Study Guide for Exam #4, Ch. 21, 24-25

Chem1B, General Chemistry II

MEMORIZE

- $\ln[A]_t = -kt + \ln[A]_0$
- $\Delta E = \Delta m\ c_2$, $c = 2.9979 \times 10^8$ m/s
- mass defect = mass of individual nucleons – nuclear mass
- 1 gram = 6.022×10^{23} amu AND 1 mole = 6.022×10^{23} atoms
- $E = h(c/\lambda)$
- Splitting patterns for the d-orbitals for octahedral, tetrahedral, and square planar complexes
- Paramagnetism (unpaired e^-) and diamagnetism (paired e^-)
- Isomerizations (constitutional vs. conformational vs. enantiomerism)
- IUPAC nomenclature for alkanes, alkenes, alkynes, cycloalkanes, haloalkanes.
- Reactions for hydrocarbons (combustion, halogenations, hydrogenation, hydrohalogenation, hydration)

WILL BE PROVIDED

- "Magic numbers"; belt of stability
- First-order half-life equation: $t_{1/2} = 0.693/k$,
- $c = 2.9979 \times 10^8$ m/s ; $h = 6.626 \times 10^{-34}$ J·s
- mass of electron = 5.4858799×10^{-4} amu, mass of neutron = 1.008665 amu, mass of proton = 1.007276 amu
- Spectrochemical series, dentate patterns for ligands, color wheel

Chapter 21: Nuclear Chemistry

I. Rates of Decay (21.4): Know how to use the half-life equation for radioactive decay (first order reaction) and integrated rate law and be able to use it to convert between amount and time, or vice versa.
Examples, Ch. 21: 33-34, 36-42, 72

II. Energy Changes (21.6): Know how to calculate the energy change for a nuclear reaction using $\Delta E = c^2\ \Delta m$. Be able to calculate the binding energy for a nucleus in J/mole, J/atom, and J/nucleon.
Examples, Ch. 21: 43, 46-50, 77

Chapter 24: Chemistry of Coordination Compounds

I. Coordination Compunds (24.1-3): Know how to determine the oxidation state of the metal, coordination number, and overall charge of a compound. Know how to name inorganic coordination compounds.

Examples, Ch. 24: 19-20, 23-26, 51, 53, 58

II. Crystal Field Theory (24.5-6): Know how to write and fill the splitting patterns for a metal's d-orbitals in an octahedral, tetrahedral, and square planar fields for weak field (high spin) and strong field (low spin) complexes and determine whether the compound will be paramagnetic or diamagnetic. Know how to convert the wavelength/color of the complex back to the crystal-field splitting energy (Δ_o), or vice versa.
Examples, Ch. 24: 36-38, 40-48, 62, 65

Chapter 25: Organic and Biological Chemistry

I. IUPAC Nomenclature (25.2-3): Be able to systematically name any alkane, alkene, alkyne, cycloalkane, or haloalkane, or use the systematic name to draw the structure (line-angle OR Lewis structure).
Examples, Ch. 25: 12-24

II. Isomerization (25.3): Be able to identify constitutional vs. conformational isomers vs. enantiomers.
Examples, Ch. 25: 25-28, 77-80

II. Hydrocarbon Reactions (25.3): Be able to predict the products from the combustion, (all hydrocarbons) hydrogenation, halogenations, hydrohalogenation, or hydration (for alkenes) reactions.
Examples, Ch. 25: 31-38

III. Functional Groups (25.4): Be able to identify alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, and amides in structures.
Examples, Ch. 25: 39-41, 53-54, 82-83, 85-87