**Chemistry 30**

**Thermo - Thermochemical Changes**

**Key Concepts and Learning Goals**

**Focusing Questions:** How does our society use the energy of chemical changes? What are the impacts of energy use on society and the environment? How do chemists determine how much energy will be produced or absorbed for a given chemical reaction?

**Key Concepts:**

* enthalpy of formation
* enthalpy of reaction
* Δ*H* notation
* Hess’ law
* molar enthalpy
* energy diagrams
* activation energy
* catalysts
* calorimetry
* fuels and energy efficiency

**Learning Goal: You willdetermine and interpret energy changes in chemical reactions.**

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| **You Will:** | **Explanation/Definition:** (What is the concept?) | **Example:**(other than those from notes given in class) |
| 1. Recall the application of *Q = mc*Δ*t*to the analysis of heat transfer |  |  |
| 2. Explain, in a general way, how stored energy in the chemical bonds of hydrocarbonsoriginated from the sun |  |  |
| 3. Define enthalpy and molar enthalpy for chemical reactions |  |  |
| 4. Write balanced equations for chemical reactions that include energy changes |  |  |
| 5. Understand relationship between kinetic energy and temperature change. Understand relationship between potential energy and bond change. |  |  |
| 6. Use and interpret Δ*H* notation to communicate and calculate energy changes in chemicalreactions |  |  |
| 7. Predict the enthalpy change for chemical equations using standard enthalpies of formation |  |  |
| 8. Explain and use Hess’ law to calculate energy changes for a net reaction from a series of reactions |  |  |
| 9. Use calorimetry data to determine the enthalpy changes in chemical reactions |  |  |
| 10. Identify that liquid water and carbon dioxide gas are reactants in photosynthesis and products of cellular respiration and that gaseous water and carbon dioxide gas are the products of hydrocarbon combustion in an open system |  |  |
| 11. Classify chemical reactions as endothermic or exothermic, including those for the processes of photosynthesis, cellular respiration and hydrocarbon combustion. |  |  |

**Learning Goal: You will explain and communicate energy changes in chemical reactions.**

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| **You Will:** | **Explanation/Definition:** (What is the concept?) | **Example:**(other than those from notes given in class) |
| 12. Define activation energy as the energy barrier that must be overcome for a chemical reaction to occur |  |  |
| 13. Explain the energy changes that occur during chemical reactions, referring to bonds breaking and forming and changes in potential and kinetic energy |  |  |
| 14. Analyze and label energy diagrams of a chemical reaction, including reactants, products, enthalpy change and activation energy |  |  |
| 15. Draw enthalpy diagrams, indicating changes in energy for chemical reactions |  |  |
| 16. Explain that catalysts increase reaction rates by providing alternate pathways for changes, without affecting the net amount of energy involved; *e.g., enzymes in living systems.* |  |  |
| 17. Explain the discrepancy between the theoretical and actual efficiency of a thermal energy conversion system |  |  |
| **Other resources for Organic Compounds Include:** |
| Vocabulary & Definitions for Unit: |