Nova’s States of Matter Laboratory

Learning objective: To identify, classify, and explain the properties of solids, liquids, and gases, and describe how temperature affects the state of matter.

Nova the Owl is conducting experiments in her treetop laboratory. She has collected several samples but needs you to help her classify them. Read the 'Experimental Samples' list below and sort them into the correct state of matter. Then, answer the deeper thinking questions to demonstrate your scientific understanding.

Word bank: Solid · Liquid · Gas · Particles · Vibrate · Flow · Compress · Melting · Evaporation

1. 1. Sort these items into their correct state of matter: A gold coin, orange juice, steam, a wooden block, helium inside a balloon, and honey. Explain the arrangement of particles in a solid compared to a gas. (3 marks)

2. 2. Nova leaves a bowl of ice cubes in the sun. Explain the process of 'state change' occurring here. What happens to the energy of the particles? (2 marks)

3. 3. Compare and contrast: Why can you compress a gas into a smaller space, but you cannot easily compress a liquid or a solid? (3 marks)

4. 4. Justify your answer: If you pour 200ml of water from a tall, thin cylinder into a wide, shallow bowl, does the volume of the water change? Why or why not? (2 marks)

5. 5. What might happen if the particles in a solid stopped vibrating completely? Research or hypothesise the effect of absolute zero on matter. (3 marks)

6. 6. Design a fair test: How would you prove that air (a gas) is actually matter and takes up space? Describe your experimental method. (4 marks)

Draw: Draw a scientific diagram showing the arrangement of particles in a solid, a liquid, and a gas. Use small circles to represent particles and include arrows to show how they move.

Extension challenge: Imagine you are a particle. Write a creative diary entry from the perspective of a water molecule that has just moved from being part of a solid ice cube to being part of a gaseous cloud. Use scientific vocabulary such as 'thermal energy', 'bonds', and 'kinetic movement' to describe your journey.