

Name \_\_\_\_\_ Date \_\_\_\_\_

# 1A: States of matter

- 1 This question relates to explaining the properties of solids, liquids and gases. For each statement about a property, write 'solid', 'liquid' or 'gas'.

| Property                                                                    | State of matter |
|-----------------------------------------------------------------------------|-----------------|
| Has the highest kinetic energy                                              | Gas             |
| Vibrates in a fixed spot                                                    |                 |
| Fills an entire container                                                   |                 |
| Close arrangement of particles but with no regular ordering                 |                 |
| Very high density – a large number of particles are covered in a small area |                 |
| Can take the shape of the container but not change volume                   |                 |

- 2 Complete the diagram in Figure 1.1 to show what happens to particles at different changes of state.

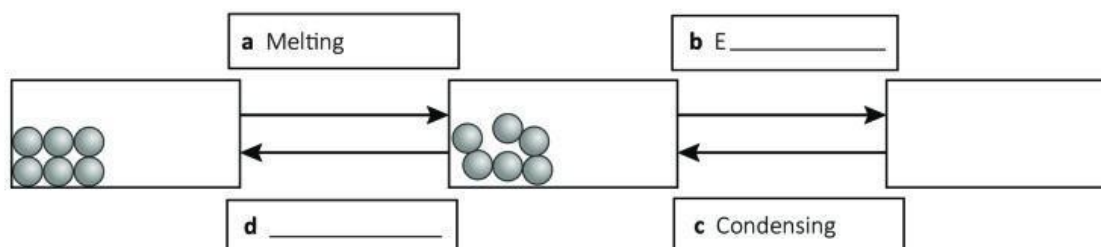


Figure 1.1

- 3 Explain the following energy changes:

*Think about the terms endothermic (takes in energy), exothermic (gives out energy) and intermolecular forces. Consider what is happening to the kinetic energy of the particles.*

For example, a gas turning into a liquid is exothermic because the particles need to give out energy to turn into a liquid (which is at a lower energy).

- a Liquid turning into a solid.

\_\_\_\_\_

- b Liquid turning into a gas.

\_\_\_\_\_

4 This question relates to the physical states of elements at different temperatures.

| Element   | Melting point (°C) | Boiling point (°C) |
|-----------|--------------------|--------------------|
| Hydrogen  | -259               | -253               |
| Oxygen    | -218               | -183               |
| Iron      | 1538               | 2861               |
| Magnesium | 650                | 1090               |
| Sulfur    | 115                | 445                |
| Carbon    | 3550               | 4027               |
| Neon      | -249               | -246               |

a Which elements are a solid at 200 °C?

*There are three, and they need to have a melting point above 200 °C.*

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b Which elements are a gas at 1500 °C?

*There are five, and they need to have a boiling point below 200 °C.*

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c What state is neon in at -250 °C?

*Think about whether -250 is higher than -249. Try placing the MP, BP and -250 °C on a vertical line. Where does -250 °C sit?*

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d What state is oxygen in at -200 °C?

*Think about whether -200 is higher than -183. Try placing the MP, BP and -183 °C on a vertical line. Where does -183 °C sit?*

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5 This question relates to how changes of state of a substance can be represented graphically.

a Add the missing labels to the graph in Figure 1.2.

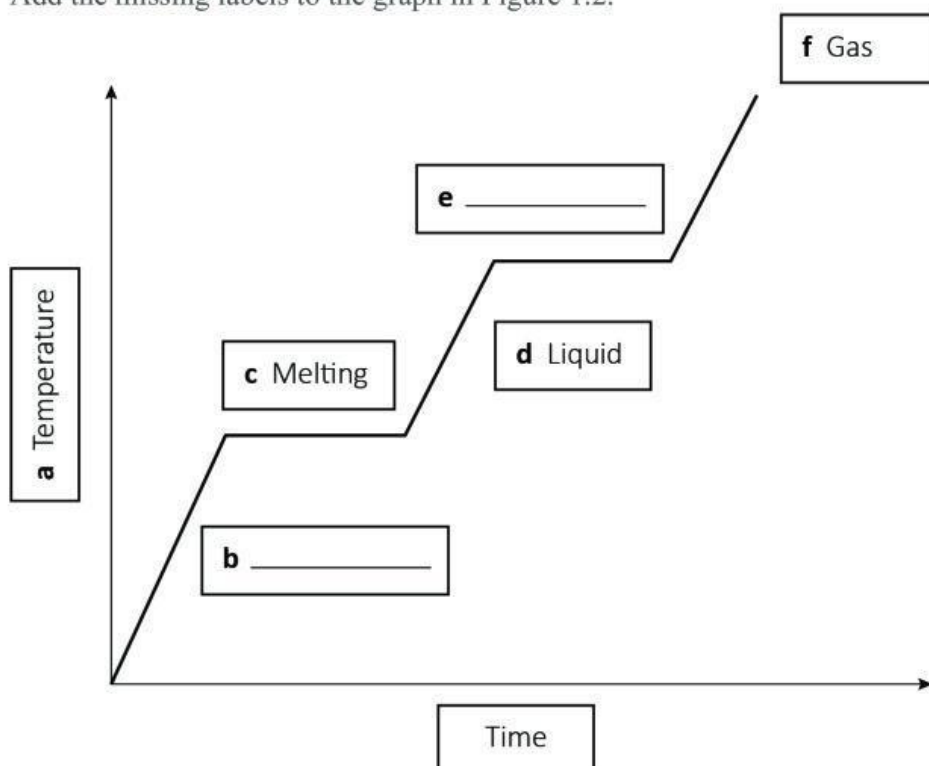


Figure 1.2

b Explain the increase in temperature at points b and d.

*Think about kinetic energy.*

c Explain why there is no change at points c and e.

*Think about intermolecular forces. They interact with the particles. If there is a change in state, what needs to happen to these intermolecular forces to allow the change of state?*

d How can you tell from the graph that the substance is pure?

*Pure water melts at 0 °C. Think about what adding salt to pure ice (water) does to the purity and melting point.*

6 This question relates to diffusion.

a Explain the term *diffusion*.

*Include the words particles and concentration in your answer.*

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b Complete the diagram in Figure 1.3 to show how bromine liquid can be used to explain diffusion.

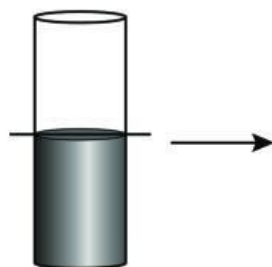


Figure 1.3

c Give **two** factors that can affect the rate of diffusion.

*Think about how particles are more likely to move from one place to another more quickly.*

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