INKCHEMISTRY FLASHCARDS

Thermodynamics

Unit C08 · 32 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions to learn and misconceptions to correct. These cards, and a check-yourself question for every lesson, run on the website with spaced-repetition scheduling, at inklearning.co.uk/chemistry/flashcards.

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DEFINITION

Define: Lattice enthalpy of formation.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Lattice enthalpy of dissociation.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Enthalpy of atomisation.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: First ionisation energy.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Second ionisation energy.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: First electron affinity.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Second electron affinity.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Enthalpy of formation.

LATTICE ENTHALPY AND BORN–HABER CYCLES

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DEFINITION

The enthalpy change when one mole of a solid ionic compound is separated into its gaseous ions under standard conditions.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

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

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The enthalpy change when one mole of gaseous atoms each lose one electron to form one mole of gaseous 1+ ions.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The enthalpy change when one mole of gaseous atoms is formed from the element in its standard state.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The enthalpy change when one mole of gaseous atoms each gain one electron to form one mole of gaseous 1- ions.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The enthalpy change when one mole of gaseous 1+ ions each lose one electron to form one mole of gaseous 2+ ions.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

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

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The enthalpy change when one mole of gaseous 1- ions each gain one electron to form one mole of gaseous 2- ions.

LATTICE ENTHALPY AND BORN–HABER CYCLES

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DEFINITION

Define: Perfect ionic model.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Polarisation.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Polarising power.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Polarisability.

LATTICE ENTHALPY AND BORN–HABER CYCLES

SPOT THE ERROR

Say what is wrong with this claim:

The lattice enthalpy of sodium chloride is just its enthalpy of formation: the energy given out when sodium reacts with chlorine.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

Define: Enthalpy of solution.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

Define: Enthalpy of hydration.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

Define: Ion–dipole attraction.

ENTHALPIES OF SOLUTION AND HYDRATION

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DEFINITION

The distortion of the electron cloud of an anion by a neighbouring cation, giving the bond some covalent character.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

A model of an ionic lattice in which the ions are perfect spheres with evenly spread charge and the only interactions are electrostatic attractions and repulsions.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

How easily the electron cloud of an anion is distorted; it is greater for a larger anion with a larger charge.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The ability of a cation to distort the electron cloud of an anion; it is greater for a smaller cation with a larger charge, a higher charge density.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The enthalpy change when one mole of an ionic solid dissolves in enough water that the dissolved ions are well separated and do not interact with one another.

ENTHALPIES OF SOLUTION AND HYDRATION

SPOT THE ERROR

The enthalpy of formation, -411 kJ mol^{-1}, starts from sodium metal and chlorine gas. The lattice enthalpy of formation, -787 kJ mol^{-1}, starts from gaseous ions: $Na^+(g) + Cl^-(g) \rightarrow NaCl(s)$. The difference is the cost of making those ions, and the Born–Haber cycle adds it up.

LATTICE ENTHALPY AND BORN–HABER CYCLES

DEFINITION

The electrostatic attraction between an ion and the oppositely charged end of a polar molecule such as water.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

The enthalpy change when one mole of gaseous ions dissolves in water to form one mole of aqueous ions.

ENTHALPIES OF SOLUTION AND HYDRATION

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DEFINITION

Define: Charge density.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

Define: Solvation.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

Define: Hess's law.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

Define: Lattice enthalpy of dissociation.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

Define: Hydrated ion.

ENTHALPIES OF SOLUTION AND HYDRATION

SPOT THE ERROR

Say what is wrong with this claim:

A salt that takes in heat when it dissolves can't really want to dissolve, so endothermic salts must be insoluble.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

Define: Entropy.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Define: Standard entropy.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

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DEFINITION

The surrounding of a dissolved ion or molecule by solvent molecules attracted to it; hydration is solvation by water.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

The charge on an ion relative to its size; a small ion with a large charge has a high charge density.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

The enthalpy change when one mole of a solid ionic compound is separated into its gaseous ions under standard conditions.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

The enthalpy change of a reaction is independent of the route taken, provided the initial and final conditions are the same.

ENTHALPIES OF SOLUTION AND HYDRATION

SPOT THE ERROR

Ammonium nitrate dissolves readily and cools the water by several degrees. Dissolving is driven by free energy, $\Delta G = \Delta H - T\Delta S$, not by enthalpy alone: ions spreading through water raise the entropy, and at room temperature that $T\Delta S$ term can outweigh a positive ΔH. Instant cold packs hold ammonium nitrate and water apart until squeezed.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

An ion in aqueous solution surrounded by water molecules held to it by ion–dipole attractions.

ENTHALPIES OF SOLUTION AND HYDRATION

DEFINITION

The entropy of one mole of a substance in its standard state at 100 kPa and a stated temperature, usually 298 K.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

A measure of the disorder of a system: the number of ways the particles and their energy can be arranged.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

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DEFINITION

Define: Entropy change of a reaction.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Define: Gibbs free-energy change.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Define: Feasible.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Define: Kinetically stable.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Define: Thermodynamically stable.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Define: Entropy change of the surroundings.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Define: Total entropy change.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

SPOT THE ERROR

Say what is wrong with this claim:

Reactions happen because they give out heat, so an endothermic reaction can only go if you keep forcing energy in.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

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DEFINITION

The quantity $\Delta G = \Delta H - T\Delta S$, which combines the enthalpy change, the entropy change and the temperature; a reaction is feasible when it is zero or negative.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

The sum of the standard entropies of the products minus the sum of the standard entropies of the reactants, each multiplied by its number of moles in the equation.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Describes a feasible reaction mixture that does not react at a measurable rate because its activation energy is high.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Able to take place without a continuous input of energy from outside, which is so when ΔG is zero or negative.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

The entropy change of everything outside the reacting system, equal to $-\Delta H/T$; it is positive for an exothermic reaction.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

Describes a substance or mixture for which the possible reaction has a positive ΔG, so the reaction is not feasible under the conditions stated.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

SPOT THE ERROR

A reaction is feasible when $\Delta G = \Delta H - T\Delta S$ is negative, and a large enough rise in entropy makes that true with ΔH positive. Ammonium nitrate dissolving, ice melting above 0 °C and ammonium carbonate reacting with ethanoic acid all take heat in from their surroundings and go on their own.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

DEFINITION

The sum of the entropy changes of the system and of the surroundings; a change takes place naturally when it is positive.

ENTROPY AND GIBBS FREE-ENERGY CHANGE

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