CHM 161 Final Examination checklist

I will give you all formulas needed for the exam. You will be given a periodic table. You should know how to interconvert millimeters into meters or kcal in cal without any formulas (all conversions within a metric unit).

CH 1 – Matter and Measurements in Chemistry

- Metric prefixes (milli, centi, kilo, etc), what they mean and how to interconvert
- Unit conversions using dimensional analysis
- density
- Scientific notation – know how to use your calculator

CH 2 – Atoms and the Periodic Table

- Make-up of the atom
  - Nucleus with protons and neutrons
  - Electrons outside the nucleus
- Atomic number (number of protons or electrons in atom)
- Mass number (number of protons and neutrons in nucleus)
- Isotopes
- Electron configurations (pp. 56-65)

CH 3 – Ionic Compounds

- How periodic table is used to predict ion formation: cations and anions
- Electron configurations of ions (how does the number of electrons change)
- Electron-dot symbols, octet rule
- Binary ionic compounds (with two elements)
- Polyatomic ions – names, formulas and charges (p. 91)
  Know: ammonium, carbonate, bicarbonate, hydroxide, nitrate, nitrite, phosphate, sulfate, sulfite
- *Nomenclature* (naming) ionic compounds using Roman numeral system and standard system (e.g. gold(III) chloride and ammonium carbonate)

CH 4 – Molecular Compounds

Covalent bonding

- Octet rule
- bonding tendencies of different atoms
- similarities between elements in the same group
- Lewis structures
- Be able to draw Lewis structures from molecular formulas or from partially drawn structures
- geometries of compounds based on the structure
- Naming covalent compounds (P_2O_5 is diphosphorous pentoxide e.g.)

CH 5 – Classification and Balancing of Chemical Reactions

- Balancing chemical equations (crucial)
- Classes of chemical reactions
  - Solubility
  - Acid-base neutralization
  - Oxidation-reduction
- Be able to predict the products of acids with hydroxide bases (neutralization)

CH 6 – Chemical Reactions: Mole and Mass relationships

- Molecular weight (molar mass)
- Mole concept; number of atoms/molecules in a mole (Avogadro)
- Mole to mole conversions (using balanced equations)
- Mole to gram conversions (using molecular weights)
- Gram to gram conversions (using both)
  - g reactant -> mol reactant -> mol product -> g product
- Be able to balance these equations (CH 5), carry out mole-mole conversions (CH 6), molarity to mol conversions (CH 9); mol to gram conversions (CH 6)

CH 7 – Chemical Reactions - Energy, Rates and Equilibrium

- Exothermic vs. Endothermic reactions
- $\Delta G = \Delta H - T*\Delta S$
- Equilibrium, LeChatelier's principle
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CH 8 – Gases, Liquids and Solids

- P, V, T problems using combined gas law 8.8-8.13
- Ideal gas law PV=nRT (solving for missing variable) 8.16, 8.17
- Know what "directly" and "inversely" proportional means mathematically
- Avogadro's molar volume (1 mol of any gas = 22.4 L at **S**tandard **T**emp and **P**ressure (STP) 8.70-8.72
- Dalton's partial pressure law 8.88

CH 9 – Solutions (sections 1-5,7,12,13)

- Mixtures, homogeneous vs. heterogeneous, examples
- Concentration units:
  - Weight/volume (mass solute g/volume solution in mL)
  - Molarity (M, moles solute/liter solution)
  - Mol/L x L = mol
- $C_1V_1 = C_2V_2$ (solve for missing variable)
- Osmosis: osmolarity – how it relates to molarity; hypotonic, isotonic, hypertonic solutions