

BLOCK 04 TOPICS (CH 9-10)

(INCLUDES SOME TOPICS FROM CHAPTERS 5 & 7)



The following is a list of important topics for students taking Chemistry 30A. Exams and assignments will focus on helping students achieve these goals. Additional topics may be added during the semester and not all will be tested for on any given exam or assignment. Students are encouraged to use this outline as a baseline for reviewing readings, preparing for exams, and determining if Chemistry 30A meets the student's personal objectives in studying chemistry.

CH 09: SOLUTIONS (1070)

Solutions:

- ☐ Recognize the three intermolecular forces hydrogen bonding, dipole-dipole, and London forces.
- ☐ Define a solvent, solute, and solution.
- ☐ Distinguish between the solvation of molecular and ionic solids.

Electrolytes:

- ☐ Define electrolyte and recognize examples of electrolytes.
- ☐ Recognize that acids are electrolytes.
- ☐ Understand that electrolytes in solution equilibrate between associated and dissociated ions.
- ☐ Understand that strong electrolytes favor dissociated ions and weak electrolytes favor associated ions.
- ☐ Know non-electrolytes are either molecular substances or insoluble ionic substances.
- ☐ Know that HF and acetic acid are weak electrolytes.

Concentration:

- ☐ Define concentration, dilution, and saturation.
- ☐ Relate the moles of a solute and volume of a solution to its molarity.
- ☐ Relate the mass of a solute and volume or mass of a solution to mass percent.
- ☐ Use molarity as a conversion factor between solution volume and solute moles.
- ☐ Use the concept of constant moles to solve dilution problems for molarity or volume.

Solubility:

- ☐ Use double displacement kinetics to predict the possible products of two electrolytes in solution.
- ☐ Recognize if all possible double displacement products are electrolytes no reaction will occur.
- ☐ Recognize if a double displacement product is not soluble in solution a precipitation reaction will occur.
- ☐ State the four solubility rules.
- ☐ Use solubility rules to identify ionic solids that are soluble or will form precipitates.
- ☐ Use solubility rules to predict if a double displacement reaction will occur between two electrolytes.

Oxidation & Reduction (see chapter 7 section 5):

- ☐ Define oxidation and reduction.
- ☐ Determine the oxidation state (oxidation number) of an atom.
- ☐ Use oxidation numbers of reactants and products to determine if an atom has been oxidized or reduced in a reaction.
- ☐ Understand carbon based molecules are reduced or oxidized if their carbon atoms are reduced or oxidized.
- ☐ Use loss or gain of oxygen carbon bonds to determine if a carbon atom has been oxidized or reduced.
- ☐ Use loss or gain of hydrogen carbon bonds to determine if a carbon atom has been oxidized or reduced.
- ☐ Recognize a combustion reaction and understand combustion is a red-ox (reduction-oxidation) reaction.

Red-Ox Reactions:

- ☐ Use single displacement kinetics to predict the possible products of an electrolyte and a metal in solution.
- ☐ Understand metals have different activities (tendency to oxidize and form ions).
- ☐ Recognize if a single displacement would produce a more active metal from a less active one, no reaction occurs.
- ☐ Recognize if single displacement mechanism allows a more active metal to be oxidized a red-ox reaction will occur.
- ☐ With a periodic table, estimate which of two competing metals is more active.
- ☐ Use the relative activity of two metals to determine if a red-ox (oxidation-reduction) reaction will occur.

CH 10: ACIDS (1071)

Properties:

- ☐ State and describe five properties of acids and five properties of bases.
- ☐ Give examples and sources of common acidic and basic substances.
- ☐ Provide the Liebig definition of acids.

Acids Electrolytes:

- ☐ Provide the Arrhenius definition of acids and bases.
- ☐ Know Arrhenius explained acids and bases using the model of electrolytes.
- ☐ Recognize, name and provide the formula of binary acids and common oxy-acids.

- ☐ Classify an acid as monoprotic, diprotic, or polyprotic.
- ☐ Recognize, name and provide the formula of simple Arrhenius bases.
- ☐ Identify and give examples of strong and weak Arrhenius acids.

Reactions of Acids & Bases

- ☐ Recognize the reaction of an acid with an active metal is a single displacement reaction and also a gas evolution reaction.
- ☐ Know H_2 , CO_2 , NH_3 and H_2S are insoluble gases in water.
- ☐ Recognize if a double displacement product is an insoluble gas in solution a gas evolution reaction will occur.
- ☐ Understand H_2CO_3 and NH_4OH decompose to form insoluble gases.
- ☐ Recognize the reaction of an Arrhenius acid and Arrhenius base to form water is a neutralization reaction.
- ☐ Recognize neutralization reactions are double displacement reactions.
- ☐ Recognize if a double displacement product is water a neutralization reaction will occur.
- ☐ Predict the products of a possible reaction that forms an insoluble gas or water.

Acid-Base Reactions:

- ☐ Define a Brønsted-Lowry acid or base and differentiate it from the Arrhenius model.
- ☐ Recognize any reaction between an acid and base is an acid-base reaction. (Note: not all are neutralization reactions)
- ☐ Identify the two conjugate pairs in an acid base reaction.
- ☐ Differentiate between a reversible and irreversible reaction.
- ☐ Understand reactions occur faster when their components exist in higher concentration.
- ☐ Identify the forward and reverse reaction in an equilibrium reaction equation.
- ☐ State and explain Le Chatelier's principle.
- ☐ Qualitatively predict the change in concentration of components at equilibria when reactants or products are added.

Amphoteric Substances:

- ☐ Define amphoteric and recognize water is amphoteric.
- ☐ Know the ion product constant of water.
- ☐ Relate hydroxide ion to hydronium ion concentration by the ion product constant of water.
- ☐ Identify an aqueous solution as acidic or basic by its hydronium ion concentration.
- ☐ Relate pH to hydronium ion concentration.
- ☐ Relate pOH to hydroxide ion concentration.
- ☐ Determine whether an aqueous solution is acidic or basic from its pH.
- ☐ Understand how a buffer solution maintains pH with the addition of small amounts of acid or base.

CH 05: NUCLEAR CHEMISTRY (1072)

Radioactivity:

- ☐ Describe the property of radioactivity and define radioisotope.
- ☐ Understand the differences in charge and mass of alpha, beta, and gamma radiation.
- ☐ Know the charge mass, symbol and isotopic notation for alpha particles, beta particles, protons, and neutrons.

Nuclear Reactions:

- ☐ Using isotopic notation relate the a radioisotope to it's alpha decay products.
- ☐ Using isotopic notation relate the a radioisotope to it's beta decay products.
- ☐ Define half life.
- ☐ Determine the number of half lives and mass remaining, given a samples half life and initial mass.
- ☐ Define nuclear fission, fusion and chain reaction.
- ☐ Given a nuclear reaction, classify it as a fission or fusion reaction.