02 Kinetic Particle Theory

Set A **Answer key**

A From the lesson

10 MARKS

1 **B** They are close together and slide past one another. [1]

Liquid particles are closely packed in a disorderly way and slide past one another.

A This describes a solid.

C This describes a gas.

D Particles that are far apart have very weak forces of attraction.

2 **C** condensation [1]

In condensation the particles lose energy and come closer together. Melting, boiling and sublimation all absorb energy.

3 **B** The particles of a gas are far apart, with a lot of empty space between them. [1]

A gas can be squeezed because its particles are far apart. The particles of a liquid are already touching.

4 **B** Perfume particles move randomly and spread from a higher to a lower concentration. [1]

This is diffusion: the net movement of particles from a region of higher concentration to a region of lower concentration.

5

In a solid the particles are very closely packed in an orderly arrangement, but in a gas they are very far apart in a disorderly arrangement. [1]

In a solid the particles vibrate and rotate about fixed positions, but in a gas they move quickly and randomly in any direction. [1]

Accept the other differences from the lesson, such as kinetic energy or forces of attraction.

6 **(a)**

The energy absorbed is used to overcome the forces of attraction between the particles. [1]

It is not used to increase the kinetic energy of the particles, so the temperature stays the same. [1]

(b)

The particles gain energy and vibrate more quickly. [1]

They move slightly further apart, so the solid expands. [1]

B Practice

23 MARKS

7 **C** a substance diffusing through a liquid [1]

Movement from a higher to a lower concentration is diffusion. The words "very slowly" show that it is through a liquid, because gas particles move rapidly.

8 **D** Evaporation only occurs at room temperature, while boiling only occurs at the boiling point.

Evaporation can occur at any temperature, not only at room temperature. [1]

9 **B** 3 to 1 [1]

Sublimation is a solid changing straight to a gas. Diagram 3 is the solid and diagram 1 is the gas.

A Liquid to gas is boiling or evaporation.
C Liquid to solid is freezing.
D Solid to liquid is melting.

10 **D** 59 °C [1]

L is a liquid at 25 °C, so its boiling point must be above 25 °C.

11 **B** The carbon dioxide particles become far apart. [1]

0 °C is above −78 °C, so the solid carbon dioxide turns into a gas and its particles become far apart.

12 **(a)** Argon and carbon dioxide. [1]

(b) Particles close together in an orderly arrangement, with at least 3 by 3 particles. [1]

Nitrogen is a solid at −300 °C, because this is below its melting point of −210 °C.

(c) The particles change from sliding past one another to moving rapidly in any direction. [1]

The particles change from being close together and disorderly to being far apart and disorderly. [1]

Oxygen boils at −183 °C, so it changes from a liquid to a gas.

13 **(a)(i)** 100 °C [1]

(ii) 250 °C [1]

(b)(i) Solid [1]

(ii) Solid and liquid [1]

(iii) Gas [1]

(c) As the temperature increases, the particles gain energy and move faster. [1] [1]

When the temperature is high enough, the particles have sufficient energy to overcome the forces of attraction. [1]

The particles are spread far apart and can move about rapidly in all directions. [1]

14 **(a)** The mistake is in methane. [1]

The lower the relative molecular mass, the faster the rate of diffusion. Methane has a lower relative molecular mass than carbon monoxide and nitrogen, so it should diffuse in less than 32 s, but the data shows 35 s. [1]

(b) Ammonia is soluble in water. [1]

(c) The molecules are closely packed in a disorderly (irregular) manner [1]

and slide past one another. [1]