

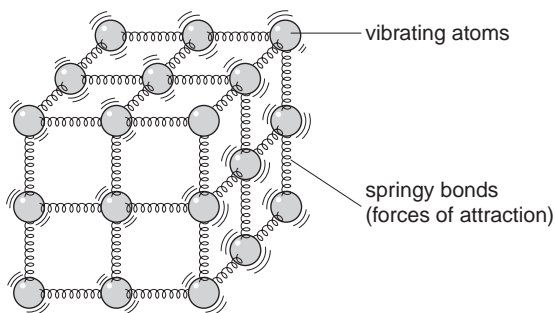
# Kinetic theory (1)

## STATES OF MATTER

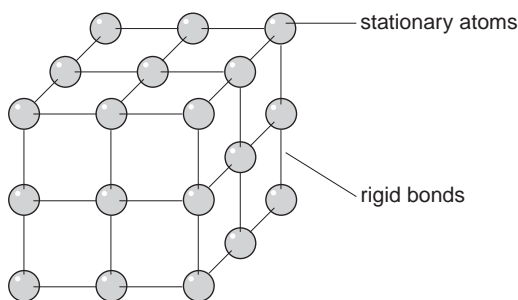
The kinetic theory is a series of ideas and models put forward to explain the basic properties of solids, liquids, and gases (fluids).

## KINETIC THEORY OF SOLIDS

All solids are made up of tiny particles: atoms or molecules. These are often arranged in a regular pattern called a **lattice**. Within a lattice there are electrostatic forces which hold the particles (molecules) in place but allow them to vibrate from side to side. It is these strong intermolecular forces which are responsible for the firmness and rigidity of solids.



a model of a solid at a temperature above absolute zero

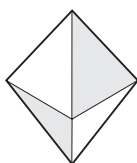


a model of a solid at absolute zero

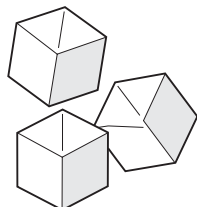
When a solid is cooled the internal energy of the lattice decreases. The molecular vibrations lessen. Eventually if a solid is cooled to 0 K or  $-273\text{ }^{\circ}\text{C}$  the vibrations stop. The solid has no internal energy.

### Evidence to support the kinetic theory of solids

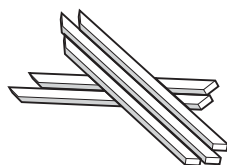
- Some solids such as common salt or copper sulphate form crystals which are always the **same shape**.



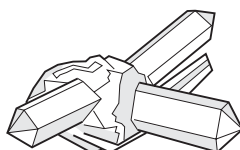
alum



common salt

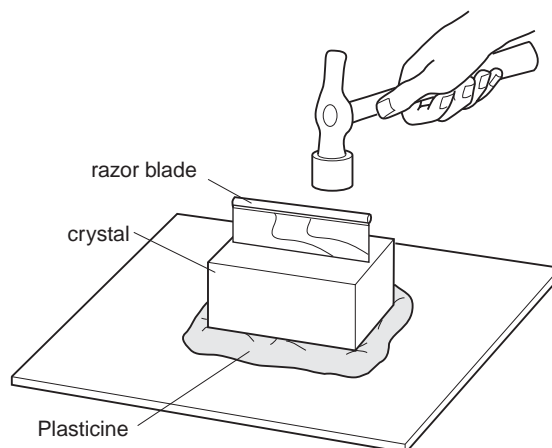


potassium nitrate



quartz

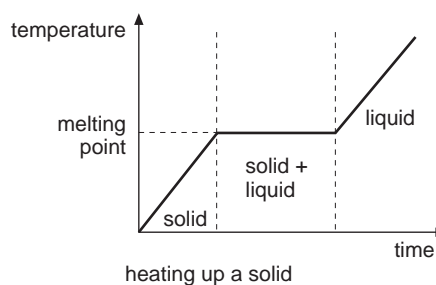
- It is possible using a sharp blade to cleave crystals. The blade passes between the planes of atoms or molecules.



### Melting

When a solid is heated the internal energy of the lattice increases and the molecular vibrations become more violent. Eventually if enough energy is given to the solid the vibrations become so violent that the lattice structure begins to break down. There is now no large rigid structure but rather large groups of molecules which are able to flow past each other. The solid has melted.

The energy which is needed to break down the lattice structure in order to produce a liquid is called the **latent heat of fusion**. The temperature remains unchanged whilst the solid melts. All the energy being provided is being used to break down the lattice structure.



If a liquid is solidifying the lattice structure is reforming and energy is being released. During this time the temperature of the liquid/solid mixture remains constant.

