

WJEC (Wales) Chemistry A-level

Topic 3.6 - Enthalpy Changes for Solids and Solutions

Flashcards

This work by [PMT Education](https://www.pmt.education) is licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)



Define enthalpy of atomisation



Define enthalpy of atomisation

The enthalpy change when one mole of gaseous atoms is formed from a compound in its standard state under standard conditions.



Define lattice enthalpy of formation



Define lattice enthalpy of formation

The enthalpy change when one mole of a solid ionic compound is formed from its gaseous constituent ions under standard conditions.



Define lattice dissociation enthalpy



Define lattice dissociation enthalpy

The energy required to break apart an ionic lattice into its constituent ions in a gaseous state under standard conditions.



Define enthalpy of solution



Define enthalpy of solution

The enthalpy change when one mole of an ionic solid is dissolved in a solvent to infinite dilution so that the ions no longer interact under standard conditions.



Define enthalpy of hydration

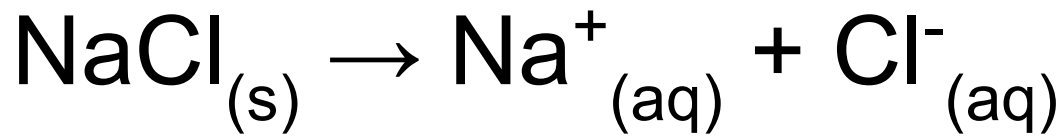


Define enthalpy of hydration

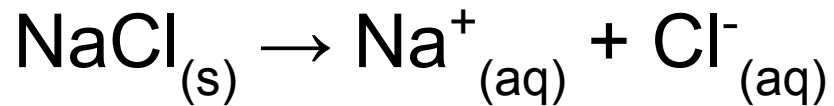
The enthalpy change when one mole of aqueous ions is formed from one mole of gaseous ions.



What type of enthalpy change is taking place in the following reaction?



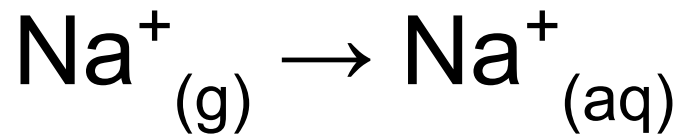
What type of enthalpy change is taking place in the following reaction?



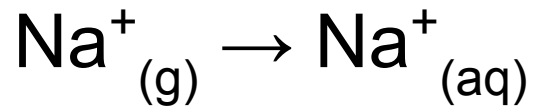
Enthalpy change of solution



What type of enthalpy change is taking place in the following reaction?



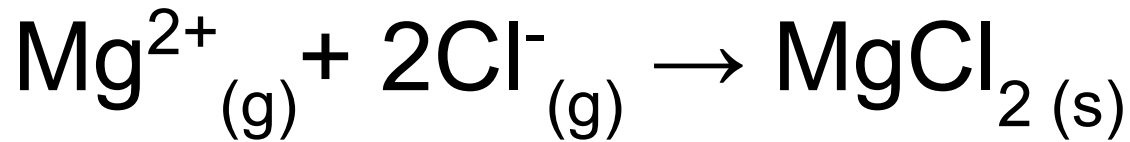
What type of enthalpy change is taking place in the following reaction?



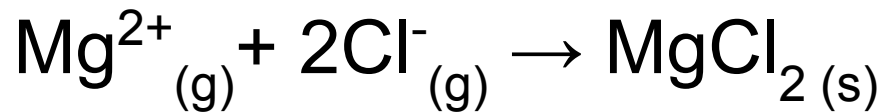
Enthalpy change of hydration



What type of enthalpy change is taking place in the following reaction?



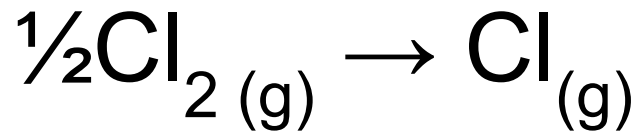
What type of enthalpy change is taking place in the following reaction?



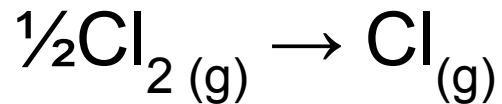
Lattice enthalpy of formation



What type of enthalpy change is taking place in the following reaction?



What type of enthalpy change is taking place in the following reaction?



Enthalpy of atomisation



What affects the solubility of ionic compounds in water?



What affects the solubility of ionic compounds in water?

The solubility of ionic compounds depends on the balance between the hydration enthalpy of the ions in the compound and the lattice dissociation enthalpy of the compound.



What factors affect enthalpy of hydration?



What factors affect enthalpy of hydration?

Hydration enthalpy of an ion depends on the amount of attraction between the ions and the water molecules. The bigger the charge and the smaller the ion, the larger the enthalpy of hydration.



What is Hess's law?



What is Hess's law?

The enthalpy change of a reaction is independent of the route taken.



How can the enthalpy change of a solution be calculated using an energy cycle?



How can the enthalpy change of a solution be calculated using an energy cycle?

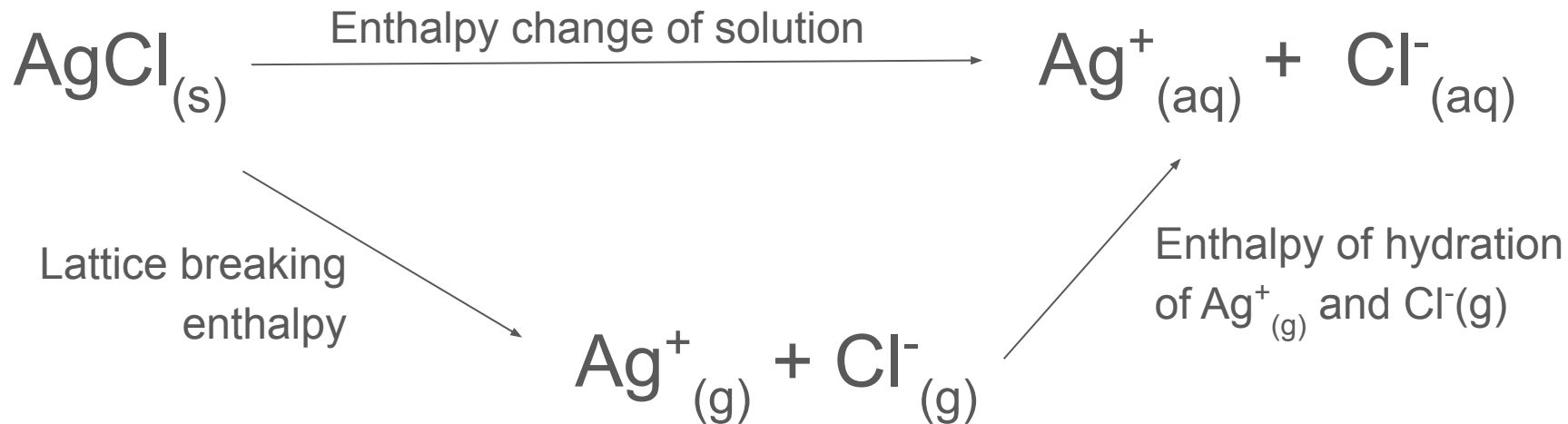
Lattice breaking enthalpy and enthalpy change of hydration can be used in an energy cycle to calculate the enthalpy change of solution using Hess's law.



Give the energy cycle which can be used to find the enthalpy change of solution of $\text{AgCl}_{(s)}$



Give the energy cycle which can be used to find the enthalpy change of solution of $\text{AgCl}_{(s)}$



What is a Born-Haber cycle?



What is a Born-Haber cycle?

Lattice enthalpy cannot be calculated directly so a Born-Haber cycle can be used to calculate the lattice enthalpy by applying Hess's law. A Born-Haber cycle calculates lattice enthalpy by comparing the standard enthalpy of formation of the ionic compound to the enthalpy required to make gaseous ions from the elements.



Define standard enthalpy of formation



Define standard enthalpy of formation

The enthalpy change when one mole of a compound is formed from its elements in their standard states under standard conditions.



Define first ionisation energy



Define first ionisation energy

The enthalpy change when one mole of gaseous atoms forms one mole of gaseous $1+$ ions.



Define first electron affinity



Define first electron affinity

The enthalpy change when one mole of gaseous 1^- ions is formed from one mole of gaseous atoms.

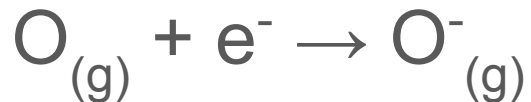


Give the equations for the first electron affinity of oxygen and the first ionisation energy of magnesium



Give the equations for the first electron affinity of oxygen and the first ionisation energy of magnesium

First electron affinity of oxygen:



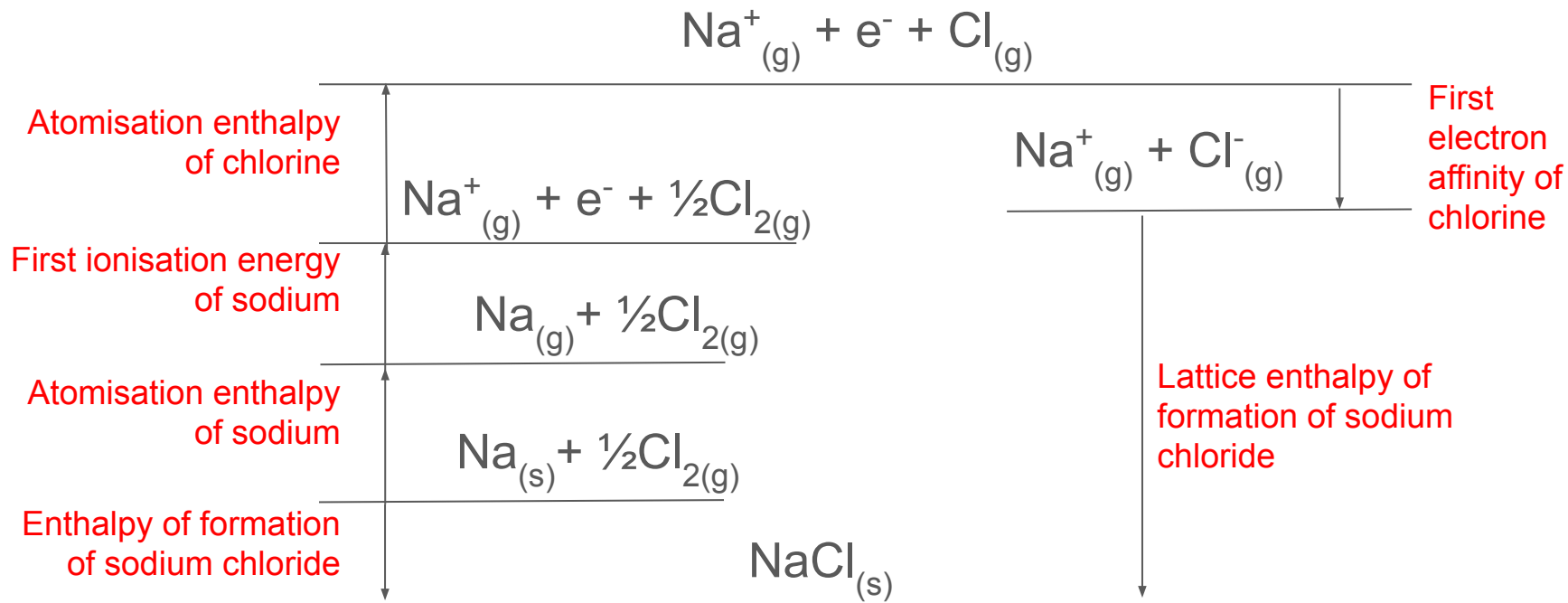
First ionisation energy of magnesium:



Draw a labelled Born-Haber cycle which could be used to calculate the lattice enthalpy of sodium chloride



Draw a labelled Born-Haber cycle which could be used to calculate the lattice enthalpy of sodium chloride



What is the perfect ionic model?



What is the perfect ionic model?

The perfect ionic model assumes that all ions are perfectly spherical and that the bonds have no covalent character.



Why are theoretical lattice enthalpies often different from experimental ones?



Why are theoretical lattice enthalpies often different from experimental ones?

Theoretical lattice enthalpies use calculations which are based on a perfect ionic model of the lattice. The experimental values often differ because most ionic compounds have some covalent character. The more polarisation in the ionic bond, the more covalent character of the compound.



How does exothermicity or endothermicity of $\Delta_f H^\ominus$ act as a qualitative indicator of a compound's stability?



How does exothermicity or endothermicity of $\Delta_f H^\ominus$ act as a qualitative indicator of a compound's stability?

For an exothermic reaction the products are more stable than the reactants.

For an endothermic reaction the reactants are more stable than the products.

