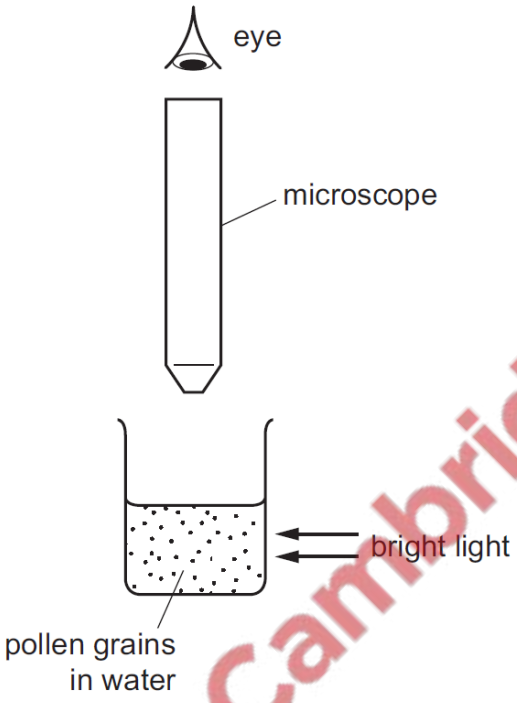
# The Properties and Temperature – 2021 IGCSE 0625

**1.** June/2021/Paper_11,12,13,21,22&23/No.15

Very small pollen grains are suspended in water. A bright light shines from the side.

When looked at through a microscope, small specks of light are seen to be moving in a random, jerky manner.




What are the moving specks of light?

**A** pollen grains being hit by other pollen grains

**B** pollen grains being hit by water molecules

**C** water molecules being hit by other water molecules

**D** water molecules being hit by pollen grains

**2.** June/2021/Paper_11/No.16

Why are small gaps left between the metal rails of a railway track?

**A** to allow for expansion of the rails on a hot day

**B** to allow for contraction of the rails on a hot day

**C** to allow for expansion of the rails on a cold day

**D** to allow for contraction of the rails on a cold day

**3.** June/2021/Paper_11/No.17

All thermometers require a physical property that changes with temperature.

Which property would **not** be suitable for use in a thermometer?

**A** pressure

**B** volume

**C** electrical resistance

**D** mass

**4.** June/2021/Paper_11,12&13/No.18

The thermal capacity of object Y is greater than that of object Z.

What is a consequence of this?

**A** Object Y needs less thermal energy to melt it than object Z.

**B** Object Y needs less thermal energy to raise its temperature by 1 °C than object Z.

**C** Object Y needs more thermal energy to melt it than object Z.

**D** Object Y needs more thermal energy to raise its temperature by 1 °C than object Z.

**5.** June/2021/Paper_12/No.14

A person taking a shower notices that water appears on the inside of the bathroom window, even though the window is some distance from the shower.

Which statement explains this observation?

**A** Droplets of water from the hot shower move through the air and onto the window.

**B** The colder window causes the steam in the atmosphere to solidify.

**C** Water vapour from the atmosphere condenses onto the colder window.

**D** The hot water boils and turns into steam.

**6.** June/2021/Paper_12&22/No.16

A hole is drilled in a metal plate.

What happens to the length of the plate and to the diameter of the hole when the plate is cooled?

| | length of plate | diameter of hole |
|---|---|---|
| **A** | decreases | decreases |
| **B** | decreases | increases |
| **C** | increases | decreases |
| **D** | increases | increases |

**7.** June/2021/Paper_12/No.17

A liquid-in-glass thermometer uses alcohol as its liquid.

Which property of alcohol is used to measure the temperature?

**A** boiling point

**B** colour

**C** thermal capacity

**D** volume

**8.** June/2021/Paper_13/No.14

A car tyre contains air.

The temperature of the air in the tyre rises. The volume of the air in the tyre remains constant.

Students are asked to suggest how this temperature rise will affect the movement of the air molecules.

1 The air molecules will move faster.

2 The air molecules will hit the tyre walls more often.

3 The air molecules will hit the tyre walls harder.

Which suggestions are correct?

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

**9.** June/2021/Paper_13&23/No.16

The liquid level in a thermometer rises when the thermometer is placed in hot water.

What causes this?

**A** The liquid contracts.

**B** The liquid evaporates.

**C** The liquid expands.

**D** The liquid freezes.

**10.** June/2021/Paper_13/No.17

Which description of condensation is correct?

**A** a gas changing into a liquid as its molecules lose energy

**B** a gas changing into a liquid as its molecules gain energy

**C** a liquid changing into a gas as its molecules lose energy

**D** a liquid changing into a gas as its molecules gain energy

**11.** June/2021/Paper_13/No.18

In which states of matter is convection an important method of thermal transfer?

**A** liquids only

**B** solids only

**C** liquids and gases

**D** solids and gases

**12.** June/2021/Paper_21/No.14

The table gives information about molecules.

Which row describes a gas?

| | force between molecules | distance between molecules |
|---|---|---|
| **A** | strong | close together |
| **B** | strong | far apart |
| **C** | negligible | far apart |
| **D** | negligible | close together |

**13.** June/2021/Paper_21/No.16

Why are small gaps left between the metal rails of a railway track?

**A** to allow for expansion of the rails on a hot day

**B** to allow for contraction of the rails on a hot day

**C** to allow for expansion of the rails on a cold day

**D** to allow for contraction of the rails on a cold day

**14.** June/2021/Paper_21/No.17

A block of metal absorbs 2000 J of thermal energy.

The temperature of the block rises from 10 °C to 20 °C.

The mass of the block is 2.0 kg.

What is the specific heat capacity of the metal?

**A** 50 J / (kg °C) **B** 100 J / (kg °C) **C** 200 J / (kg °C) **D** 400 J / (kg °C)

**15.** June/2021/Paper_21/No.18

Which statement about boiling and evaporation is correct?

**A** Boiling requires a supply of thermal energy but evaporation does not.

**B** Evaporation takes place at the surface of a liquid but boiling takes place throughout the liquid.

**C** When water boils in a kettle, its temperature decreases.

**D** When water evaporates, its temperature increases.

**16.** June/2021/Paper_22/No.14

Which row describes the forces between the molecules and the motion of the molecules in a gas?

| | forces between molecules | motion of molecules |
|---|---|---|
| **A** | strong | move freely |
| **B** | strong | vibrate only |
| **C** | weak | move freely |
| **D** | weak | vibrate only |

**17.** June/2021/Paper_22/No.17

Which statement describes a sensitive liquid-in-glass thermometer?

**A** a thermometer which can be used to measure very high and very low values of temperature

**B** a thermometer which gives the same increase in length of the liquid column for each degree of temperature rise

**C** a thermometer which is accurate because it has been calibrated

**D** a thermometer which gives a large increase in the length of the liquid column for each degree of temperature rise

**18.** June/2021/Paper_22/No.18

A block of aluminium of mass 2.0 kg has an initial temperature of 20 °C. It absorbs 7300 J of thermal energy.

The specific heat capacity of aluminium is 913 J/(kg °C).

What is the final temperature of the aluminium block?

**A** 4.0 °C **B** 8.0 °C **C** 24 °C **D** 28 °C

**19.** June/2021/Paper_23/No.14

A liquid at room temperature is put on a metal surface which is also at room temperature.

A student blows gently across the liquid and its temperature decreases.

What causes the liquid to become cooler?

**A** Bubbles of water vapour form in the liquid and go into the air.

**B** The moving air reduces the kinetic energy of all the particles in the liquid.

**C** Thermal energy flows from the liquid into the metal.

**D** The more energetic particles in the liquid escape into the air.

**20.** June/2021/Paper_23/No.17

A student calculates the energy needed to raise the temperature of an aluminium block from 50 °C to 60 °C.

He then does an experiment to measure the energy used to do this.

Which statement about the measured energy is correct?

**A** The measured energy will be greater than the calculated energy because some energy is transferred to the surroundings.

**B** The measured energy will be greater than the calculated energy because the block absorbs energy from the surroundings.

**C** The measured energy will be less than the calculated energy because the mass of the block decreases as it gets warmer.

**D** The measured energy will be less than the calculated energy because the thermal capacity of the block is low.

**21.** June/2021/Paper_23/No.18

Which row correctly describes a liquid that is boiling?

| | bubbles seen | where it takes place in the liquid |
|---|---|---|
| **A** | no | surface only |
| **B** | no | throughout liquid |
| **C** | yes | surface only |
| **D** | yes | throughout liquid |

**22.** March/2021/Paper_12&22/No.15

In an experiment, smoke particles are suspended in air and viewed through a microscope.

The smoke particles move about with short random movements.

Which of the following statements is correct?

**A** Air particles have large masses compared to smoke particles and they move in one direction only.

**B** Air particles have large masses compared to smoke particles and they move in random directions.

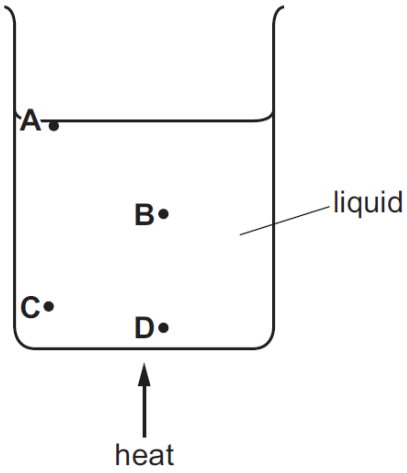
**C** Air particles move at high speeds compared to smoke particles and they move in one direction only.

**D** Air particles move at high speeds compared to smoke particles and they move in random directions.

**23.** March/2021/Paper_12/No.16

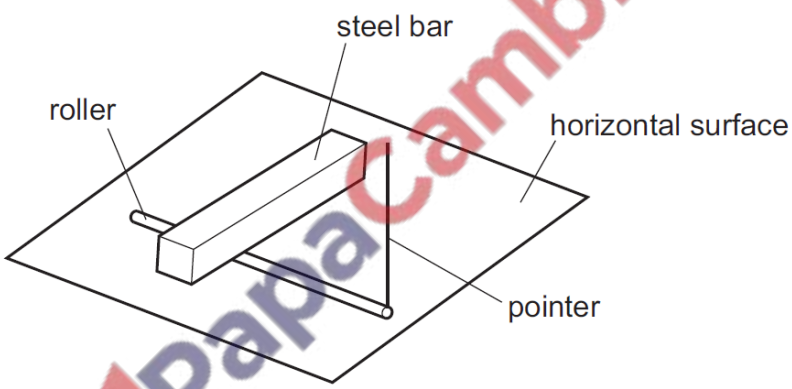
A beaker of liquid is heated slowly so that the liquid evaporates.

During evaporation, from where do the more energetic molecules leave the liquid?




**24.** March/2021/Paper_12/No.18

The diagram shows a simple type of thermometer.




The roller rests on a horizontal surface and the steel bar rests on top of the roller.

When the temperature changes, the pointer rotates.

Which physical property is being used to measure temperature?

**A** the length of the pointer

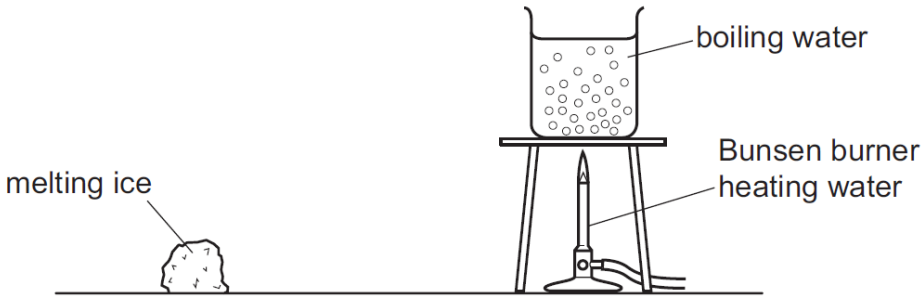
**B** the length of the roller

**C** the length of the steel bar

**D** the thickness of the roller

**25.** March/2021/Paper_12&22/No.19,17

A piece of melting ice at 0 °C and a beaker of boiling water are both in a laboratory. The laboratory is at 20 °C.




What is happening to the temperature of the melting ice and what is happening to the temperature of the boiling water?

| | temperature of melting ice | temperature of boiling water |
|---|---|---|
| **A** | constant | constant |
| **B** | constant | increasing |
| **C** | increasing | constant |
| **D** | increasing | increasing |

**26.** March/2021/Paper_22/No.118

One end of a copper rod is heated.

What is one method by which thermal energy is transferred in the copper rod?

**A** Free electrons transfer energy from the cooler end to the hotter end.

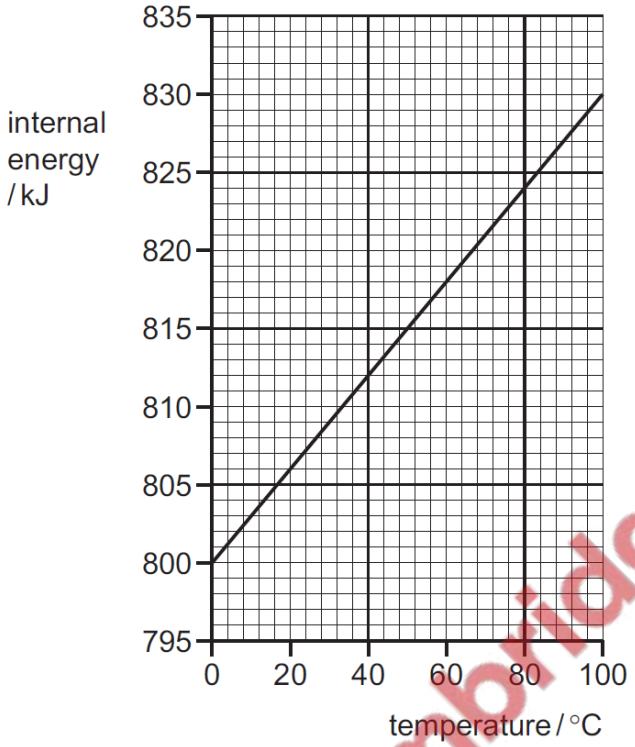
**B** Free electrons transfer energy from the hotter end to the cooler end.

**C** Molecules of copper move from the cooler end to the hotter end.

**D** Molecules of copper move from the hotter end to the cooler end.

**27.** March/2021/Paper_22/No.16

The graph shows how the internal energy of 1.0 kg of a metal changes with temperature.




What is the increase in the internal energy of a block of the same metal of mass 0.25 kg when its temperature rises from 40 °C to 50 °C?

**A** 30 J **B** 300 J **C** 750 J **D** 1200 J

**28.** June/2021/Paper_31/No.6

Fig. 6.1 shows a smoke cell. The smoke cell contains air molecules and smoke particles.
A student views the motion of the smoke particles in the smoke cell by using a microscope.

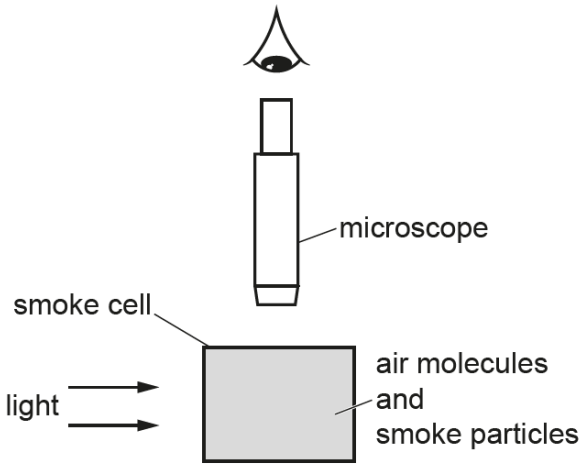



**Fig. 6.1**

Fig. 6.2 shows the path of one of the smoke particles.

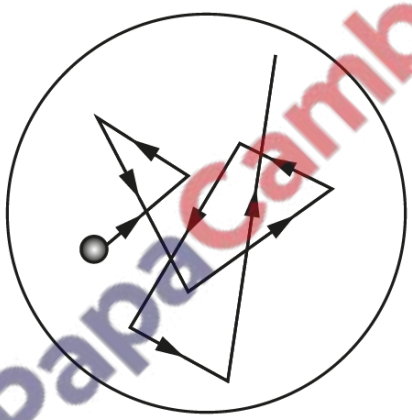


**Fig. 6.2**

**(a)** State the term used for the motion of the smoke particle.

..... [1]

**(b)** Explain the motion of the smoke particle in Fig. 6.2.

.....

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.....

..... [3]

[Total: 4]

**29.** June/2021/Paper_32/No.6

**(a)** Fig. 6.1 shows a liquid-in-glass thermometer.

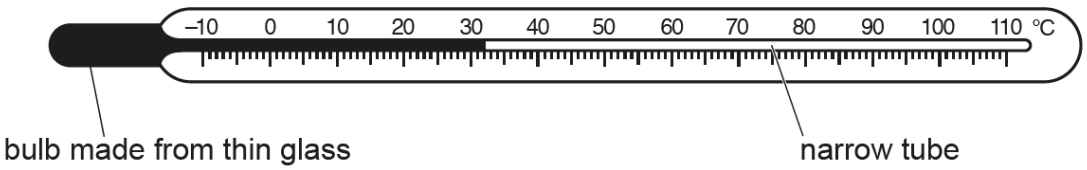


**Fig. 6.1**

**(i)** State the temperature indicated on the thermometer in Fig. 6.1.

..... [1]

**(ii)** Explain why:

**1.** the bulb is made from thin glass

.....

.....

..... [1]

**2.** the tube, along which the liquid expands, is narrow.

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..... [1]

**(b)** A substance cools from 40 °C to –20 °C.

The substance takes 40 minutes to cool from 40 °C to its melting point of –12 °C. The substance then takes 20 minutes to freeze.

On Fig. 6.2, sketch a temperature–time graph as the substance cools from 40 °C to –20 °C.

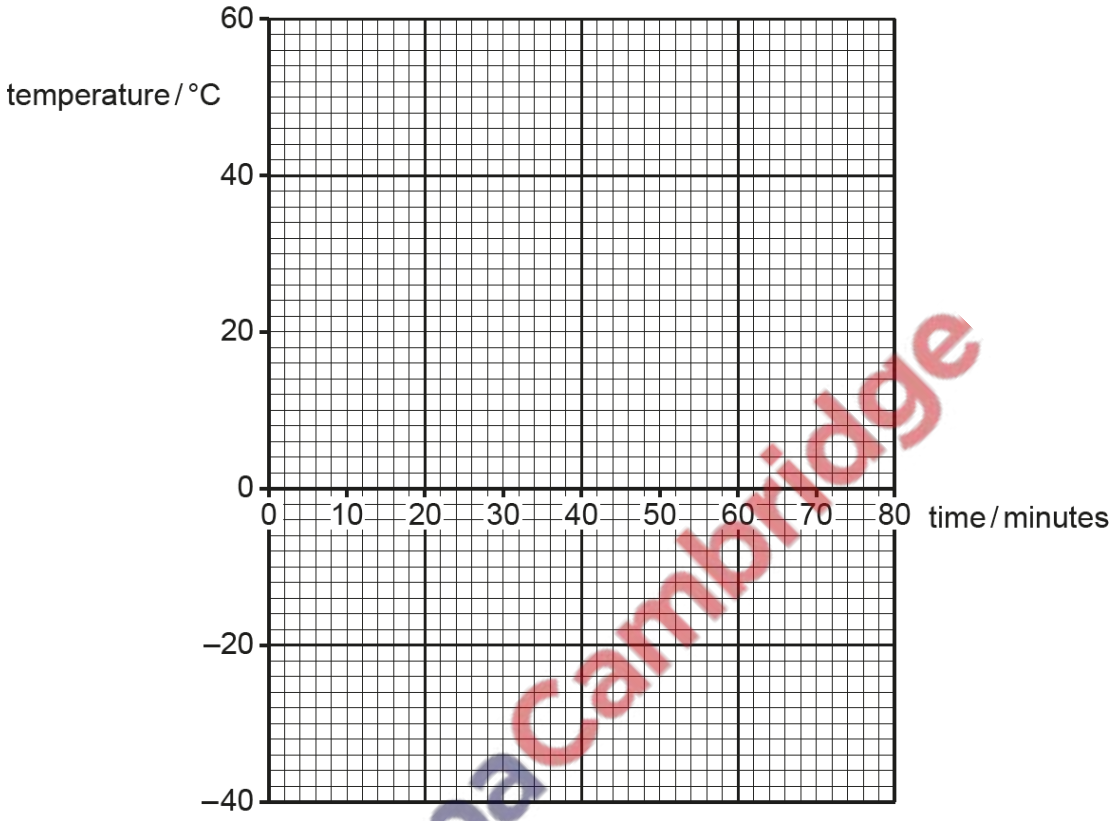


**Fig. 6.2**

[4]

[Total: 7]

**30.** June/2021/Paper_41/No.4

An aluminium saucepan with a plastic handle contains cold water.

Fig. 4.1 shows the saucepan on a hotplate.

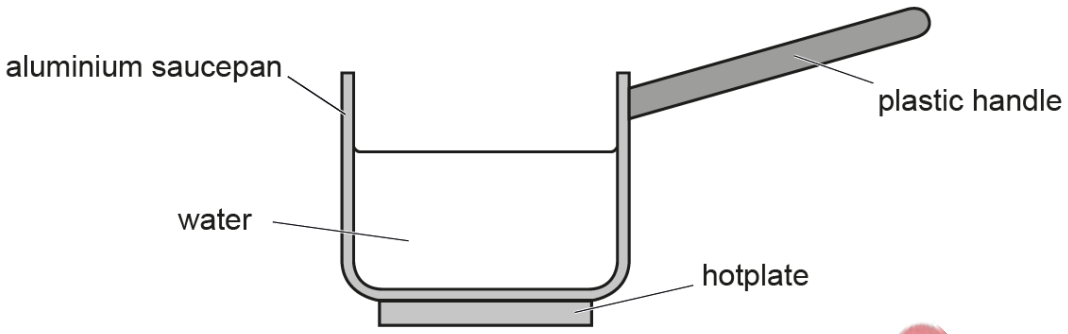


**Fig. 4.1**

**(a)** State why the pan is made from aluminium but the handle is made from plastic.

.....

..... [1]

**(b)** The hotplate is switched on and, as the temperature of the water increases, the internal energy of the water increases.

**(i)** State, in terms of molecules, what is meant by *an increase in internal energy*.

.....

..... [1]

**(ii)** Explain, in terms of the atomic lattice and electrons, how thermal energy is transferred through the aluminium.

.....

.....

.....

..... [3]

**(iii)** Eventually, the water reaches boiling point. Thermal energy from the hotplate is still being transferred to the water.

Explain, in terms of molecules, the effect of this thermal energy on the water.

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.....

.....

..... [3]

**(iv)** The mass of the water decreases by 0.11 kg in 300 s. The specific latent heat of vaporisation of water is $2.3 \times 10^6$ J / kg.

Calculate the rate at which the water gains thermal energy.

rate of gain of energy = ..... [3]

[Total: 11]

**31.** June/2021/Paper_41/No.5

Fig. 5.1 shows the structure of a liquid-in-glass thermometer.

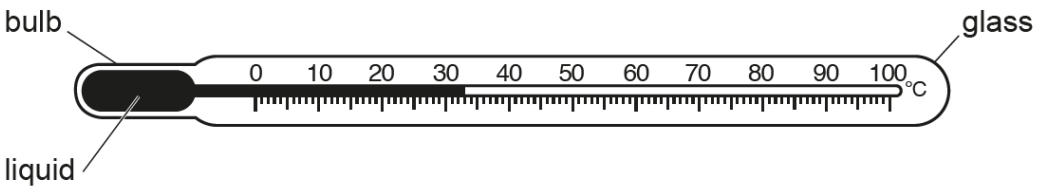


**Fig. 5.1**

The bulb of the thermometer is placed into a beaker of warm water. As the liquid expands, it moves along the tube.

**(a)** Explain, in terms of molecules, why a liquid expands when heated.

.....

.....

..... [2]

**(b)** Explain, in terms of molecules, why a liquid expands more than a solid when heated.

.....

.....

..... [2]

**(c)** A second thermometer has a larger bulb that contains more of the same liquid than the thermometer shown in Fig. 5.1. It has a different scale. In every other way, it is identical.

**(i)** Explain how the sensitivity of the second thermometer compares with the sensitivity of the thermometer in Fig. 5.1.

.....

.....

..... [2]

**(ii)** Explain how the range of the second thermometer compares with the range of the thermometer in Fig. 5.1.

.....

..... [1]

**(d)** **(i)** State **one** everyday problem that is a result of thermal expansion.

.....

..... [1]

**(ii)** Suggest and explain **one** way of solving this problem.

.....

.....

..... [2]

[Total: 10]

**32.** June/2021/Paper_42/No.4

**(a)** Pollen particles are mixed into a liquid. They are seen to move when observed through a microscope.

**(i)** Describe this movement.

..... [1]

**(ii)** Explain this movement in terms of the molecules of the liquid and the pollen particles.

.....

.....

..... [3]

**(b)** **(i)** Medical professionals sometimes rub ethanol over the skin of a patient. Ethanol evaporates readily at room temperature and has a high specific latent heat of vaporisation.

State whether the patient experiences heating, cooling or neither at the site where the ethanol is applied. Explain your answer.

statement .....

explanation .....

.....

..... [3]

**(ii)** State any effect on the rate of evaporation of ethanol when a fan blows air over the patient's skin.

..... [1]

[Total: 8]

**33.** June/2021/Paper_43/No.4

**(a) (i)** Define *specific latent heat of fusion*.

.....

..... [2]

**(ii)** A cup of water contains 250 $cm^3$ of water at a temperature of 0 °C. An identical cup contains 250 $cm^3$ of a mixture of ice and water at a temperature of 0 °C.

The temperature of the surrounding air is 20 °C.

State and explain which cup contains the liquid with the lower temperature after 10 minutes.

statement .....

explanation .....

..... [2]

**(b) (i)** On a hot day, sweat forms on a person's skin and then evaporates.

Explain, in terms of molecules, how the evaporation of sweat cools the person.

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..... [3]

**(ii)** Explain why this process is more effective when a wind is blowing.

.....

..... [1]

[Total: 8]