LATTICE ENTHALPY (ENERGY)

WARNING
There are two definitions - one is the opposite of the other!
Make sure you know which one is being used.

Lattice Dissociation Enthalpy

Definition The enthalpy change when ONE MOLE of an ionic lattice dissociates into isolated gaseous ions.

Values
- **highly endothermic** - strong electrostatic attraction between ions of opposite charge
- a lot of energy must be put in to overcome the attraction
- relative values are governed by the charge density of the ions.

Example $Na^+ Cl^-_{(s)} \longrightarrow Na^+_{(g)} + Cl^-_{(g)}$

Lattice Formation Enthalpy

Definition The enthalpy change when ONE MOLE of an ionic lattice is formed from its isolated gaseous ions.

Values
- **highly exothermic** - strong electrostatic attraction between ions of opposite charge
- a lot of energy is released as the bond is formed
- relative values are governed by the charge density of the ions.

Example $Na^+_{(g)} + Cl^-_{(g)} \longrightarrow Na^+ Cl^-_{(s)}$

Notes
- one **cannot measure this value directly**; it is CALCULATED USING A BORN-HABER CYCLE
- the **greater the charge densities** of the ions, the more they attract each other and the **larger the lattice enthalpy**.
- the **higher the lattice enthalpy**, the **higher the melting point** of the compound
- solubility of ionic compounds is affected by the **relative values** of Lattice and Hydration Enthalpies

Some Lattice Enthalpy Values

	Cl^-	Br^-	F^-	O^{2-}
Na^+	-780	-742	-918	-2478
K^+	-711	-679	-817	-2232
Rb^+	-685	-656	-783	
Mg^{2+}	-2256			-3791
Ca^{2+}	-2259			

Check which definition is being used and use appropriate sign for ΔH

Smaller ions will have a greater attraction for each other because of their higher charge density. They will have larger Lattice Enthalpies and larger melting points because of the extra energy which must be put in to separate the oppositely charged ions.

Look up values for the melting points of some ionic compounds formed between pairs of ions listed above.