EXAM 4 study guide

Atoms First 2e sections: 8.4-8.5, 5.9, 9.1-9.4, 9.6, 13.1-13.2, 13.4-13.6, 10.1-10.8

**DAY 22, Terms to know**:

Sections 8.4, 5.9, 8.5 limiting reagent, excess reagent, theoretical yield, actual yield, percent yield, percent composition by mass

**DAY 22, Specific outcomes and skills that may be tested on exam 4:**

Sections 8.4, 5.9, 8.5

* Given starting quantities of reactants, be able to determine which is the limiting reagent and which is in excess and quantify the amount in excess
* Given quantities of reactants, be able to determine the theoretical yield for any of the products
* Given any two of the three following quantities, be able to calculate the third: theoretical yield, actual yield, and percent yield
* Given a chemical formula, be able to calculate the mass percent composition for any element in the compound
* Be able to use pressure changes during a chemical reaction to determine how many moles of reaction have occurred and relate that to the percent yield

**DAY 23, Terms to know**:

Sections 9.3, 9.5, 9.6 Arrhenius acid/base definition, Brønsted acid/base definition, dissociation, strong versus weak, dynamic chemical equilibrium, monoprotic, diprotic, polyprotic, neutralization, pH, titration

**DAY 23, Specific outcomes and skills that may be tested on exam 4:**

Sections 9.3, 9.5, 9.6

* Be able to identify a compound as a strong acids, weak acid, strong, base, or weak base
* Given an acid and base, be able to predict the products that would form from their reaction
* Given reactants and products, be able to identify the acids and bases on both sides of equation
* Be able to balance acid base reactions including mono-, di-, or polyprotic acids
* Be able to describe how pH affects a solution qualitatively
* Given a pH, be able to determine the H3O+ molarity
* Given a H3O+ molarity, be able to determine the pH
* Be able to describe what a neutralization process is, why the reaction occurs, and predict neutralization products
* Be able to describe what an acid/base titration is used and in general how it works

**DAY 24, Terms to know**:

Section 9.4 oxidation, reduction, redox, half-reaction, oxidation number or oxidation state, activity series

**DAY 24, Specific outcomes and skills that may be tested on exam 4:**

Section 9.4

* Given a redox reaction, be able to identify which reactant is oxidized and which is reduced, and be able to identify which reactant is the oxidizing agent and which is the reducing reagent
* Given a simple redox reaction, be able to write two correct half reactions that add together to give the net equation
* Given a compound, be able to determine the oxidation number for each atom in the formula
* Given a reaction, be able to determine how the oxidation number changes or remains the same for each atom involved
* Be able to use the activity series to predict products in redox reactions and whether the reaction will be product or reactant favored

**DAY 25, Terms to know**:

Sections 13.2, 13.1, 13.4, 9.1, 9.2 solution, solvent, solute, solvation, solute-solute interactions, solvent-solvent interactions, solvent-solute interactions, miscible, saturated solution, unsaturated solution, supersaturated solution, Henry’s Law, electrolyte, precipitate, molecular equation, ionic equation

**DAY 25, Specific outcomes and skills that may be tested on exam 4:**

Sections 13.2, 13.1, 13.4, 9.1, 9.2

* In a given solution, be able to identify the solvent and the solute Be able to describe what interactions must be broken and formed to dissolve a substance and under what conditions that dissolving process will be endothermic versus exothermic
* Be able to explain WHY like dissolves like from the point of view of breaking and forming intermolecular attractions
* Given two substances, be able to predict whether they are likely to be miscible or not and explain WHY
* Be able to describe how to make a saturated, unsaturated, or supersaturated solution
* Be able to describe and explain how and why the solubility of a solid dissolved in a liquid changes (generally) upon increasing temperature
* Be able to describe and explain how and why the solubility of a gas dissolved in a liquid changes upon changing the temperature, volume of gas, or moles of gas
* Be able to identify a compound as a strong electrolyte, weak electrolyte, or nonelectrolyte and EXPLAIN your identification

**DAY 26, Terms to know**:

Sections 10.1-10.4 system, surroundings, thermochemistry, thermal energy, exothermic, endothermic, open system, closed system, isolated system, first law of thermodynamics (law of conservation of energy), enthalpy, calorimetry, specific heat, heat capacity, heat of reaction, coffee cup calorimeter, bomb calorimeter

**DAY 26, Specific outcomes and skills that may be tested on exam 4:**

Sections 10.1-10.4

* Be able to describe potential energy changes for the system, kinetic energy and temperature changes for the surroundings, and bond stability changes for the system in any endothermic or exothermic system.
* Given either change in energy for the system or surroundings, be able to calculate the other
* Given two out of three of any of the following quantities, be able to calculate the third: change in heat for the system, change in work for the system, overall change in energy for the system
* Given initial heat and final heat, be able to calculate the change in enthalpy for a system
* Be able to determine whether a process is endo or exothermic based on the mathematical sign for the change in enthalpy
* Be able to calculate how the enthalpy change will be different if a chemical equation is reversed or multiplied by a certain stoichiometric coefficient
* Given two of the following quantities, be able to calculate the third: temperature change, heat change, heat capacity
* Given three of the following quantities, be able to calculate the fourth: temperature change, heat change, mass, specific heat
* Be able to describe how to set up a coffee cup or bomb calorimeter to calculate changes in energy based on measured changes in temperature and energy exchanges between system and surroundings

**DAY 27, Terms to know**:

Sections 10.5-10.8, 13.5-13.6 Hess’s law, standard enthalpy of formation, bond enthalpy, colligative properties, van’t Hoff factor

**DAY 27, Specific outcomes and skills that may be tested on exam 4:**

Sections 10.5-10.8, 13.5-13.6

* Be able to use Hess’s law and given heats of reactions to determine the heat of reaction for another reaction
* Be able to determine enthalpies of formation for elements in their standard states
* Be able to use given enthalpies of formation to determine the enthalpy of a reaction
* Given bond enthalpies, be able to determine the enthalpy of reaction for a given reaction
* Be able to use a given heat of reaction as a relationship in a conversion question
* Be able to explain WHY each of the colligative properties changes upon increasing concentration of solute
* Be able to use the formulas for the colligative properties to calculate any of the variables in the equation given the rest of the variables
* Be able to predict the van’t Hoff factor for a given solute and use it in the formulas for colligative properties
* Be able to explain WHY the van’t Hoff factors for ionic solids at higher concentrations are often less than would normally be predicted

**DAY 28: Exam 4**

**Day 29: Review for comprehensive final exam**