Particles and their behaviour

Task 1: Particles

Take a lump of modelling clay and break it in half. Keep breaking it in half until you can't get the lump any smaller.

Do you think you have just one particle left now? Explain your answer.

_____

_____

Task 2: Particle model

Completing the table will help you describe arrangements of particles. You will need to draw a diagram for each state using circles for each particle. The first particle has been drawn in to help you. The missing words are given beneath.

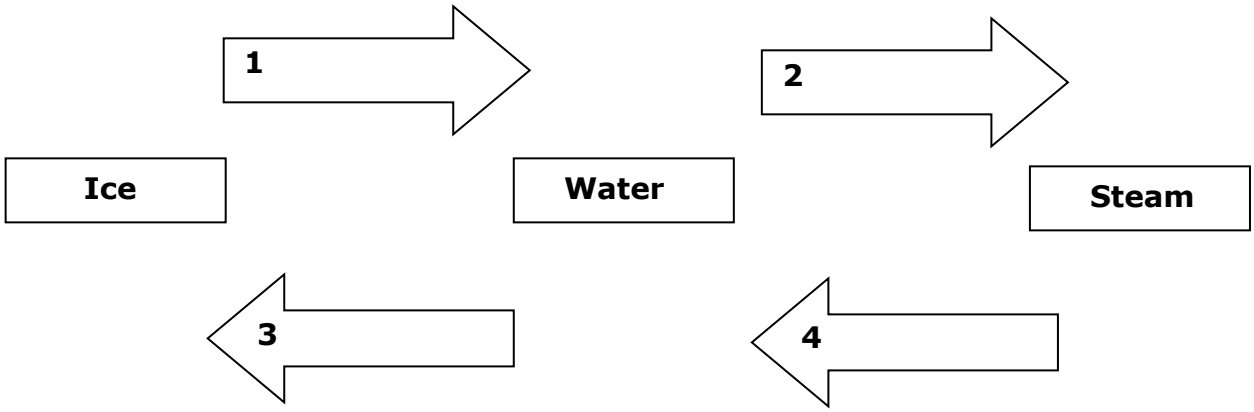
Solid	Liquid	Gas
○	○	○
The particles are in _____ positions. Solids cannot be _____. Solids have fixed _____.	The particles can move _____ one another but cannot _____. Liquids have fixed volume but can be _____.	The particles are very _____ apart and do not _____ one another. The particles move very _____ and can be compressed. Gases _____ any space.

Missing words:

fast volumes fixed far escape poured touch compressed past fill.

Task 3: Changes of state

You need to complete the following diagram and table to show what happens to an ice cube when it is heated up in a saucepan.



1 Label arrows 1–4 with the name of the process that is happening.

2 Decide which of the statements in the table below describes each arrow.

Add the correct arrow number to each statement.

Arrow	Description
	Particles are very far apart and moving very quickly. They begin to get closer together until they are in contact with one another. Particles can still move around but now take up less volume.
	Particles start to vibrate more and more. They can move from their fixed positions and are able to move past one another.
	Particles gain enough energy to escape from each other. They begin to move around on their own, very fast. They spread out into the full space of their container.
	Particles stop moving past each other and have fixed positions. They still have some energy and vibrate but they cannot move about anymore.

3 Water is not able to sublime. Tick the statement below that describes sublimation.

	Particles are moving past each other freely and then escape. They now take up more space and move about very quickly, not touching one another.
	Particles are in fixed positions. They gain so much energy they can escape from their positions. They now take up more space and move about very quickly, not touching one another.

Task 4: Melting and boiling points

Different substances have different melting points and boiling points. The melting point is the temperature when a substance turns from a solid to a liquid.

The boiling point is the temperature when a substance turns from a liquid to a gas. Melting always happens at a lower temperature than boiling.

Use the following melting points and boiling points to answer some questions about chlorine, water, and lead.

Substance	**Melting point (°C)**	**Boiling point (°C)**
chlorine	−101	−34.7
water	0	100
lead	327	1744.0

Tips:

- For a substance to be a solid, the temperature of the surroundings must be lower than its melting point.
- For a substance to be a liquid, the temperature of the surroundings must be higher than its melting point but lower than its boiling point.
- For a substance to be a gas, the temperature of the surroundings must be higher than its boiling point.

Chapter 1 Checkpoint
Revision (Route A)

1 Chlorine is usually found as a gas. In 1954 a temperature of –66 °C was recorded in Greenland. Would chlorine still have been a gas? Explain your answer.

2 Would a puddle freeze if the temperature was –5 °C? Explain your answer.

3 What state will lead be in if it is placed in an oven that has been heated to 250 °C? Explain your answer.

Task 5: Diffusion

In this task you are going to write an explanation for diffusion in gases and liquids using the particle model. First work through the questions.

1 In which state of matter are particles more spread out? Circle your answer.

liquid **solid** **gas**

2 Tick the statement below that you think is correct.

	Particles diffuse more quickly in gases.
	Particles diffuse more quickly in liquids.

3 Write an explanation for why diffusion happens more quickly in this state.

Chapter 1 Checkpoint
Revision (Route A)

Task 6: Gas pressure

Look at the pictures of the balloons. Both contain air particles. The balloon that is blown up has more particles in it.

1 Do you think the particles in the blown up balloon are more likely or less likely to bump into each other and the side of the balloon? Circle your answer.

more likely **less likely**

When particles bump into the rubber of the balloon they exert a force. The amount of force exerted across an area is the gas pressure.

2 When you blow up a balloon, do you think the gas pressure increases or decreases?

increases **decreases**

3 Use the information from Questions 1 and 2 to write an explanation for gas pressure. Use the key words given in the box.

particles	force	gas pressure	collide