***STUDY GUIDE EXAM 2 (Major Concepts)***

***Chapter 5 (Gases: KMT and PV = nRT)***

* State the five postulates of KMT : (1) a gas is a collection of point particles whose motion is chaotic (constant and but random) but the particles move in a straight line from point to point (2) the Vgas particles/Vgas = 0 (3) there is no attraction between particles so the gas particles act independently of each other (4) gas particles have elastic collisions *( i.e. total KE is conserved)* , (5) the average molecular KE of gas particles ≅ T*. ( also see the KMT diagram at the end of this document)*
* Recognize the four major properties of gases *(i.e. pressure, volume temperature and moles.)*
* Understand the concept governing the barometer
* Solve problems using equations associated with the following laws:

1. Boyle’ law
2. Charles’ law
3. Avogadro’s law (solve a molar volume problem at STP conditions )
4. Ideal Gas law (PV = nRT ….this includes calculating the density and the molar mass of the gas…
5. stoichiometry and limiting reactant gas problem
6. Dalton’s law of partial pressure (including using an I Δ E ) also should be able to apply this to a collecting a gas over water type problem )
7. Monometer including converting water to mm Hg

* Use the concept of mole fraction to determine the partial pressure of a gas in a gaseous mixture
* State the two conditions where the assumptions for an ideal gas or no longer valid.
  + Explain why real gases deviate from ideal gas behavior at: (1) low temperature and (2) high pressure
* Calculate the urms (root mean square) of a molecule
* Differentiate between diffusion and effusion.
* Calculate the molar mass, the time or the rate of effusion and diffusion using Graham’s Law
* Recognize or explain the purpose of the van der Waals equation. (This includes understanding the uniqueness of the van der Waals constants a and b and the correction terms for pressure and volume )

***Chapter 6 (Thermochemistry: ∆H (enthalpy change) and the first law of thermo ( ∆E = q + w) )***

* Describe key distinctions between the terms or concepts given in a-f. These terms are associated directly or indirectly with the first law of thermodynamics which says that energy is conserved (*i.e. energy cannot be destroyed or created)* and mathematically stated is ∆E = q + w .

*(Note: versus is abbreviated below as vs.)*

(a) An endothermic vs an exothermic reaction or process.

(b) A system vs the surrounding

(c) A state function vs a non-state function

(d) The heat of a reaction (q) vs the pressure-volume work ( PΔV) of a reaction

(e) Specific heat capacity (J/gl·K vs molar heat capacity (J/mol·K ) vs molar heat capacity(J/K)

(*Note: q = c x m x Δ T, q=cn x n x Δ T, q = C x Δ T respectively)*

(f) The results of a calorimetric experiment using a constant-pressure calorimeter (e.g. coffee-cup) vs the results using a constant-volume calorimeter (e.g. a bomb calorimeter)

* Calculate the ∆H = ∆Hrxn = qp = qrxn when give calorimetric data from a coffee-cup calorimeter experiment.
* Calculate the enthalpy change necessary to convert a solid to liquid to gas and vice versa. *(This includes an understanding of the heat of fusion and the heat of vaporization*
* Calculate the qrxn = ∆E = qv = Ccalorimeter x ∆T when given calorimetric data from a bomb calorimeter experiment.
* Calculate the ∆Hrxn *( enthalpy of reaction….. also referred to as* ∆H *or enthalpy change)* for a reaction that has two or more steps by applying Hess’s law .
* Calculate the ΔHrxn° *( standard enthalpy of reaction……. also referred to as ΔH° or standard enthalpy change)* using ΔHf ° *( standard enthalpy of formation* values from a table
* Calculate the ΔHf° by applying Hess’s law to two or more reactions . ( This includes being aware that the ΔHf° requires that one mole of product be formed from the most stable allotropic form of its elements, so it may be necessary to use a fraction to change the coefficient of the product to the number one in the final equation. The fraction would also have to be applied to the ΔHf ° .
* This includes being aware of the following: that the sign of ∆H reverses , that ∆H can has a stoichiometric relationship to the reactants and products in a reaction,

***Chapter 18.2***

* Balance redox reactions in either acidic or basic solutions using the half-reaction method (This includes being able to do the following: assign oxidation numbers, identifying and writing the oxidation and reduction half-reactions, and balancing the half-reaction