

IB Chemistry HL - S1.1

Introduction to the particulate nature of matter

Exercises + Practice questions

Official answers appended at the end

Exercise

Q1. Identify the homogeneous mixture.

A water and oil

B sand and water

C salt and water

D sand and salt

Q2. Identify the correct descriptions about mixtures.

I. The components can be elements or compounds.

II. All components must be in the same state.

III. The components retain their individual properties.

A I and II only

B I and III only

C II and III only

D I, II and III

Q3. Identify the homogeneous mixtures.

I. gold

II. bronze

III. steel

A I and II only

B I and III only

C II and III only

D I, II and III

Q4. (a) River water needs to be purified to make it safe to drink. The water passes through a grid and is then left in a tank where other impurities are removed as they fall to the bottom in a process known as sedimentation. Suggest why pollutants such as fertilizers are not removed in this process.

(b) Drinking water can be obtained from seawater by distillation. Explain the disadvantages of using distillation to obtain large amounts of drinking water.

Q5. A layer of oil paint is left to dry in the air and it hardens. Suggest what causes the oil to harden.

Q6. Metal coins are made from different metals. The composition of a 20-cent and a 50-cent euro coin is given below.

	Mass/g			
Coin	Copper	Aluminium	Zinc	Tin
20 cent	5.11	0.287	0.287	0.057
50 cent	6.94	0.39	0.39	0.080

Compare the chemical compositions of the two coins.

Exercise

- Q7.** A mixture of two gases, X and Y, which both have strong but distinct smells, is released. From across the room the smell of X is detected more quickly than the smell of Y. What can you deduce about X and Y?
- Q8.** Use the kinetic theory to explain whether you would expect the rate of diffusion in a liquid to increase or decrease as the temperature is increased.
- Q9.** Which is the correct descriptor for the movement of particles in the solid, liquid and gaseous states?

	Solid	Liquid	Gas
A	vibrational movement in one dimension	vibrational movement in two dimensions	vibrational movement in three dimensions
B	no movement, fixed in position	only vibrational movement	free movement in all dimensions
C	free movement in all dimensions	free movement in all dimensions	free movement in all dimensions
D	vibrational movement	limited movement in all dimensions	free movement in all dimensions

- Q10.** A closed flask contains a pure substance, a brown liquid that is at its boiling point.
- (a) Explain what you are likely to observe in the flask.
- (b) Distinguish between the inter-particle distances and the average speeds of the particles in the two states present.
- Q11.** A beaker containing solid carbon dioxide is placed in a fume cupboard at room temperature. The carbon dioxide becomes gaseous. Which process describes this change of state?
- A** boiling **B** condensation **C** evaporation **D** sublimation
- Q12.** Water exists in three states: ice, liquid water or steam. Which transition can occur over a range of temperatures at constant pressure?
- A** freezing **B** melting **C** evaporation **D** boiling

Q13. A liquid is placed in an open dish. Which change increases the rate of evaporation?

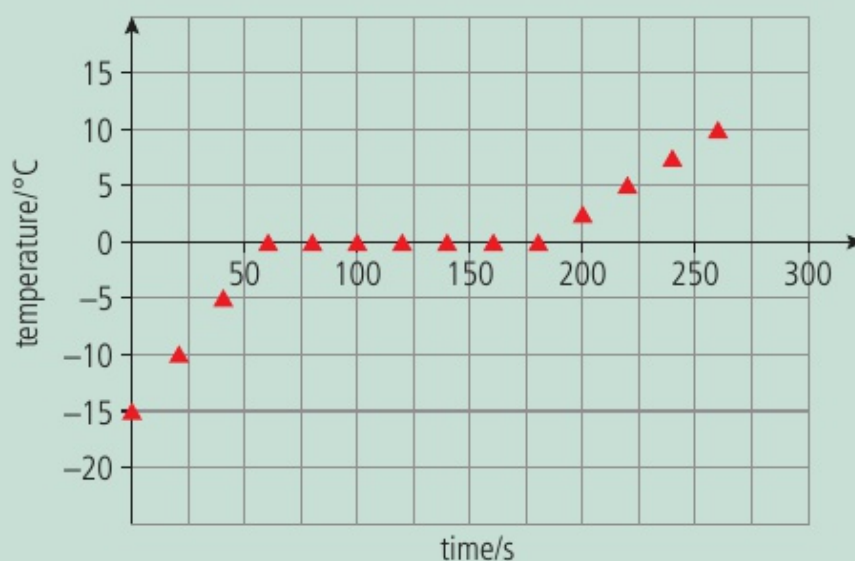
- I. increased temperature of the liquid
- II. increased depth of the liquid
- III. increased surface area of the liquid

A I and II **B** I and III **C** II and III **D** I, II and III

Q14. During very cold weather, snow often gradually disappears without melting. Explain how this is possible.

Exercise

Q15. A solid is heated and the temperature is measured every 20 seconds.



- (a) Identify the solid.
- (b) Describe how the particles in the solid are moving in the interval 0–60 s.
- (c) Describe how the particles are moving in the interval after 180 s.
- (d) Explain why the temperature does not change in the interval 60–180 s.
- (e) Use the graph to predict the temperature after the material has been heated for 600 s.
- (f) Use the graph to predict the temperature after 1200 s. Comment on the validity of your prediction.