Thermal Properties of Matter – 2020 O Level 5054

1. Nov/2020/Paper_11/No.20

An instruction in a physics book states 'divide the length between two marks on the glass tube into 100 equal parts'.

What is being described?

A how to calculate weight using the extension of a spring

B how to calibrate a thermometer

C how to determine pressure with a manometer

D how to measure volume with a measuring cylinder

2. Nov/2020/Paper_11/No.21

What is a unit for heat capacity?

A J **B** J/g **C** J/°C **D** J/(g °C)

3. Nov/2020/Paper_11/No.23

Which statement about the melting of ice and the boiling of water is correct?

A Both processes are accompanied by a decrease in volume.

B Both processes involve energy transfer and a temperature change.

C Both processes involve the absorption of latent heat.

D Both processes result in the increase of intermolecular forces.

4. Nov/2020/Paper_11/No.24

A substance has a melting point of –17 °C and a boiling point of 117 °C.

In which state does the substance exist at –10 °C and at 110 °C?

	at –10 °C	at 110 °C
A	solid	liquid
B	solid	gas
C	liquid	liquid
D	liquid	gas

5. Nov/2020/Paper_12/No.18

Which physical property **cannot** be used for the measurement of temperature?

A the length of a metal bar

B the mass of a plastic block

C the pressure of a gas

D the resistance of a wire

6. Nov/2020/Paper_12/No.19

A student performs an experiment to find out how much energy is needed to change the temperature of a steel nail by 1.0 °C.

Which quantity is the student determining?

A the heat capacity of the nail

B the latent heat of the nail

C the specific heat capacity of steel

D the specific latent heat of steel

7. Nov/2020/Paper_12/No.20

A substance has a melting point of –17 °C and a boiling point of 117 °C.

In which state does the substance exist at –10 °C and at 110 °C?

	at –10 °C	at 110 °C
A	solid	liquid
B	solid	gas
C	liquid	liquid
D	liquid	gas

8. Nov/2020/Paper_21/No.5

Fig. 5.1 shows some parts of a thermocouple thermometer that is being used to determine the temperature of a liquid.

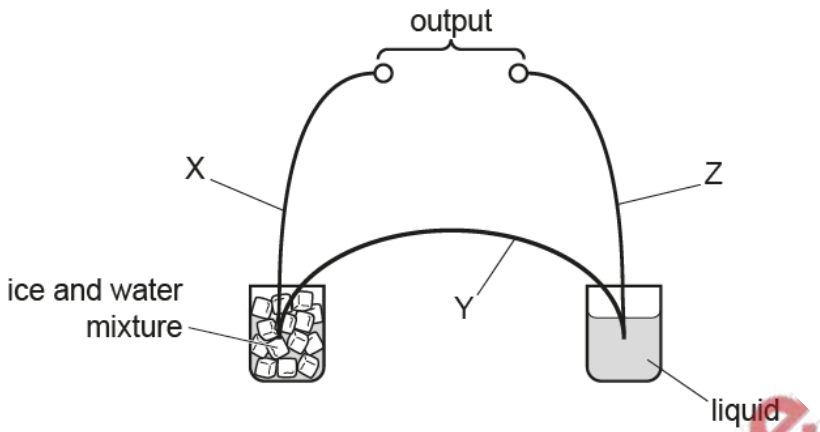

Fig. 5.1

(a) Suggest an appropriate material for:

- X .....
- Y .....
- Z. .....

[1]

(b) All types of thermometer require the measurement of a physical property that varies with temperature in order to obtain a value for the temperature.

(i) State the physical property of a thermocouple thermometer that is used in this way.

..... [1]

(ii) Discuss what is meant by the term *linearity* when applied to a thermocouple thermometer.

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..... [2]

(c) State **two** advantages of a thermocouple thermometer over a liquid-in-glass thermometer.

1. .....

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2. .....

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[2]

9. Nov/2020/Paper_22/No.4

(a) Describe, in terms of molecules, the structure of a solid.

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..... [3]

(b) Fig. 4.1 shows a metal-worker heating a horseshoe to a high temperature before shaping it.

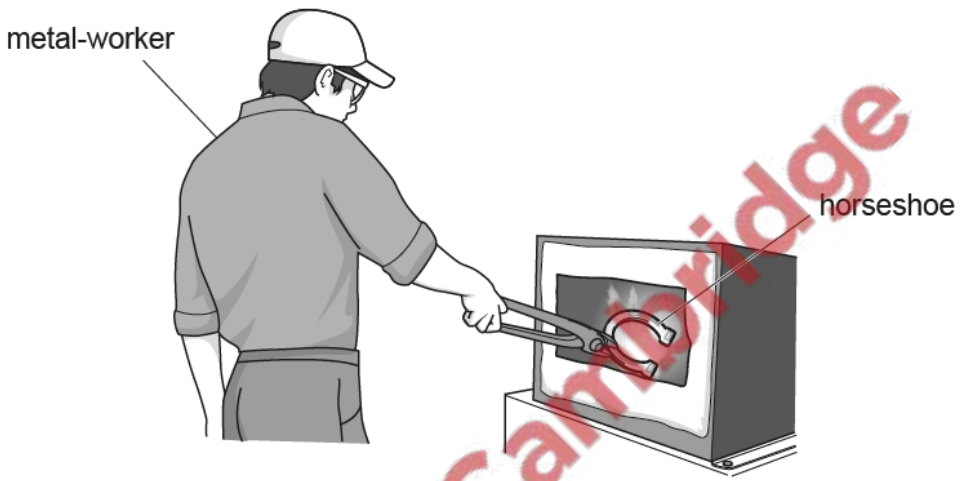


Fig. 4.1

The metal-worker then cools the horseshoe by dropping it into 8.0 kg of water at 18 °C. The final temperature of the water is 43 °C.

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

(i) Calculate the thermal energy transferred to the water as the horseshoe cools.

energy = ... [2]

(ii) The heat capacity of the horseshoe is 850 J / °C.

Calculate the temperature of the horseshoe immediately before it is dropped into the water.

temperature = ... [3]

10. June/2020/Paper_11/No.20

Which statement about a mercury-in-glass clinical thermometer is correct?

A It covers a much larger range than an ordinary laboratory thermometer.

B It is more sensitive than an ordinary laboratory thermometer.

C Its scale is not linear.

D Its sensitivity is affected by the constriction in the capillary tube.

11. June/2020/Paper_11/No.22

The temperature of a body increases by 1 °C.

Which other quantity also increases?

A heat capacity

B internal energy

C specific heat capacity

D specific latent heat

12. June/2020/Paper_11/No.23

The thermal energy produced by an electric heater in three minutes is used to melt wax. The solid wax is initially at its melting point of 60 °C.

The specific latent heat of the wax is 220 J / g. The heater supplies 7700 J of thermal energy to the wax. Some of the wax melts.

How much wax melts?

A 0.58 g **B** 1.7 g **C** 12 g **D** 35 g

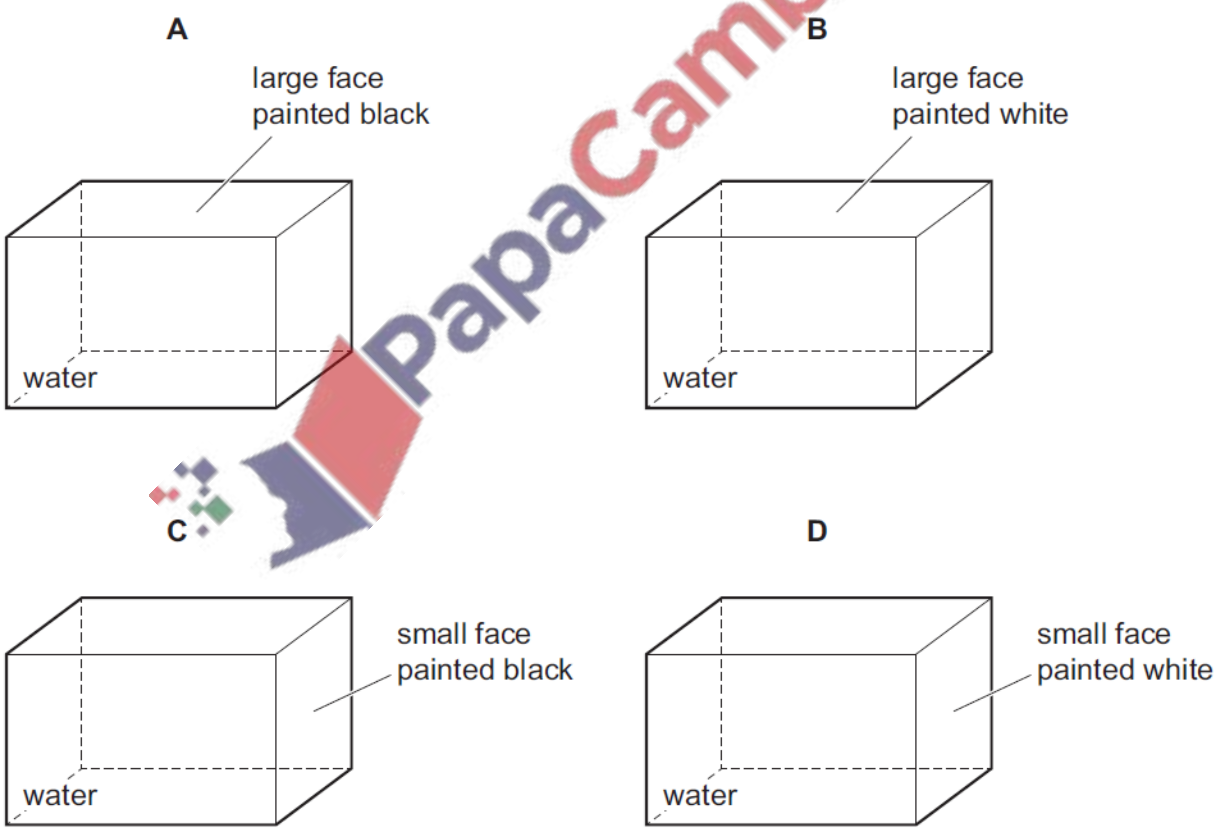
13. June/2020/Paper_12/No.23

Four metal containers, with identical dimensions, are filled with water at 90 °C.

All the faces, except one, of each container are covered in a very good insulator.

The one exposed face on each container is painted either black or white.

In which container does the water cool the fastest?



14. June/2020/Paper_12/No.25

The thermal energy produced by an electric heater in three minutes is used to melt wax. The solid wax is initially at its melting point of 60 °C.

The specific latent heat of the wax is 220 J / g. The heater supplies 7700 J of thermal energy to the wax. Some of the wax melts.

How much wax melts?

A 0.58 g **B** 1.7 g **C** 12 g **D** 35 g

15. June/2020/Paper_12/No.26

What always happens when the temperature increases?

A A gas at constant pressure expands.

B A metal rod becomes longer, but its volume remains constant.

C A liquid contracts and then expands.

D The hole in the centre of a metal disc becomes smaller.

16. June/2020/Paper_21/No.4

Glass and iron are both conductors of heat. However, glass is a poor conductor of heat and iron is a good conductor of heat.

(a) Describe, using ideas about particles, how the conduction of heat takes place in glass and in iron. You should make it clear why iron is a better conductor of heat.

conduction in glass .....

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conduction in iron .....

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[4]

(b) Fig. 4.1 shows apparatus used to show expansion.

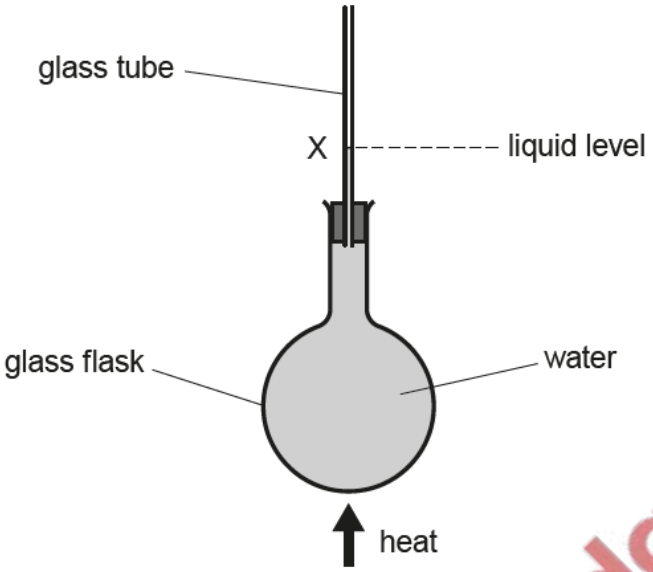

Fig. 4.1

The glass flask, full of water, is heated. A student is surprised when the liquid level X in the glass tube falls for a few seconds before it rises.

(i) Suggest why the liquid level falls and why it then rises.

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..... [2]

(ii) Describe how heat is transferred throughout the water in the glass flask.

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..... [2]

[Total: 8]

17. June/2020/Paper_22/No.8d

Fig. 8.1 shows the circuit diagram of a temperature gauge. It contains an ammeter, a thermistor, a fixed resistor R and a battery.

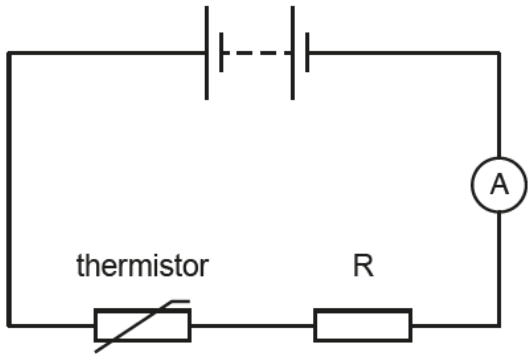

Fig. 8.1

The current is measured at different temperatures and a graph of the results is shown in Fig. 8.2.

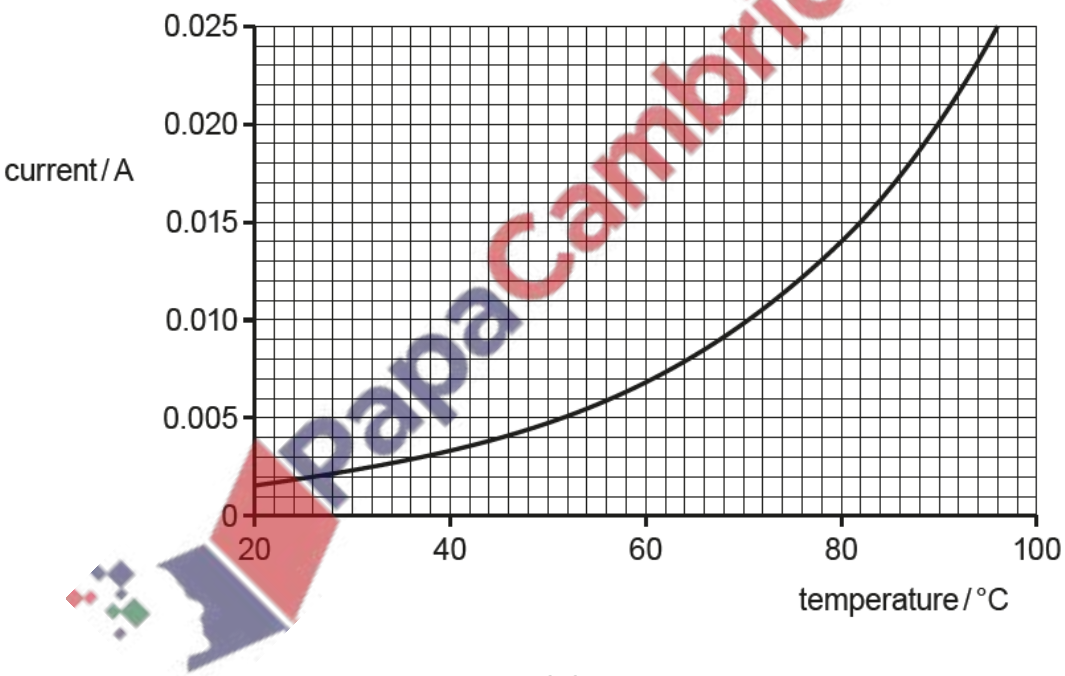

Fig. 8.2

(d) The current scale on the ammeter is linear.

Using values from Fig. 8.2, a student marks the scale on the ammeter with temperature values that correspond to the values of the current.

The temperature is then read directly from the temperature scale on the ammeter.

(i) State what is meant by a *sensitive* thermometer.

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..... [1]

(ii) State and explain at which temperatures this thermometer is most sensitive.

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..... [2]