02 Kinetic Particle Theory

Set B **Answer key**

A Multiple choice

6 MARKS

1 **D** melting point 194 °C and boiling point 229 °C [1]

Z is a gas at 232 °C, so its boiling point is below 232 °C. Z is a solid at 179 °C, so its melting point is above 179 °C.

A The melting point is below 179 °C, so Z would not be a solid at 179 °C.

B The melting point is below 179 °C, so Z would not be a solid at 179 °C.

C The boiling point is above 232 °C, so Z would be a liquid, not a gas, at 232 °C.

2 **D** Molecules in ammonia diffuse more quickly because they have a smaller mass than molecules of hydrogen chloride. [1]

The ring forms nearer the hydrogen chloride end, so the ammonia molecules travelled further. Lighter molecules diffuse faster.

3 **A** The two gases remain mixed. [1]

Gas particles are in constant random motion, so a mixed gas stays mixed. It does not separate into layers.

4 **C** 64 seconds [1]

Hydrogen chloride (M_r 36.5) is heavier than ammonia (M_r 17), so it diffuses more slowly and takes longer than 30 seconds.

5 **D** Both the air and bromine particles move randomly. [1]

The particles of both gases are in constant random motion, so they diffuse until they are evenly mixed.

6 **B** X is neon and Y is fluorine [1]

Neon (M_r 20) is lighter than fluorine (M_r 38), so neon diffuses into the pot faster than fluorine diffuses out. The pressure in the pot rises and pushes the water level on the left side down.

B Structured questions

21 MARKS

7 **(a)**

The particles are vibrating and rotating about their fixed positions. [1]

They are very closely packed in an orderly manner. [1]

(b)

10 min [1]

Units are needed.

(c)

The forces of attraction between the particles at B are stronger than at C. [1]

The kinetic energy of the particles at B is lower than at C. [1]

8 **(a)**

80 °C [1]

(b)

The energy is absorbed to overcome the attractive forces between the molecules. [1]

(c)

The particles vibrate faster about their fixed positions. [1] [1]

9 **(a)**

Gases X and Y have a lower relative molecular mass than oxygen. [1]

The gases diffuse faster into the container filled with oxygen than the oxygen diffuses out of the container. [1]

The gases are then pushed down the tube, into the water, and escape as bubbles. [1]

(b)

Carbon dioxide *or* sulfur dioxide *or* nitrogen dioxide. Accept any gas with a higher relative molecular mass than oxygen. [1]

(c)

Chlorine has a higher relative molecular mass than the surrounding air, so it has a higher density than air. [1]

The comparison must be with air, not oxygen.

(d)

Bubbles would be produced faster in the beakers of gases X and Y, *or* water would rise faster up the tubes of gas Z and chlorine. [1]

As the temperature increases, the rate of diffusion increases. [1]

More thermal energy is converted into kinetic energy in the gas particles, so they move and diffuse faster. [1]

"More bubbles" is not accepted, because the idea of speed must be there.

10 **(a)**

The particles roll and slide over each other at first, and vibrate about fixed positions afterwards. [1]

The particles are closely packed and disorderly at first, and become closely packed and orderly. [1]

(b)

The liquid turns into a gas. **[1]**

Heat energy is absorbed and overcomes the forces of attraction between the particles, so the particles move further apart from each other. **[1]**