Kinetic Model of Matter – 2020 O Level 5054

1. Nov/2020/Paper_11/No.22

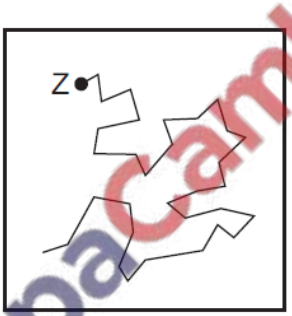
A block of aluminium is heated.

What happens to the kinetic energy and to the potential energy of the molecules?

	kinetic energy	potential energy
A	increase	increase
B	increase	decrease
C	decrease	increase
D	decrease	decrease

2. Nov/2020/Paper_11/No.25

A smoke particle Z is seen to move randomly when suspended in air as illustrated.



Which statement explains why Z moves randomly?

A Air molecules are much larger than Z.

B Air molecules are smaller than Z.

C Air molecules hit Z from different directions.

D Air molecules vibrate about a fixed position.

3. Nov/2020/Paper_12/No.21

Which description of a liquid is correct?

A fixed shape, fixed volume

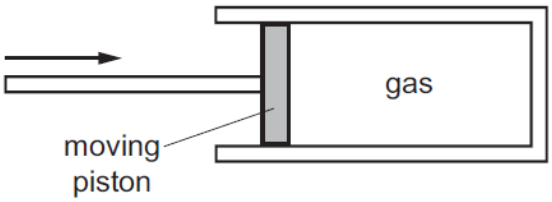
B fixed shape, no fixed volume

C no fixed shape, fixed volume

D no fixed shape, no fixed volume

4. Nov/2020/Paper_12/No.22

A mass of gas is trapped inside a cylinder by a moving piston.



As the piston moves in, the volume of the gas decreases but the temperature stays the same.

What happens to the gas pressure, and why?

	pressure	reason
A	decreases	the molecules have less room to move in the cylinder
B	decreases	the molecules move more slowly between collisions
C	increases	the molecules collide more frequently with the piston
D	unchanged	the temperature of the gas is constant

5. Nov/2020/Paper_21/No.9

A small glass measuring cylinder of oil is placed inside a freezer where the temperature is –18 °C. Fig. 9.1 shows how the temperature of the oil varies with time *t*.

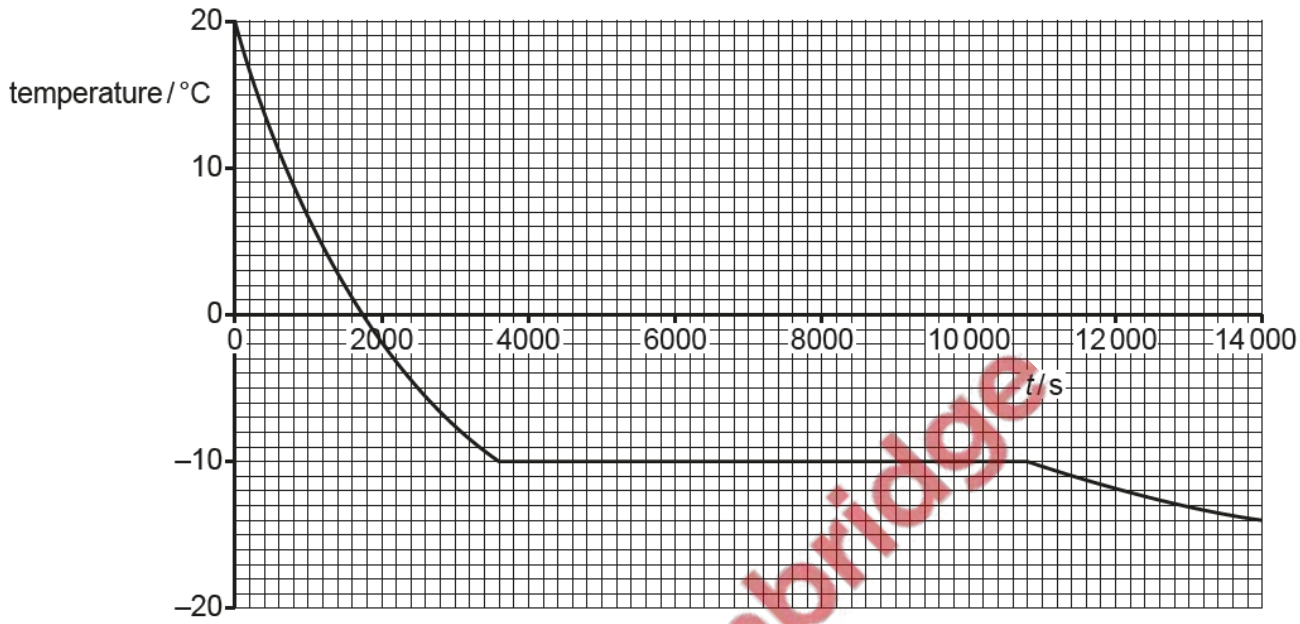


Fig. 9.1

Fig. 9.1 shows that it takes 700 s for the temperature to decrease from 20 °C to 10 °C but that it takes 1900 s to decrease from 0 °C to –10 °C.

(a) Suggest why these times are different.

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..... [3]

(b) Explain what happens to the molecules of the oil and what happens to the level of the oil in the glass measuring cylinder as the temperature decreases from 20 °C to 0 °C.

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(c) **(i)** Determine the melting point of the oil.

..... [1]

(ii) Explain, in terms of molecules, why the temperature of the oil does not change between $t = 3600\,s$ and $t = 10\,800\,s$.

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..... [3]

(d) There is 45 g of oil in the glass measuring cylinder and the specific latent heat of fusion (melting) of the oil is $5.7 \times 10^4\,J/kg$.

Calculate:

(i) the energy transferred from the oil between $t = 3600\,s$ and $t = 10\,800\,s$

energy = ... [2]

(ii) the average rate at which energy is transferred from the oil between $t = 3600\,s$ and $t = 10\,800\,s$.

rate = ... [1]

(e) The graph in Fig. 9.1 is steeper before the horizontal section than it is after.

Use this observation to compare the specific heat capacity of oil in the liquid and solid states and explain your reasoning.

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..... [2]

[Total: 15]

6. June/2020/Paper_11/No.24

Which row explains why a liquid has a fixed volume but does **not** have a fixed shape?

	force between molecules in the liquid	movement of molecules in the liquid
A	large	free to move within the liquid
B	large	vibrate at fixed positions
C	small	free to move within the liquid
D	small	vibrate at fixed positions

7. June/2020/Paper_11/No.25

A fixed mass of gas is enclosed in a cylinder by a piston which is free to move.

Which combination of changes to the pressure and to the temperature **must** increase the density of the gas?

	pressure	temperature
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

8. June/2020/Paper_12/No.24

Thermal energy is used to turn water at 100 °C to steam at 100 °C.

Which of the following occurs?

1 The forces between the molecules decrease.

2 The speed of the molecules increases.

3 The separation of the molecules increases.

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

9. June/2020/Paper_12/No.27

Which row explains why a liquid has a fixed volume but does **not** have a fixed shape?

	force between molecules in the liquid	movement of molecules in the liquid
A	large	free to move within the liquid
B	large	vibrate at fixed positions
C	small	free to move within the liquid
D	small	vibrate at fixed positions

10. June/2020/Paper_12/No.28

The air in a sealed can is heated.

Which statement explains the increase in pressure inside the can?

A The molecules collide with the walls of the can more frequently when the air is heated.

B The mass of the molecules is greater when the air is heated.

C There are more molecules per unit volume when the air is heated.

D The separation of molecules becomes greater when the air is heated.