2 Kinetic Particle Theory

For each question, choose the most suitable option and write the letter (**A**, **B**, **C** or **D**) in the brackets provided.

Level 1

1. In which of the following substances would the distance between particles be the **closest**?

   A Air

   B Liquid zinc metal

   C Rainwater

   D Wood ( )

2. A balloon is partially filled with some cooking oil.

   Which of the following in Figure 2.1 shows the possible arrangement of the particles of the oil in the balloon?

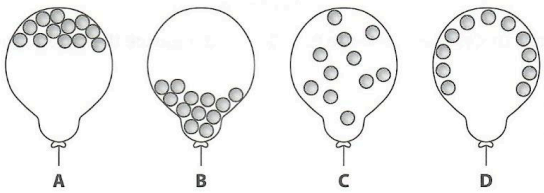


Figure 2.1

   A Balloon **A**

   B Balloon **B**

   C Balloon **C**

   D Balloon **D** ( )

3. Which of the following is **true** when a solid sublimes?

   A A liquid is formed.

   B Energy is absorbed to overcome forces of attraction between the particles.

   C Energy is released and the forces of attraction between particles become stronger.

   D The particles become closer together. ( )

Level 2

4. Figure 2.2 shows the arrangement of particles in substance **X** at two different temperatures.

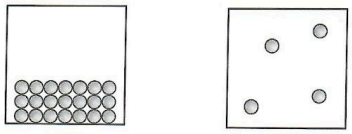


Figure 2.2

What could be the **correct** melting and boiling points for substance **X**?

	Melting Point / °C	Boiling Point / °C
A	−133	−76
B	−139	−82
C	−144	−60
D	−152	−94

( )

5. The scent of a perfume can be detected easily.

This is because the substances in the perfume _____.

A break down into simpler substances when sprayed

B have low boiling points

C have low density

D have low volatility

( )

6. Figure 2.3 shows the arrangement of the particles of water at different states.

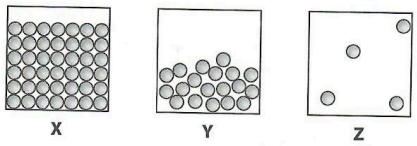


Figure 2.3

Which of the following change occurred when water is heated from −20 °C to 15 °C?

A X ⟶ Y

B Y ⟶ X

C Y ⟶ Z

D Z ⟶ Y

7. Table 2.1 shows the boiling points of four substances.

Table 2.1

Substance	Boiling Point / °C
A	–75
B	–102
C	–44
D	–67

Substances **A**, **B**, **C** and **D** are mixed together at a temperature of –110 °C. The mixture is then heated and the temperature of the mixture increases by 45 °C.

Which substances will be in the liquid state?

A Substances **A** and **B** only

B Substances **A** and **D** only

C Substances **A**, **B** and **D** only

D Substances **C** and **D** only ( )

8. A substance undergoes changes in states as shown in Figure 2.4. **I** to **VI** represent the processes that the substance undergo during these state changes.

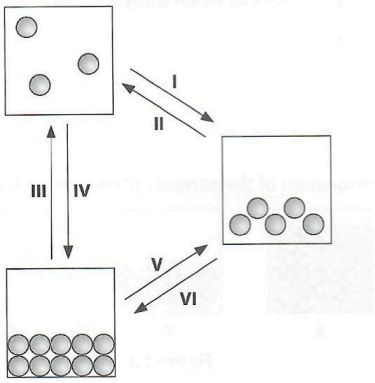


Figure 2.4

Which of the following statements is **true**?

A If the substance is iodine, it can undergo process **III**.

B If the substance is sodium chloride, it can undergo process **V** at room temperature.

C Processes **I**, **IV** and **VI** require energy.

D Processes **III** and **IV** can take place at the same temperature. ( )

9. Which of the following consist(s) of particles which are able to move freely and in any direction?

   1 A jar containing a mixture of gaseous nitrogen and water at room temperature

   2 Dry ice

   3 Molten sodium chloride

   4 Sodium chloride crystals

   A 1 only

   B 1 and 2 only

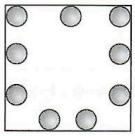
   C 1 and 3 only

   D 1, 3 and 4 only ( )

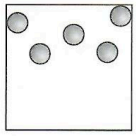
10. Gaseous bromine is denser than air. A sample of gaseous bromine is added into a container of air.

    Which of the following diagrams shows the **correct** arrangement of particles of gaseous bromine in the container?

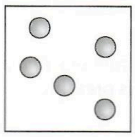
A



B



C



D

( )

11. Figure 2.5 shows the cooling curve of substance **Y**.

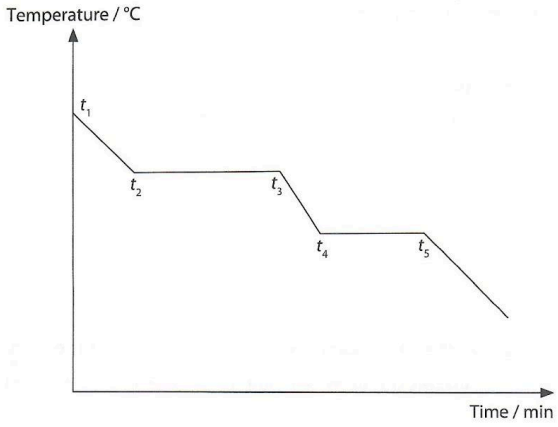


Figure 2.5

Which of the following show the **correct** descriptions of substance **Y** at t_1 to t_5?

	Between t_1 and t_2	Between t_2 and t_3	Between t_4 and t_5
A	Particles start to gain energy from the surroundings.	A mixture of liquid and solid is present.	Particles start to lose energy.
B	Particles start to lose energy to the surroundings.	A mixture of gas and liquid is present.	A mixture of liquid and solid is present.
C	Particles start to be drawn closer together.	A mixture of liquid and solid is present.	A mixture of liquid and solid is present.
D	Particles start to move slightly apart.	A mixture of gas and liquid is present.	Only a liquid is present.

( )

Level 3

12. Figure 2.6 shows what happens during the evaporation and boiling of the same liquid.

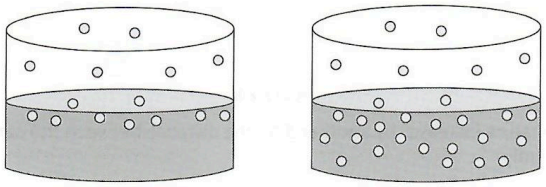


Figure 2.6

Which of the following is **true**?

A Boiling occurs when particles in the liquid absorb energy while evaporation occurs without any absorption of energy.

B Boiling takes place at one temperature while evaporation only takes place at room temperature.

C Evaporation cannot take place when the liquid is boiling.

D Evaporation only takes place at the surface of the liquid. ( )

13. Figure 2.7 shows the melting points of mixtures of substance **X** and substance **Y** in different compositions.

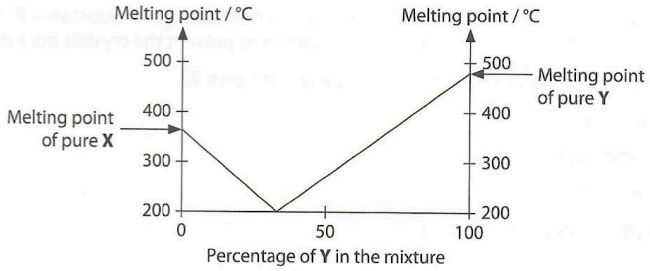


Figure 2.7

Which of the following observations about the mixture is/are **correct**?

1 A mixture of **X** and **Y** will always have a melting point below that of pure **X**.

2 A mixture of **X** and **Y** will always have a melting point below that of pure **Y**.

3 A mixture of **X** and **Y** will always have a melting point between that of both **X** and **Y**.

4 A mixture of **X** and **Y** in a 1 : 1 ratio has the lowest melting point.

A 1 only

B 1, 2 and 4 only

C 2 only

D 2 and 3 only ( )

14. Figure 2.8 shows the arrangement of particles at 125 °C for substance **M**.

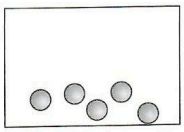


Figure 2.8

When the temperature increases by another 5 °C, the distance between the particles start to increase significantly.

Which of the following statements are **true** of substance **M**?

1 **M** could be water.

2 **M** would evaporate at a slower rate than water at room temperature.

3 Particles of **M** would resemble that of particles of carbon dioxide at 125 °C.

4 Pure **M** has a boiling point of 130 °C.

A 1 and 2 only

B 1 and 3 only

C 2 and 4 only

D 3 and 4 only ( )

15. The following is some information about substance **Z**.

"Substance **Z** has a melting point of 38 °C. It exists as a crystalline solid. Substance **Z** is stored and kept in a cool and dry place in tightly sealed containers to prevent the crystals from disappearing."

Which of the following properties could be **true** of substance **Z**?

A **Z** can sublime.

B **Z** is a compound.

C **Z** is an element.

D **Z** may contain impurities in its crystal. ( )

Level 3

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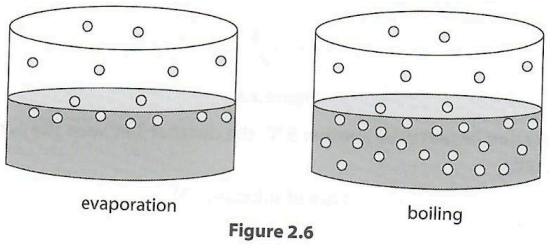

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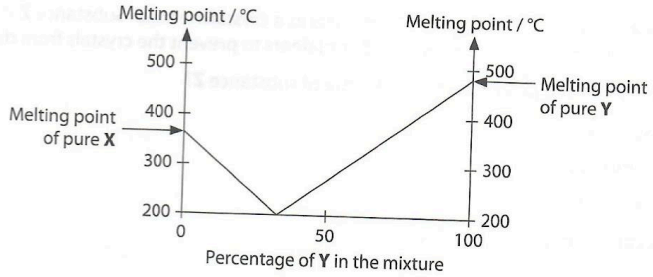

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( )