CH40S **Major Topics for Exam Review**

Unit 1 – Aqueous Reactions

- ☐ Dissociation equations
- ☐ Ion Concentrations
- ☐ Precipitation reactions
- ☐ Molecular, ionic, net-ionic equations
- ☐ Properties of Acids and Bases
- ☐ Neutralization reactions. & problems
- ☐ Determine oxidation numbers
- ☐ Determine if a reaction is a redox rxn…identify LEO, GER, oxidizing agent, reducing agent.
- ☐ Balance redox reactions, balance in acid/base solution.

Unit 2- Atomic Structure

- ☐ Electromagnetic spectrum (Wavelength, Frequency, energy, ROYGBIV)
- ☐ Models of the atom
- ☐ Quantum model (Schroedinger, DeBroglie, Heisenburg, Bohr)
- ☐ Line/Absorbtion spectra (how formed)
- ☐ Orbitals and filling order
- ☐ Electron arrangement and configurations (standard, noble gas and valence) for atoms and ions
- ☐ Define and explain trends in electronegativity, Ionization energy, atomic radius
- ☐ Atomic radii of ions vs atoms
- ☐ Explain trends in successive ionization energies

Unit 3 – Kinetics

- ☐ Factors affecting rates of reactions (Nature of reactants, S.A. , Concentration, pressure, volume, temp, catalyst), and how they affect the rate → use collision theory.
- ☐ How can we measure the rate of a reaction? (pH change, colorimeter, volume change, mass change etc.)
- ☐ Calculate average & instantaneous rate from data.
- ☐ Given rate of appearance/disappearance of one species in a rxn, use stoichiometry to determine rate of another.
- ☐ Reaction mechanisms: intermediates, catalysts, R.D.S., etc.
- ☐ Determine the rate law from a reaction mechanism → use R.D.S
- ☐ Determine rate law → initial rates method (using experimental data)
- ☐ Coordinate diagrams: ΔH, E_a, exothermic/endothermic, catalysts.
- ☐ Order of a reaction → overall order, order of each reactant

Unit 4 – Chemical Equilibria

- ☐ Conditions necessary for equilibrium
- ☐ Mass-Action expression (K_{eq} law)
- ☐ I.C.E. table problems:
  - Type 1: given initial & equilibrium concentrations find K_{eq}
  - Type 2: given k_{eq} & an initial conc. Find equilibrium concentrations
- ☐ Le Chatelier's principle
  - predict shifts when concentration, temp, pressure, volume are changed. (also addition of a catalyst)
  - How to make a reaction shift in a certain direction.
- ☐ Determine if rxns are complete/incomplete (product or reactant favoured) using value of k_{eq}.
- ☐ Concentration versus time graphs and shifts in equilibrium.
- ☐ Ksp equations
- ☐ Find ksp given solubility, and vice versa.
- ☐ Find solubility of a compound in the presence of a common ion (common ion effect)
- ☐ Given ksp, determine which is more soluble.

Unit 5 – Acid/Base

- ☐ Weak/Strong electrolytes/acids & bases
- ☐ Conjugate acid/base pairs
- ☐ pH – Scale, how to calculate (-log [H+]) → also pOH
- ☐ Type 1 & 2 ICE problems → finding pH/pOH or $K_{a/b}$of a weak acid/base
- ☐ Conversions between pH, pOH, [OH-], [H+]. (use k_w)
- ☐ Find OH/H concentrations in strong acids/bases
- ☐ Determine the products, and which direction an acid/base reaction will favour (find stronger acid)
- ☐ % dissociation → calculate % dissociation, use % to find [initial], etc.
- ☐ Distinguish between strong & concentrated, and weak & dilute.
- ☐ Titrations → Curves (strong-strong, weak-strong), neutralization, equivalence point, ½ equivalence, pKa & pKb

Unit 6 - Redox

- ☐ Spontaneous reactions.
- ☐ Redox stoichiometry.
- ☐ Electrochemical cells – anode, cathode, salt bridge, ½ rxns, potential, etc.
- ☐ Electrolytic cells – same as above, plus electroplating.
- ☐ Corrosion – anode/cathode reactions
- ☐ Faradays law questions