

Major Concepts for Exam 2 – Chem 309

While the chapter study guides are the most complete list of all the skills you should be able to do, here is a list of the major concepts and skills.

Chapter 6 – Hydrocarbons and Structure

- Converting between the IUPAC name, skeletal-line structure and condensed structure
- Recognizing Conformer, Structural (Constitutional) Isomers, and Geometric Isomers (cis/trans)
- Naming alkanes, alkenes, and alkynes (IUPAC)
- Naming substituted Benzenes

Chapter 7 – Organic Functional Groups

- Recognize and name (IUPAC) alcohols, aldehydes, ketones, carboxylic acids, esters, and amides
- Recognize thio esters, phosphate esters, and phosphate anhydrides
- Apply your understanding of electron geometry, molecular geometry, and polarity to all of the functional groups studied in this class
- Apply your understanding of Intermolecular Forces (IMFs) to predicting the relative boiling points and water solubility of the functional groups studied in this class.
- Predict the products of combustion reactions
- Predict the products of acid-base reactions for carboxylic acids and amines and explain how these reactions can change the water solubility of compounds with these functional groups

Chapter 8 – Chemical Reaction Basics

- Balance chemical reactions
- Convert between Calories, calories and joules
- Relate enthalpy (endothermic and exothermic), activation energy, transition states, and catalysts to chemical reactions and reaction energy diagrams
- Relate collision theory, reactant concentration, temperature, and catalysts to reaction rates
- Relate reaction energy to catabolism and anabolism

Chapter 9 – Acids, Bases, pH, and Buffers

- Predict the products of acid-base neutralization reactions
- Recognize or predict the chemical structure (formula) of conjugate acid-base pairs
- Apply Le Chatelier's Principle to acid-base equilibrium reactions – especially the bicarbonate and biphosphate equilibrium reactions
- Calculate the $[\text{OH}^-]$ and/or $[\text{H}_3\text{O}^+]$ using K_w
- Calculate the pH of a solution given the $[\text{OH}^-]$ or $[\text{H}_3\text{O}^+]$ or vice versa
- Perform 1:10 serial dilution calculations
- Describe and/or recognize a buffer system

Chapter 10 – Reactions of Organic Functional Groups in Biochemistry

- Recognize, distinguish between, predict the products, and predict the reactants for oxidation, reduction, acid-base, hydration, dehydration, acyl group hydrolysis, acyl derivative formation, and phosphoryl group transfer reactions
- Recognize whether a compound or ion is shown in its oxidized or reduced state
- Recognize oxidizing and reducing agents