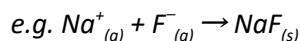


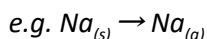
# Definitions and Concepts for Edexcel Chemistry A-level

## Topic 13: Energetics 2

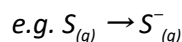
**Standard lattice energy:** Energy change when 1 mole of an ionic solid is formed from its constituent gaseous ions under standard conditions.



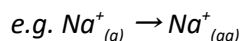
**Standard enthalpy of atomisation:** Enthalpy change when 1 mole of gaseous atoms is formed from the elements in its standard states. Always endothermic.



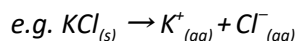
**First electron affinity:** the enthalpy change that takes place when one electron is added to each atom in one mole of gaseous atoms to form one mole of gaseous 1- ions (could be asked for successive electron affinities).



**Enthalpy change of hydration:** The enthalpy change when 1 mole of a gaseous ion is completely dissolved in water under standard conditions.



**Enthalpy change of solution:** Enthalpy change when 1 mole of ionic solid completely dissolves in water under standard conditions to form an infinitely dilute solution.



**Polarisation:** Distortion of a charge distribution, e.g. in covalently bonded HF, the bond is *polarised* towards fluorine, as fluorine is more electronegative than hydrogen. The consequence is the partial negative charge on fluorine and the partial positive charge on hydrogen. Similarly, in “ionic” NaI, sodium cation is more charge dense than iodide anion (both have a charge of 1 +/-, but sodium is smaller) and hence will attract some of the electron density of iodide, thus disrupting the electron distribution; sodium cation *polarises* the iodide anion - this allows us to understand the *covalent character* of some molecules which display *ionic bonding*.

**Entropy:** A measure of the disorder of a system. The units of entropy are JK<sup>-1</sup>mol<sup>-1</sup>. On molecular level, gases are more disordered than liquids, which are more disordered than solids (compare their structures). A reaction that produces the greater number of molecules than the number of reactants molecules will have a positive entropy change, as there will exist more random arrangements of these molecules, i.e. the system will become more disordered.

$$\Delta S_{\text{system}} = \Delta S_{\text{products}} - \Delta S_{\text{reactants}}$$

$$\Delta S_{\text{surroundings}} = -\Delta H/T$$

$$\Delta S_{\text{total}} = \Delta S_{\text{system}} + \Delta S_{\text{surroundings}}$$

**Gibbs free energy:** A measure of a feasibility of a chemical reaction. This is solely a thermodynamic understanding - it does not take into account the kinetics of a chemical reaction - remember that some thermodynamically feasible reactions may have a significant activation energy barrier!



$$\Delta G = \Delta H - T\Delta S_{\text{system}}$$

Gibbs free energy in terms of K,  $\Delta G = (-RT)\ln K$

For a spontaneous reaction,  $\Delta G < 0$ , as then K is  $> 1$

exothermic (-ve)  $\Delta H$  and positive  $\Delta S_{\text{system}}$  together always make  $\Delta G < 0$

