| FRONT OF CARD INFO | BACK OF CARD INFO |
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| **System** | The system is the reaction that is taking place. All energy loss or gain is in reference to the system.<br><br>If energy flows into the system it will be a positive change since the reaction is absorbing energy<br><br>If energy flows out the system is losing energy and the change will be a negative since energy is released |
| **Surroundings** | everything that is not a directly involved in a reaction. Common examples are containers and solvents (usually water) |
| **Enthalpy** | The amount of heat gained/lost in a process (not always a reaction)<br><br>Enthalpy is abbreviated as **ΔH** and the units of enthalpy are **kJ/mole**<br><br>It is important to remember that enthalpy is a molar value! If you change the number of moles to anything but 1 mole the value will change!<br><br>Positive enthalpy means heat is absorbed (energy will be a reactant) by the system and the process is endothermic<br><br>Negative enthalpy means heat is released (energy will be a product) by the system and the process is exothermic |
| **Enthalpy of Reaction** | $\Delta H_{rxn}$<br>amount of heat released (negative values) or absorbed (positive values)by a chemical reaction at constant pressure in kJ/mol |
| **Enthalpy of Combustion** | $\Delta H_{comb}$<br>Amount of heat absorbed/released when burning a substance |
| **Enthalpy of formation** | $\Delta H_f$<br>heat absorbed or released when **ONE** mole of compound is formed from elements in their standard states in kJ/mol<br><br>These are table values and you need to understand that you can use these values to calculate Enthalpy of reaction using the following equation:<br><br>$\Delta H_{rxn} = \Sigma\ \Delta H_{f\ (products)} - \Sigma\ \Delta H_{f\ (reactants)}$ |

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| **Enthalpy of fusion** | $\Delta H_{fus}$<br>heat absorbed to melt (overcome IMFs) 1 mole of solid to liquid expressed in kJ/mol<br><br>Note: since heat must be absorbed to melt the value will always be positive and the process will always be endothermic<br><br>Trick alert---- Also, since enthalpy is a state function this value also tells us how much energy must be released (negative enthalpy) to freeze a substance! |
| **Enthalpy of vaporization** | $\Delta H_{vap}$<br>heat absorbed to vaporize (overcome IMFs) 1 mole of liquid to gas expressed in kJ/mol<br><br>Note: since heat must be absorbed to vaporize the value will always be positive and the process will always be endothermic<br><br>Trick alert-----Also, since enthalpy is a state function this value also tells us how much energy must be released (negative enthalpy) to condense a substance! |
| **Calorimetry** | Process by which we measure heat gained/lost by a process at a constant pressure<br><br>Formula: $q = mc\Delta T$<br><br>Remember that heat lost should be a negative q value and heat gained should be a positive |
| **Heat capacity** | Amount of heat needed to raise the temperature of a substance 1 $^{o}$C<br>The units are J/$^{o}$C<br><br>Specific heat capacity = specifically 1 gram of substance (J/g $^{o}$C)<br><br>Molar heat capacity = 1 mole of substance (J/mole $^{o}$C) |
| **Specific heat capacity of water** | 4.184 J/g $^{o}$C OR 1.00 cal/g $^{o}$C<br><br>Notice, knowing these two values also give you the conversion factor between joules and calories |

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| **Bond energies** | Amount of energy needed to break a bond, or the amount of energy released upon the formation of a bond. These are enthalpies, so they are state functions and molar values!!!!!!<br><br>Remember:<br>breaking bonds require energy (positive ΔH)<br><br>Forming bonds releases energy (negative ΔH)<br><br>Bonds are broken in the reactants and formed in the products<br><br>Once you have changed the signs on the bond energies just add them all together to get the overall $\Delta H_{rxn}$ |
| **Entropy** | ΔS<br><br>Is a measure of disorder in a system. ALL elements/compounds have some disorder associated with them so entropy will NEVR be zero!<br><br>Similar to enthalpy to calculate overall entropy you use:<br>$\Delta S_{rxn} = \Sigma\ \Delta S_{(products)} - \Sigma\ \Delta S_{(reactants}$<br><br>Units of entropy are J/mole K<br>WATCH OUT!!!! Will need to convert to kJ before using entropy with ΔH or ΔG |
| **Gibbs Free Energy** | ΔG<br>Describes the amount of energy available to perform work<br><br>ΔG ultimately determines whether a process is thermodynamically favorable or not<br>Positive ΔG = **<u>NOT</u>** Thermodynamically favorable<br>Negative ΔG = Thermodynamically favorable<br><br>Similar to enthalpy to calculate overall entropy you use:<br>$\Delta G_{rxn} = \Sigma\ \Delta G_{(products)} - \Sigma\ \Delta G_{(reactants}$ |
| **Gibbs equation** | $\Delta G_{rxn} = \Delta H_{rxn} - T\Delta S_{rxn}$ |

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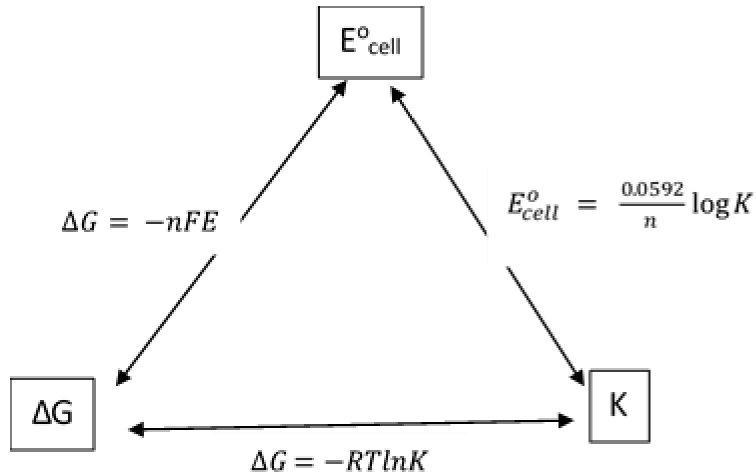
| **Relationship between G, K, E** |  |