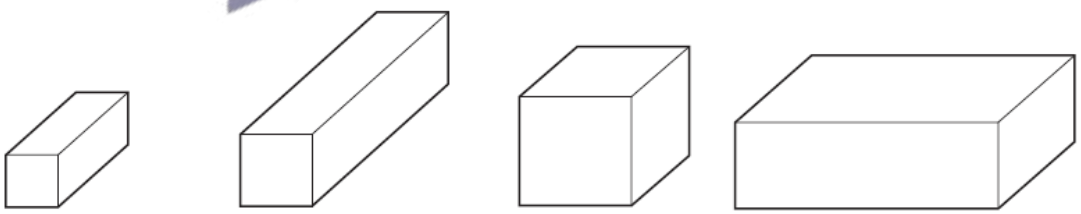
16. June/2020/Paper_13/No.17

The diagrams show four blocks of steel. The blocks are all drawn to the same scale.

The same quantity of thermal energy is given to each block.

Which block shows the greatest rise in temperature?

A **B** **C** **D**



17. June/2020/Paper_13/No.18

A gas is cooled so that its molecules move more slowly, come closer together and do not move freely.

Which process is being described?

A boiling

B condensing

C freezing

D melting

18. June/2020/Paper_21/No.16

A solid is heated causing it to expand.

What effect does this have on its mass and on its density?

	mass	density
A	decreases	decreases
B	decreases	stays constant
C	stays constant	decreases
D	stays constant	stays constant

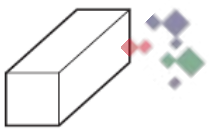
19. June/2020/Paper_21/No.17

The diagrams show four blocks of steel. The blocks are all drawn to the same scale.

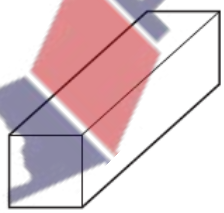
The same quantity of thermal energy is given to each block.

Which block shows the greatest rise in temperature?

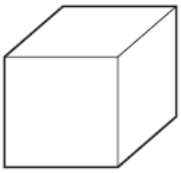
A



B



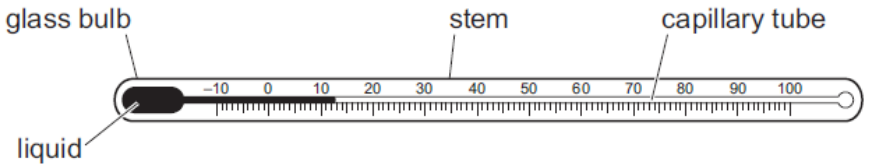
C



D

20. June/2020/Paper_22/No.16

The diagram shows a liquid-in-glass thermometer.



The design of this thermometer includes the following features.

1 a liquid which expands linearly when it is heated

2 a glass bulb which has a thick glass wall

3 a capillary tube with a very small diameter

Which features increase the sensitivity of the thermometer?

A 1 only **B** 1 and 2 **C** 2 and 3 **D** 3 only

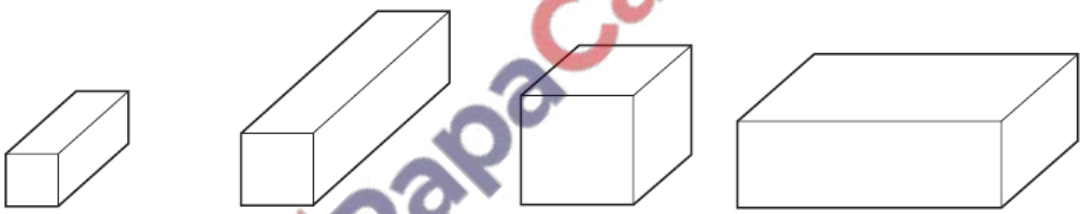
21. June/2020/Paper_22/No.17

The diagrams show four blocks of steel. The blocks are all drawn to the same scale.

The same quantity of thermal energy is given to each block.

Which block shows the greatest rise in temperature?

A **B** **C** **D**



22. June/2020/Paper_23/No.16

The diagram shows a liquid-in-glass thermometer.

Which row gives the correct labels for the thermometer?

	X	Y
A	water	narrow tube of uniform diameter
B	alcohol	narrow tube of uniform diameter
C	water	this end immersed in substance to be measured
D	alcohol	this end immersed in substance to be measured

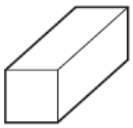
23. June/2020/Paper_23/No.17

The diagrams show four blocks of steel. The blocks are all drawn to the same scale.

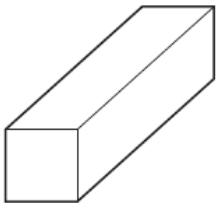
The same quantity of thermal energy is given to each block.

Which block shows the greatest rise in temperature?

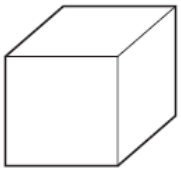
A



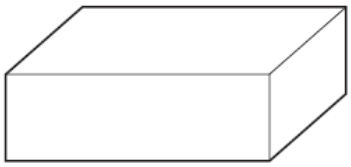
B



C



D



24. June/2020/Paper_31/No.6(a),(b)

Fig. 6.1 shows a liquid-in-glass thermometer.

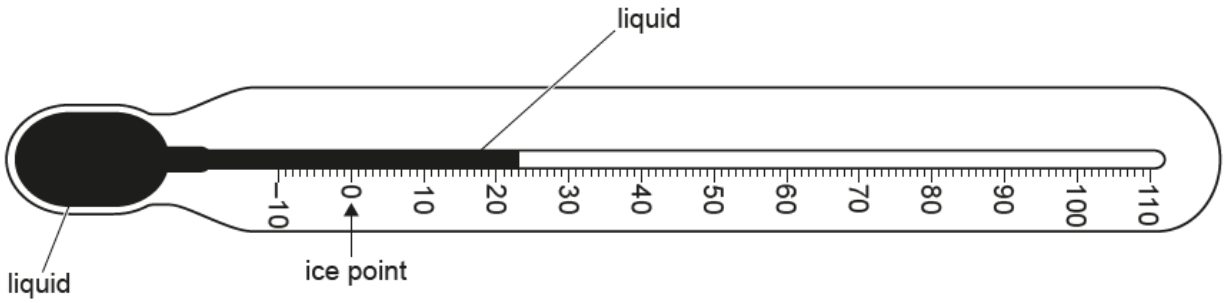


Fig. 6.1

(a) **(i)** This thermometer is used for measuring temperatures in science experiments.

State the unit for measuring temperature.

..... [1]

(ii) On Fig. 6.1, an arrow points to the temperature reading when the thermometer is placed in pure melting ice. This is labelled **ice point**.

On Fig. 6.1, draw an arrow pointing to the temperature reading when the thermometer is at the upper fixed point. Label this arrow **steam point**. [1]

(b) A liquid-in-glass thermometer uses the property of expansion of a liquid to measure temperature.

State **one** other application or consequence of thermal expansion.

.....

..... [1]

25. June/2020/Paper_41/No.4

Water has a specific heat capacity of 4200 J/(kg °C) and a boiling point of 100 °C.

(a) State what is meant by *boiling point*.

.....

..... [1]

(b) A mass of 0.30 kg of water at its boiling point is poured into a copper container which is initially at 11 °C. After a few seconds, the temperature of the container and the water are both 95 °C.

(i) Calculate the energy transferred from the water.

energy transferred = ... [2]

(ii) Calculate the thermal capacity of the copper container.

thermal capacity of the copper container = ... [2]

(iii) Water from the container evaporates and the temperature of the remaining water decreases slowly.

Explain, in terms of molecules, why evaporation causes the temperature of the remaining water to decrease.

.....

.....

.....

..... [3]

[Total: 8]

26. June/2020/Paper_42/No.4

Fig. 4.1 shows a liquid-in-glass thermometer without a temperature scale.
The liquid inside the thermometer has a melting point of –39 °C.

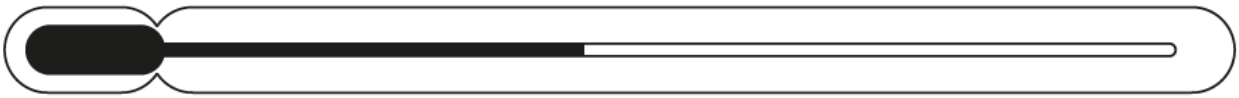


Fig. 4.1

(a) Describe simple experiments to mark the positions of the fixed points on this liquid-in-glass thermometer.

.....

.....

.....

.....

.....

..... [4]

(b) A scientist is measuring temperatures at the South Pole. These temperatures have a minimum value of –90 °C.

State why the liquid used in the thermometer in Fig. 4.1 would **not** be suitable for this scientist.

..... [1]

(c) State a design change that:

(i) increases the sensitivity of a liquid-in-glass thermometer

..... [1]

(ii) increases the range of a liquid-in-glass thermometer.

..... [1]

(d) State the property of the liquid which ensures that the scale on a liquid-in-glass thermometer is linear.

..... [1]

[Total: 8]

27. June/2020/Paper_43/No.5

(a) Fig. 5.1 shows a plastic cup. The cup contains sand, an electric heater and a thermometer.

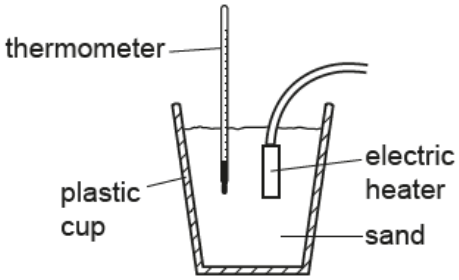


Fig. 5.1

The power of the heater is 50 W. The mass of the sand in the cup is 550 g. The initial temperature of the sand is 20 °C. The heater is switched on for 2.0 minutes. The temperature is recorded until the temperature stops increasing. The highest temperature recorded by the thermometer is 33 °C.

(i) Calculate the energy supplied by the heater.

energy = ... [2]

(ii) Calculate a value for the specific heat capacity of the sand, using your answer to **(a)(i)** and the data in the question.

specific heat capacity = ... [3]

(iii) Explain why the specific heat capacity of sand may be different from the value calculated in **(a)(ii)**.

.....

..... [2]

(b) On a sunny day, the temperature of the sand on a beach is much higher than the temperature of the sea.

Explain why.

.....

.....

..... [2]

(c) Draw a labelled diagram to show the structure of a thermocouple thermometer.

[3]

[Total: 12]