1.1 The particulate nature of matter

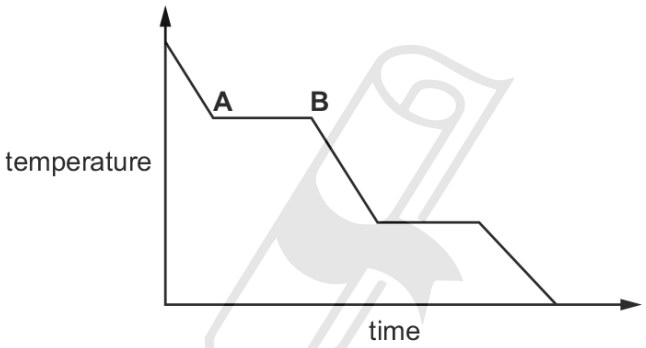
01. 0620_s20_qp_43 Q: 5

(a) Complete the table about solids, liquids and gases.

	particle separation	particle arrangement	type of motion
solid		regular	vibrate only
liquid	touching		random
gas	apart	random	

[3]

(b) The graph shows the change in temperature as a sample of a gas is cooled.



Name the change of state taking place between **A** and **B**.

..... [1]

(c) A bottle of liquid perfume is left open at the front of a room.

After some time, the perfume is smelt at the back of the room.

Name the **two** physical processes taking place.

1 .....

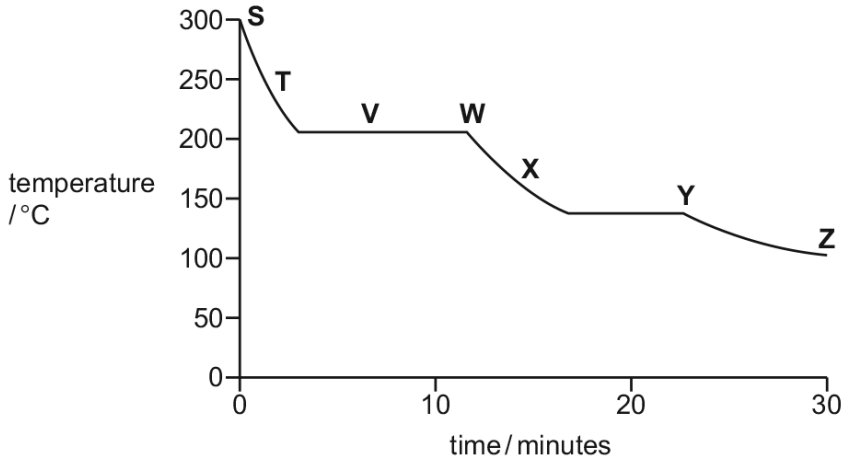
2 .....

[2]

[Total: 6]

02. 0620_w17_qp_41 Q: 2

The graph shows how the temperature of a substance changes as it is cooled over a period of 30 minutes. The substance is a gas at the start.



Each letter on the graph may be used once, more than once or not at all.

(a) Which letter, **S**, **T**, **V**, **W**, **X**, **Y** or **Z**, shows when

(i) the particles in the substance have the most kinetic energy,

..... [1]

(ii) the particles in the substance are furthest apart,

..... [1]

(iii) the substance exists as both a gas and a liquid?

..... [1]

(b) Use the graph to estimate the freezing point of the substance.

..... °C [1]

(c) Name the change of state directly from a solid to a gas.

..... [1]

(d) When smoke is viewed through a microscope, the smoke particles in the air appear to jump around.

(i) What term describes this movement of the smoke particles?

..... [1]

(ii) Explain why the smoke particles move in this way.

.....

.....

..... [2]

[Total: 8]

03.0620_w16_qp_42 Q: 1

Particles behave differently when in different physical states.

(a) Solids have a fixed volume and a definite shape.
Gases have no fixed volume and take the shape of the container.

Describe the volume and shape of liquids.

.....

..... [1]

(b) Complete the table to show the separation, arrangement and movement of particles in each physical state.

state	separation of particles	arrangement of particles	movement of particles
solid			
liquid	touching one another	randomly arranged	move over one another
gas			

[6]

(c) Name the following changes of state.

(i) Ice turning into water.

..... [1]

(ii) Solid carbon dioxide turning directly into gaseous carbon dioxide at room temperature.

..... [1]

[Total: 9]

04.0620_s14_qp_33 Q: 2

Explain each of the following in terms of the kinetic particle theory.

(a) The rate of most reactions increases at higher temperatures.

.....

.....

.....

..... [3]

(b) A liquid has a fixed volume but takes up the shape of the container. A gas takes up the shape of the container but it does not have a fixed volume.

.....

.....

.....

.....

..... [3]

[Total: 6]

05.0620_w12_qp_33 Q: 3

(a) A small amount of liquid bromine is added to a container which is then sealed.

$$Br_2(l) \rightarrow Br_2(g)$$

Use the ideas of the Kinetic Theory to explain why, after about an hour, the bromi molecules have spread uniformly to occupy the whole container.

.....

.....

.....

(b) The diagrams below show simple experiments on the speed of diffusion of gases.

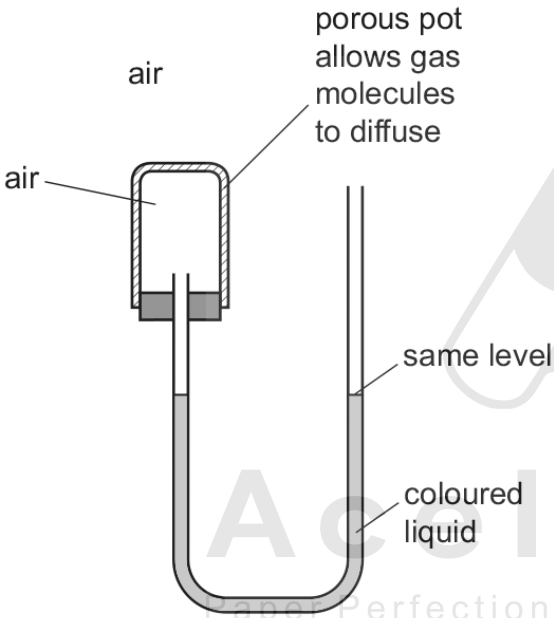


diagram 1

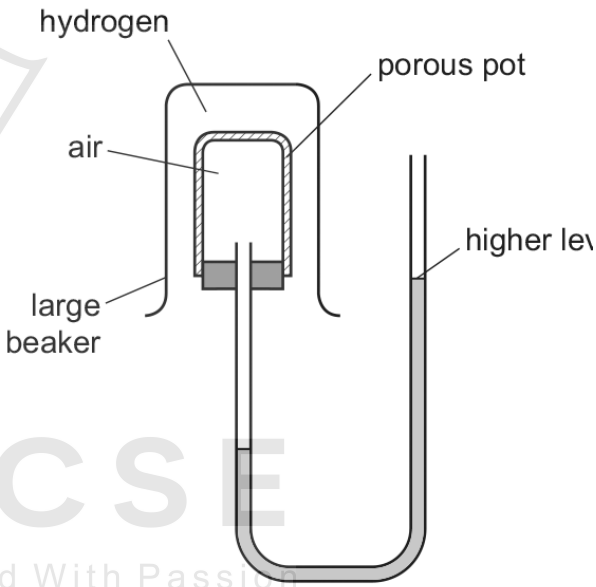


diagram 2

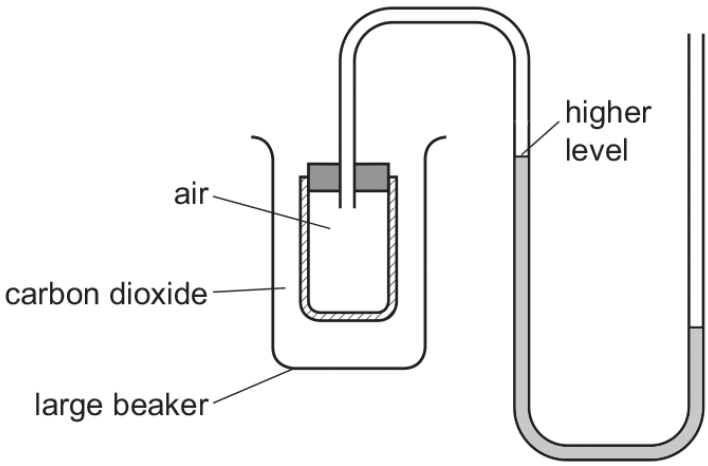


diagram 3

Complete the following explanations. Diagram 1 has been done for you.

Diagram 1

There is air inside and outside the porous pot so the rate of diffusion of air into the pot is the same as the rate of diffusion of air out of the pot. The pressure inside and outside the pot is the same so the coloured liquid is at the same level on each side of the tube.

Diagram 2

.....

.....

.....

..... [3]

Diagram 3

.....

.....

.....

..... [3]

[Total: 9]

Appendix A

Answers

01.0620_s20_ms_43 Q: 5

(a)		particle separation	particle arrangement	type of motion	3
	solid	touching			
	liquid		random		
	gas			random	
(b)	condensing				1
(c)	evaporation diffusion				2

02.0620_w17_ms_41 Q: 2

(a)(i)	**S**	1
(a)(ii)	**S**	1
(a)(iii)	**V**	1
(b)	any value in the range 130–145 °C	1
(c)	sublimation	1
(d)(i)	Brownian motion	1
(d)(ii)	nitrogen / oxygen / carbon dioxide / air molecules hit / bombard the smoke particles	1
	(the bombarding particles) move randomly	1

03. 0620_w16_ms_42 Q: 1

(a)	fixed volume **AND** take the shape of the container				1
(b)					6
	solid	touching	regular	vibrate	
	liquid				
	gas	not touching	random	random	
(c)(i)	melting				1
(c)(ii)	sublimation				1

04. 0620_s14_ms_33 Q: 2

(a) any **three** from:
particles have more energy (1)
move faster (1)
collide more frequently (1)
more particles have energy greater than E_a [3]
guidance: more colliding molecules have enough energy to react is worth (2)

(b) particles move in all directions / randomly <u>in both</u> liquids and gases (1)

no bonds / very weak forces between particles in gases (1)
molecules can move apart / separate (to fill entire volume) (1)
OR
bonds / forces / IMF between particles in liquids (1)
molecules cannot move apart / separate (so fixed volume in liquids) (1) [3]

[Total: 6]

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05. 0620_w12_ms_33 Q: 3

(a) explanation of evaporation e.g. particles (or molecules) with a lot of energy leave the liquid / bromine particles break free from each other / forces or bonds between bromine molecules broken / molecules (in liquid) have weak forces holding them together / weak intermolecular forces / Van der Waals forces between molecules (don't have to be stated as weak) / (weak intermolecular forces alone scores this mark);
allow: particles (or molecules) of bromine escape from liquid [1]

diffusion / diffuse / movement of particles; [1]

explanation of diffusion involving qualified movement of molecules / particles
i.e. random movement of molecules / particles move in all directions; [1]

(b) air more dense / heavier / high<u>er</u> M_r <u>than hydrogen</u>; [1]
hydrogen diffuses fast<u>er</u> (than air diffuses out); [1]
accept: diffusion in is faster than out (without naming gases)
pressure inside pot is great<u>er</u> (than outside); [1]
air less dense / light<u>er</u> / low<u>er</u> M_r <u>than carbon dioxide;</u> [1]

air diffuses / moves fast<u>er</u> (than carbon dioxide); [1]
accept: diffusion out is faster than in (without naming gases)

pressure inside pot less (than outside); [1]

ORA in both parts

[Total: 9]
