

## Chemguide – answers

### SIMPLE KINETIC THEORY

- Melting happens when the solid has gained enough heat energy for the particles to loosen the attractions holding them in the rigid structure, allowing the particles to move around. The breakdown of the structure means that the particles aren't so closely packed, and gaps appear. This means that the solid expands on melting. However, the forces are still strong enough to hold the particles closely together, and so there is only a *slight* increase in the volume.
  - See the diagrams on the Chemguide page. Your liquid should show the particles mainly touching, but at random with a few gaps. Your gas should show the particles well separated. (As a rough guide, for a gas at room temperature and pressure, the distance between the particles is about ten times the diameter of the particles. Nobody is going to measure this, but it means that you should draw only a few particles, and keep them well separated.)
  - Cooling reduces the energy of the particles, so that they move more slowly. At some point, they will be moving slowly enough for the attractions between the particles to hold them together as a liquid. In substances where the forces of attraction are greater, then the forces will be strong enough to form the liquid at a higher temperature. If the forces are very weak, then a lot more cooling will be needed before the particles will stick together as a liquid.
- The enthalpy of fusion is the heat energy needed to convert 1 mole of a solid into a liquid at its melting point.
  - The enthalpy of vaporisation is the heat energy needed to convert 1 mole of a liquid into a gas at its boiling point.
- Evaporation takes place when some of the more energetic particles in a liquid have enough energy to overcome the attractive forces in the liquid and escape from the surface as a vapour. In boiling, the attractive forces between the particles are broken throughout the whole liquid, not just at the surface. Bubbles of vapour are then seen throughout the liquid.
  - When a liquid evaporates in a closed container, an equilibrium is set up where particles are returning to the liquid at the same rate as others are escaping from the surface. This leaves a constant number of particles in the vapour. As these hit the sides of the container, they exert a pressure. This is known as the saturated vapour pressure.
  - The saturated vapour pressure is a measure of the number of particles from the original liquid which are present as vapour in the container. The greater the number of particles, the more pressure they exert on the walls of the container, and so the higher the saturated vapour pressure.

The higher the temperature, the more particles will have enough energy to escape from the surface, meaning that at equilibrium there will be more particles in the vapour, and so a higher vapour pressure.

  - Sublimation is a direct change from solid to gas or gas to solid without going through the liquid state.