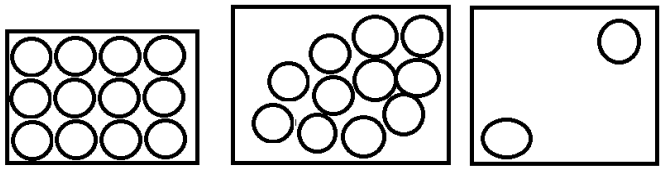
C1.1 The Particle Model

Learning Objectives	Keypoints
Describe the main features of the particle model	In a solid, the particles are regularly arranged, very close together and they vibrate about fixed positions. In a liquid, the particles are randomly arranged, close together and move around past each other. In a gas, the particles are randomly arranged, far apart and they move quickly in all directions.  **solid** **liquid** **gas**
Explain some general properties of solids, liquids and gases	Solids and liquids cannot be squashed as the particles are close together so there are no spaces for the particles to move into. Gases can be squashed because there is lots of space in between the particles. Solids cannot flow because the particles cannot move past each other. Liquids and gases can flow because the particles can move past each other. A solid has a fixed shape because the particles have a fixed arrangement. Liquids and gases take the shape of their container as the particles can move past each other.
Describe differences between chemical and physical changes	In a physical change no new substances are made. Examples include changing state and dissolving or mixing. Many physical changes can be reversed. In a chemical change one or more new substances are made. Many chemical changes cannot be reversed easily.
Explain chemical and physical changes in terms of particles	In a chemical change the bonds between atoms change. Bonds in the reactants may break and new bonds will form to make the products. In a physical change the particles stay exactly the same, but their arrangement may change.
Compare the sizes of particles to the distances between them	In a gas, the distance between the particles is much greater than the size of the particle itself. For example, in helium gas the distance between the helium toms is 55 times larger than the diameter of the helium atom.
Describe the forces between particles	There are electrostatic forces between particles. In a solid these are stronger as the particles are closer together. In a liquid they are weaker as the particles can move past each other. In a gas they are much weaker as the particles are very far apart and fast moving.
Explain the limitations of the particle model	The particle model does not show the forces between the particles or the relative size of the particles compared to the space between them.
Keywords: atoms, chemical changes, chemical reaction, electrostatic forces, matter, particle, particle model, physical changes, state	