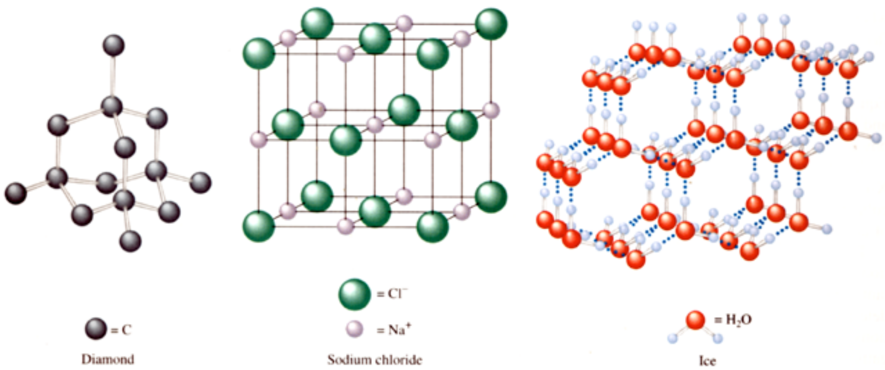
Types of Solids

Solids are nearly always arranged in a regular pattern and are generally much easier to describe and model. In this class we will be categorizing solid structures based on what type of particle makes up the regular arrangement.

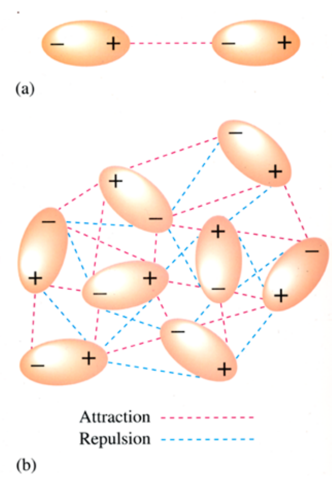


Intermolecular Forces

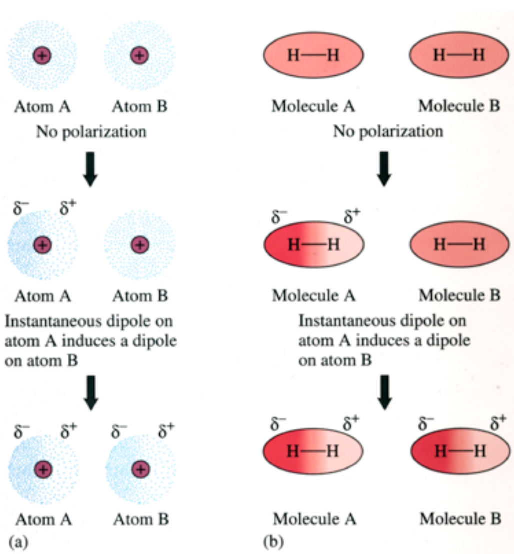
In KMT one of the postulates that we discussed was the assumption that there were no attractive forces between molecules. We went on to show that this was untrue. To understand condensed states of matter (solids and liquids) we need to have a much greater understanding of the the different types of intermolecular forces.

There are two main types of intermolecular forces:

Dipole-dipole interactions occur between molecules that are polar. Dipole-dipole interactions occur because of the attraction between the positive and negative charges on different molecules. Hydrogen bonding is an especially strong form of dipole-dipole interaction. Molecules that have hydrogen bonded to nitrogen, oxygen or fluorine can exhibit hydrogen bonding.



London dispersion forces are temporary dipole interaction that exist in all substances. They are the most important forces in non-polar molecules and are generally much weaker than dipole-dipole forces.



Changes of State

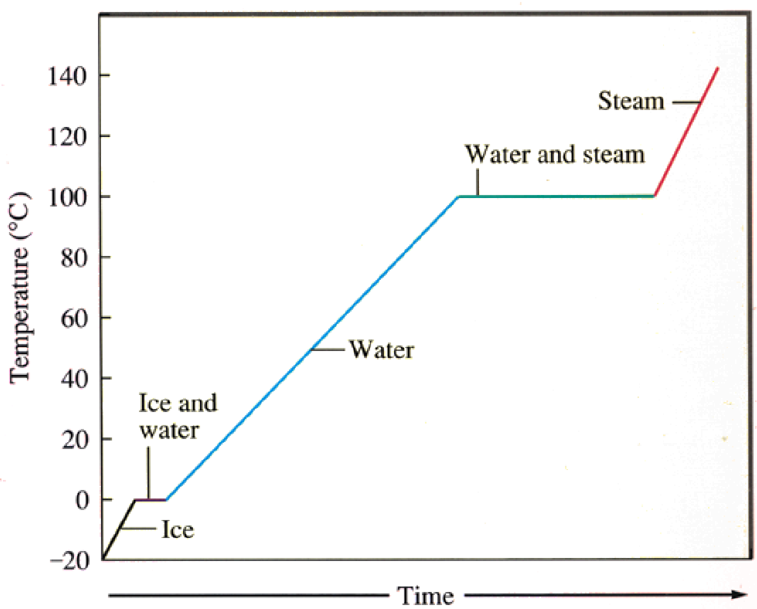
We want to be able to look at a substance and model how it will behave as it is heated or cooled. To do this we need to understand how phase changes occur.

We can illustrate this by measuring the temperate of a given amount of water as a steady source of heat is applied to it. We will want to be able to calculate the energy changes involved.

If the temperature is changing we can determine the relationship between energy and temperature by using : $q = m \ \Delta T \ s$

If the temperature is constant, then the KE must be constant and we need to calculate the energy change in a different way. We need to know the enthalpy of fusion or the enthalpy of vaporization.

$$q = n \ \Delta H_f \qquad q = n \ \Delta H_v$$



For water:

ΔH_{Vap}=40.7 kJ/mol

ΔH_{Fus}= 6.00 kJ/mol

Ex: