Nova’s States of Matter Laboratory

Learning objective: To identify, describe, and compare the properties of solids, liquids, and gases, and justify why materials change state.

Nova the owl is conducting experiments in her treehouse lab. Read the scenario for each item below. Classify the substance as a solid, liquid, or gas, and provide a scientific justification for your choice using the vocabulary from the word bank.

Word bank: particles · vibrate · fixed volume · compressed · flow · intermolecular forces · kinetic energy · lattice structure

1. Nova freezes a tray of water to make ice cubes. Explain why the ice maintains its shape while the water did not. Reference the arrangement of particles in your answer. (3 marks)

2. Max the monkey is blowing up a balloon for a party. Justify why the air inside the balloon can be compressed, whereas the juice in his cup cannot. (3 marks)

3. Compare and contrast the movement of particles in a solid block of iron versus a cloud of steam. Why does heat affect this movement? (4 marks)

4. If Nova leaves a glass of water on her windowsill on a hot day, it disappears. Explain the process occurring at a particle level. (2 marks)

5. Justify this statement: 'All liquids can flow, but not all substances that flow are liquids.' Can you provide an example of a gas that flows? (3 marks)

6. What might happen if the particles in a solid were suddenly given a large amount of kinetic energy? Predict the change of state. (2 marks)

Draw: Draw three circles representing a zoomed-in view of a solid, a liquid, and a gas. Ensure your diagram clearly shows the difference in spacing and arrangement of particles in each state.

Extension challenge: Design a fair test to investigate the rate of evaporation. Create a hypothesis stating how the surface area of a liquid might affect the time it takes to evaporate completely. How would you ensure your results are reliable?