Kinetic Model of Matter – 2023 June O Level 5054

1. June/2023/Paper_ 5054/11/No.14

Which row describes the shape and the volume of a liquid at constant temperature?

	shape	volume
A	fixed	fixed
B	fixed	not fixed
C	not fixed	fixed
D	not fixed	not fixed

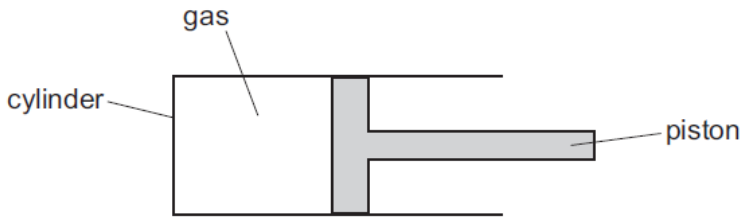
2. June/2023/Paper_ 5054/11/No.15

Which row shows how the forces and the distances between the particles in a solid generally compare with the forces and distances in a liquid?

	forces between particles in a solid	distances between particles in a solid
A	stronger	greater
B	stronger	smaller
C	weaker	greater
D	weaker	smaller

3. June/2023/Paper_ 5054/12/No.15

In an experiment, the volume of a gas in a cylinder is measured as the pressure of the gas is increased.



The values obtained are shown.

pressure P/Pa	1.0×10^5	2.0×10^5	3.0×10^5	4.0×10^5
volume V/m^3	20×10^{-5}	10×10^{-5}	6.0×10^{-5}	4.0×10^{-5}

What is a possible explanation for these results?

A After the pressure is doubled, gas starts leaking into the cylinder.

B After the pressure is doubled, gas starts leaking out of the cylinder.

C The temperature of the gas is constant.

D The temperature of the gas is increasing.

4. June/2023/Paper_ 5054/21/No.5(a, b)

Fig. 5.1 shows the particles (molecules) in a sample of liquid water.

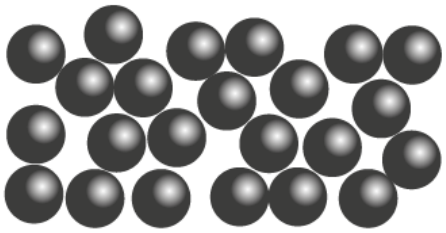


Fig. 5.1

(a) Explain, using ideas about particles, why liquids expand more than solids for the same temperature rise.

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.....

.....

..... [2]

(b) The boiling point of water is 100 °C.

(i) State the boiling point of water on the Kelvin scale of temperature.

boiling point = ... K [1]

(ii) The temperature remains constant as water turns from liquid to gas at the boiling point.

Explain, in terms of particles, why energy must be provided even though the temperature stays constant.

.....

..... [1]

5. June/2023/Paper_ 5054/22/No.3

A fixed mass of gas in a glass tube is trapped by a seal at one end of the tube and by a column of mercury. The mercury is free to move within the tube.

The tube is rotated slowly from the vertical as shown in Fig. 3.1 to the horizontal as shown in Fig. 3.2. The volume of the gas increases and its temperature remains constant.

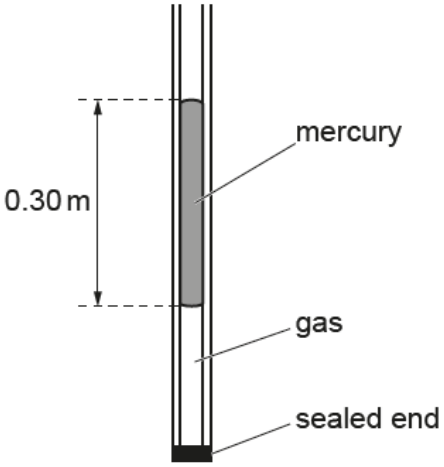

Fig. 3.1 (not to scale)

Fig. 3.2 (not to scale)

(a) (i) Describe why rotating the tube changes the pressure of the gas in the sealed end.

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..... [1]

(ii) Explain, using ideas about particles, why the pressure of the gas decreases when its volume increases.

.....

.....

.....

..... [3]

(b) In Fig. 3.1 the length of the mercury column is 0.30 m.

The density of mercury is 14 000 kg / m^3.

Atmospheric pressure is 1.0×10^5 Pa.

Calculate the pressure of the gas in the tube.

pressure = ... Pa [3]

(c) The pressure of a different sample of gas changes at constant temperature.

Fig. 3.3 shows one point, marked X, on a graph of pressure against volume for the gas sample.

At X the pressure of the gas is P_0 and its volume is V_0.

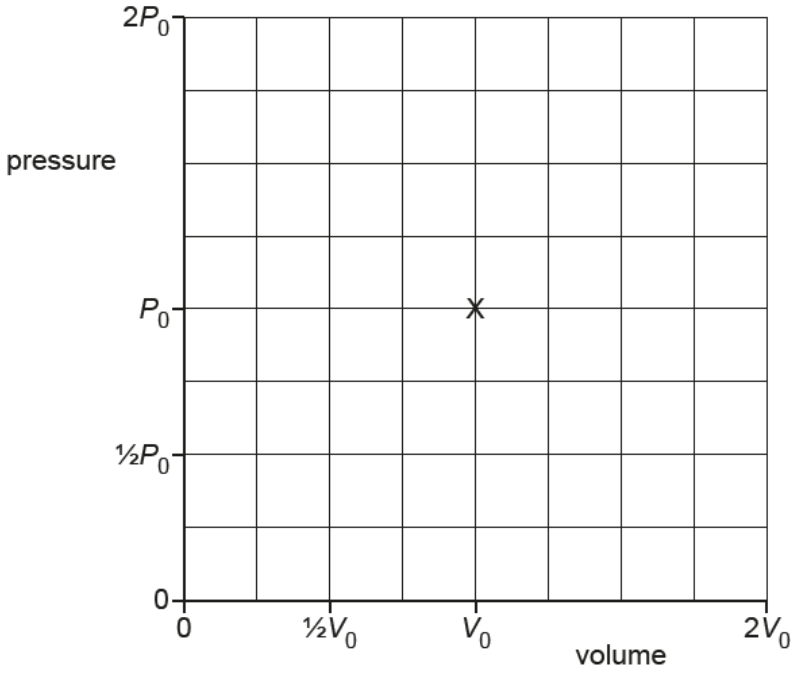

Fig. 3.3

On Fig. 3.3, sketch the graph as the pressure of the gas decreases from $2P_0$ to $\frac{1}{2}P_0$. [2]

[Total: 9]