**AP Chemistry Unit 6 Guide: Thermochemistry**

**Chapters 5 & 19\***

**\*Note:** Your textbook goes into more detail on these topics than what we need to cover in this course. For this reason, I suggest relying primarily on your “test prep” book for this unit, and not the textbook.

**Enduring Understandings:** By the end of this unit, you will understand the following “Big Picture” ideas:

**EU 5.A:** Two systems with different temperatures that are in thermal contact will exchange energy. The quantity of thermal energy transferred from one system to another is called heat.

**EU 5.B:** Energy is neither created nor destroyed, but only transformed from one form to another.

**EU 5.C:** Breaking bonds requires energy, and making bonds releases energy.

**EU 5.D:** Electrostatic forces exist between molecules as well as between atoms or ions, and breaking the resultant intermolecular interactions requires energy.

**EU 5.E:** Chemical or physical processes are driven by a decrease in enthalpy, an increase in entropy, or both.

**Objectives for this unit:**

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| **Date** | **Objective(s)** | **HW/ Reading** |
| Thursday, 1/23 | **EK 5.A.1:** Temperature is a measure of the average kinetic energy of atoms and molecules.* Explain the ideas behind Kinetic Molecular Theory, and how it relates to what we learned in our unit on phase changes.
* Explain how pressure, volume, temperature (in K), and entropy are each related to the kinetic energy of the molecules in a substance.
* Know how to convert between Celsius and Kelvin.
* Explain what is shown in a Maxwell-Boltzmann distribution.
* Predict how a temperature change will affect the shape of a Maxwell-Boltzmann distribution.
 | Ch. 5 sec.1 - 2; pgs. 159 – 168;TP pgs. 71 – 74Practice #s  |
| Friday, 1/24  | **EK 5.A.2:** The process of kinetic energy transfer at the particulate scale is referred to in this course as heat transfer, and the spontaneous direction of the transfer is always from a hot to a cold body.**EU 5.B:** Energy is neither created nor destroyed, but only transformed from one form to another.* Understand enthalpy as it relates to heat energy.
* Explain the difference between endothermic and exothermic reactions, in terms of heat AND in terms of enthalpy.
* Predict whether change in enthalpy will be negative or positive for a given change (physical or chemical)
* Understand the three main processes that change the energy of a substance: heating/cooling, phase transitions, and chemical rxns.
* Be able to calculate change in enthalpy (**Δ**H) for a sample as it undergoes a phase change.
 | Ch. 5, sec. 3 – 4;Pgs. 169 – 172TP pgs. 75 – 76  |
| Monday, 1/27 | **EK 5.B.4:** Calorimetry is an experimental technique that is used to determine the heat exchanged/transferred in a chemical system.* Understand “heat capacity” and explain why it is important to know heat capacity for calorimetry experiments
* Be able to solve problems involving heat transfer and heat capacity
* Use conservation of energy to solve calorimetry problems

**Set-up for lab:** determining the calories in food | Ch. 5 sec. 5Pgs. 181 – 187TP pgs. **HOMEWORK:** PRE-LAB QUESTIONS! |
| Tuesday, 1/28 | **Lab:** determining the calories in food.* **Lab objective:** determine which type of food is the most energy-dense (carbohydrates, proteins, or fats) by calculating the energy present in 1 g of each food.
 | **Homework:** Finish lab write-up |
| Wednesday, 1/29 |  |  |
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1) Be able to explain Kinetic Molecular Theory as it applies to changes in matter (temperature changes, phase changes, chemical changes, etc.)

2) Be able to compare and contrast physical changes and chemical changes with regard to conservation of energy.

3) Be able to explain how the three Laws of Thermodynamics apply to chemistry.

4) Understand how energy is involved in bond breaking and bond formation.

**Essential vocabulary for this unit:** you should be able to define each of the following and know the mathematical equations for each one, as well as how it applies to concepts of thermochemistry.

Energy (E):

Potential energy (PE):

Kinetic energy (KE):

Heat (q):

Enthalpy (H):

Entropy (S):

Gibb’s Free Energy (G):

Absolute zero:

Calorimetry: