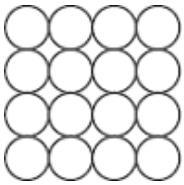
Q1. According to kinetic theory, all matter is made up of small particles. The particles are constantly moving.

Diagram 1 shows how the particles may be arranged in a solid.

Diagram 1



(a) One kilogram of a gas has a much larger volume than one kilogram of a solid.

Use kinetic theory to explain why.

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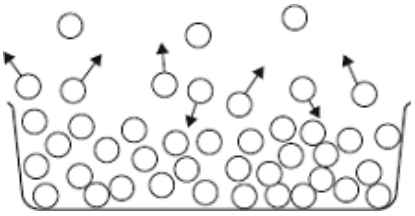
(4)

(b) **Diagram 2** shows the particles in a liquid. The liquid is evaporating.

Diagram 2



(i) How can you tell from **Diagram 2** that the liquid is evaporating?

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(1)

(ii) The temperature of the liquid in the container decreases as the liquid evaporates.

Use kinetic theory to explain why.

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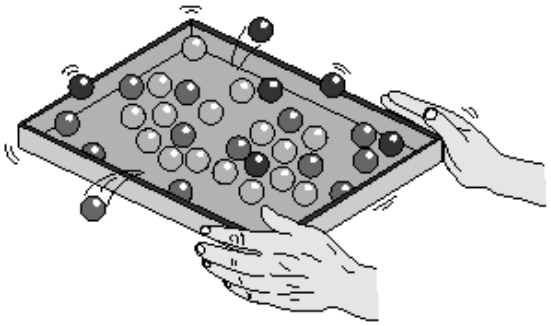
(3)
(Total 8 marks)

Q2. (a) The diagram shows a tray of marbles being shaken from side to side. As this happens some of the marbles jump out of the tray.



Explain how the tray of marbles is acting as a model for the evaporation of a liquid.

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(2)

(b) Before giving an injection, a nurse dabs some alcohol onto the patient's arm. This makes the patient's skin feel cold.

Explain what happens to make the patient's skin feel cold.

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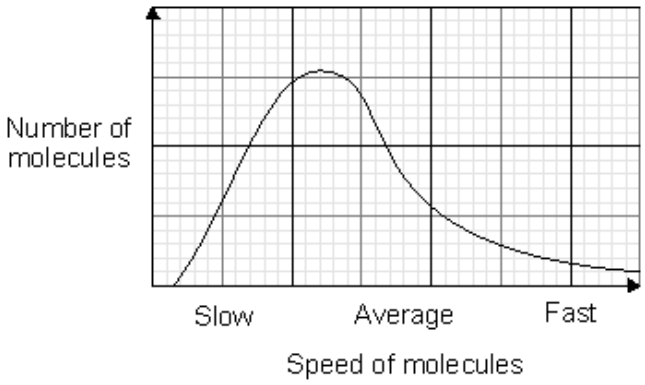
(2)

(c) The graph shows that the molecules in a liquid do not all have the same speed.



Use the information in the graph to explain why a liquid cools down when it evaporates.

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(5)
(Total 9 marks)

M1. (a) there are strong forces (of attraction) between the particles in a solid

accept molecules / atoms for particles throughout
accept bonds for forces

1

(holding) the particles close together

particles in a solid are less spread out is insufficient

1

or

(holding) the particles in a fixed pattern / positions

but in a gas the forces between the particles are negligible

accept very small / zero for negligible
accept bonds for forces

1

so the particles spread out (to fill their container)

accept particles are not close together
gas particles are not in a fixed position is insufficient

1

(b) (i) particles are (shown) leaving (the liquid / container)

accept molecules / atoms for particles throughout
accept particles are escaping
particles are getting further apart is insufficient

1

(ii) *accept molecules / atoms for particles throughout*
accept speed / velocity for energy throughout

particles with most energy leave the (surface of the) liquid

accept fastest particles leave the liquid

1

so the <u>mean / average</u> energy of the remaining particles goes down

1

and the lower the average energy (of the particles) the lower the temperature (of the liquid)

1

[8]

M2. (a) the marbles model / act as molecules

accept atoms / particles for molecules

1

molecules leaving a liquid = evaporation
or
marbles leaving tray = evaporation

1

(b) to evaporate the alcohol requires energy

1

this energy is taken from the skin and the skin feels cold

accept heat for energy

1

(c) there are attractive forces between molecules

1

only the fastest molecules have enough energy to break away from other molecules

1

these molecules escape from the surface of the liquid

1

therefore the average speed / energy of the remaining molecules goes down

1

the lower the average speed / energy of molecules the lower the temperature of the liquid

1

[9]