

This study guide is only for additional information not covered by the first four tests.

**Know definitions and identify examples of, etc.:**

**Chapter 11:** organic compounds, hydrocarbons, properties of organic compds., alkanes, condensed structural formula, expanded structural formula, skeletal formula, cycloalkanes, branch, substituent, functional groups, branched alkanes, isomers, substituent groups: (methyl, ethyl, propyl, isopropyl, fluoro, chloro, bromo, iodo) (see Table 11.5, p.369), haloalkanes, properties of alkanes, combustion reaction, cis and trans isomers, addition reactions, hydrogenation, hydration, aromatic compounds (contain benzene), identify alkanes, alkenes, alkynes and aromatic compounds.

1) Know all prefixes in Table 11.2, p.364.

2) Know names and structures of functional groups (scattered in Ch.11-16) as well as hydroxyl group (-OH), and carbonyl group(-C=O).

3) Name and write structural formulas for all alkanes, cycloalkanes, and with halogen groups or alkyl groups.

4) For all other compounds (not in #3 above), be able to identify the type of compound: alkane, alkene, alkyne, alcohol, ether, ester, aldehyde, ketone, carboxylic acid, amine, amide, aromatic, thiol, haloalkane (scattered in Ch.11-16).

5) Be able to identify cis or trans isomer (p.378).

6) Be able to write the products of addition reactions: hydrogenation and/or hydration. (p.382-384).

**Chapter 12:** properties of alcohols (solubility in water), dehydration of alcohols, identify alcohols, thiols, ethers, aldehydes and ketones. Be able to write products of dehydration of alcohol reaction (p.420).

**Chapter 13:** carbohydrates, sugars, combustion, monosaccharides (i.e. glucose), disaccharides (i.e. sucrose), polysaccharides (i.e. cellulose), monosaccharides can form cyclic structures, glycosidic bonds. chiral molecules, achiral molecules, stereoisomers, enantiomers, understand a Fischer Projection, p.440. (don't have to draw one). Be able to identify chiral and achiral molecules (p.437-440). 9) Know that monosaccharides contain a carbonyl group and hydroxyl groups; and that monosaccharides can form cyclic structures. Disaccharides contain two monosaccharides joined by a glycosidic bond. Polysaccharides contain many monosaccharides.

**Chapter 14:** carboxylic acids are weak acids (p.476+), hydrolysis, identify esters, carboxylic acids amines and amides. Be able define a hydrolysis reaction (the splitting of a molecule by the addition of water). Examples are hydrolysis of ester (p.485) and hydrolysis of amides (p.497).

**Chapter 15:** lipids, fatty acid (contains a long chain hydrocarbon and carboxylic acid group), saturated fatty acid, monounsaturated fatty acid, polyunsaturated fatty acid, lipids are not soluble in water, lipid bilayer in cell membranes (p.538+).

1) Lipids are insoluble in water. Fatty acids are lipids that have a long hydrocarbon chain and a carboxylic acid group. Hydrogenation(Ch. 11, p.524) and hydrolysis (Ch.13&14) can occur for lipids too (p.525).

2) (p.514-515): saturated means saturated with hydrogens (you cannot add anymore hydrogens), so all carbon-carbon bonds are single bonds. Monounsaturated means there is one carbon-carbon double bond. Polyunsaturated means there are more than one carbon-carbon double bonds (p.515).

3) (p. 514) cis isomers have similar groups on the same side of the carbon-carbon double bond. (double bonds cannot rotate like single bonds) ; trans isomers have similar groups on opposite sides of the carbon-carbon double bond. See also Ch. 11, p.514.

**Chapter 16:** proteins, classification of proteins and their functions (Table 16.1, p.553), amino acids, peptide bonds, primary structure of proteins, secondary structure, tertiary structure, quaternary structure, denaturation of proteins, causes of denaturation (p. 568-570). enzyme (p.571) is a protein that acts as a catalyst.

- 1) Amino acids contain an amino group (a weak base) and a carboxylic acid (a weak acid) group.
- 2) The linking of two or more amino acids forms a peptide. The bond joining the amino acids is called a peptide bond. A protein is also called a polypeptide chain.
- 3) An enzyme is a catalyst for reactions in the body (p.571).

Given: Everything given on previous exams will be given for the Final.

Below are general topics from each chapter which may help you study. This is not necessarily a complete list!!!

#### CHM1032 Final Exam Topics

##### Chapter 1

- 1) Scientific Method

##### Chapter 2

- 1) Units of Measurement, i.e. mL is volume
- 2) Scientific Notation
- 3) Metric Prefix Conversions
- 4) Measured vs. Exact Numbers
- 5) I.D. Sig. Figs.
- 6) Round to Sig. Figs.
- 7) Addition or Subtraction with Sig. Figs.
- 8) Multiplication/Division with Sig. Figs.
- 9) Mixed Operations with Sig. Figs.
- 10) Convert metric prefixes
- 11) Convert one step unit calculation
- 12) Convert multistep unit calculation
- 13) Convert volume units and/or double units (i.e. g/mL)
- 14) Density definition, solve for d, V, or mass.
- 15) Specific Gravity

##### Chapter 3

- 1) Define or id. examples of matter, pure substance, element, compound, mixture
- 2) Heterogeneous or homogeneous mixtures
- 3) States of Matter: solid, liquid, gas, and definitions

- 4) Physical Properties, physical change, chemical properties, chemical change
- 5) Energy, definition, units, Kinetic Energy, Potential Energy, Heat, Joule, calorie, Calorie
- 6) Convert temperature units, F, C, and K.
- 7) Specific heat, Calculate heat with temperature change.
- 8) Caloric values.
- 9) Change of state: melting, freezing, vaporization, condensation, sublimation, deposition
- 10) Use Heat of Fusion, or Heat of Vaporization (calculate heat of change of state)
- 11) Heating curve and cooling curve.

#### Chapter 4

- 1) Elements and Symbols and Names.
- 2) Complete Symbol (with atomic number and mass number).
- 3) Periods, Groups: alkali metals, alkaline earth metals, transition metals, halogens, noble gases.
- 4) Metal, Nonmetal, Metalloid.
- 5) Structure of Atom.
- 6) Atomic Number, Mass Number, isotopes, number of protons, neutrons, electrons.
- 7) Atomic mass, Average atomic mass.
- 8) Energy levels, valence shell, valence electrons, change in energy of electron, light emitted.
- 9) Periodic Properties: Atomic Size, Ionization Energy, Metallic Character.
- 10) Electron Dot Symbols.

#### Chapter 6

- 1) Octet Rule and Ions, cations, anions, number of protons and electrons.
- 2) Writing Ionic Chemical Formulas and Naming Ionic Compounds: fixed charge metal, variable charge metal, nonmetal ions, polyatomic ions, name polyatomic ions.
- 3) Writing Covalent Chemical Formulas and Naming Covalent Compounds.
- 4) Naturally Occurring Diatomics.
- 5) Common Names of Compounds.
- 6) Electron Dot Structures of Molecules.
- 7) Single, Double, and Triple bonds.
- 8) Electronegativity, bond polarity.
- 9) Electron Domains, Electron Domain Geometry, Molecular Geometry, Polarity of Molecules.
- 10) Attractive Forces: Dipole-Dipole attraction, Hydrogen Bonds, Ion-Dipole Attraction, Dispersion Forces.
- 11) Valence electrons, anion, cation.

#### Chapter 7

- 1) Mole, and Avogadro's Number.
- 2) Moles of elements in a formula
- 3) Molar mass of an atom, converting between moles and grams.
- 4) Molar mass of a compound, converting between moles and grams.
- 5) Writing a Chemical Equation.
- 6) Balancing Chemical Equation.
- 7) Types of Reactions: Combination, Decomposition, Single Replacement, Double Replacement, Combustion.

- 8) Oxidation-Reduction Reactions, Oxidation Charges in compound, element oxidized or reduced in a reaction.
- 9) Mole ratio.
- 10) Mass Calculations for Reactions.
- 11) Energy in Chemical Reactions: activation energy, Need Collision, Orientation and energy for reaction to occur, exothermic, endothermic, energy diagram.
- 12) Rate of Reactions: Concentration, temperature, catalyst.

#### Chapter 8

- 1) Kinetic Molecular Theory of Gases
- 2) Convert pressure units.
- 3) Boyle's, Charles', Avogadro's Laws.
- 4) Combined Gas Law.
- 5) STP and Molar Volume.
- 6) Dalton's Law of Partial Pressures.

#### Chapter 9

- 1) Solute, Solvent, Solution, types of solutions.
- 2) Polar dissolves in polar, etc.
- 3) Electrolytes, Strong and weak, nonelectrolytes.
- 4) Equivalents and Eq/liter.
- 5) Solubility, saturated, unsaturated, supersaturated solutions, effect of temperature on solubility, read solubility from graph.
- 6) Henry's Law
- 7) Soluble and Insoluble Salts (?) (not Fall 2011)
- 8) Concentrations: %(m/m), %(v/v), %(m/v), Molarity.
- 9) Dilution of Solutions
- 10) Colloids, Suspensions, Colligative Properties: Freezing Pt. depression, Boiling Pt. Elevation, increase of Osmotic Pressure.
- 11) Osmosis, reverse osmosis, dialysis, isotonic, hypotonic, hypertonic solutions, crenation, hemolysis.

#### Chapter 10

- 1) Definitions of Arrhenius acid & base, and Bronsted-Lowry acid & base.
- 2) Name acids and write chemical formulas of acids. Name and write chemical formulas of bases.
- 3) I.d. the acid, base, conjugate acid and conjugate base in a reaction.
- 4) Given an acid, i.d. its conjugate base.
- 5) I.d. and definitions of strong acids & bases, and weak acids & bases.
- 6) Ionization of water.  $K_w = [H^+][OH^-]$ ,  $K_w = 1.0 \times 10^{-14}$ . Use equation to solve for  $[H^+]$  or  $[OH^-]$ .
- 7) Given  $[H^+]$  or  $[OH^-]$ , classify as acid, base or neutral solution.
- 8) Given pH, classify as acid, base or neutral solution.
- 9) Calculate  $pH = (-1)\log[H^+]$ .
- 10) Calculate  $[H^+] = 10^{-pH}$ .

- 11) Calculate using some combination of numbers 6-10 above.
- 12) Write products of reactions of acids with active metals.
- 13) Write products of reactions of acids with carbonate or bicarbonate ions.
- 14) Write products of a neutralization reaction, and definition.
- 15) Acid-base titration calculations.
- 16) Buffers, equilibrium, shifts in equilibrium, buffers in blood, acidosis, alkalosis.

#### Chapter 5

- 1) Definitions, etc.: radioactivity, radiation, radioisotope, transmutation.
- 2) Types of radiation and symbols: alpha, beta, positron, gamma.
- 3) Radiation protection.
- 4) Write nuclear decay equations for alpha emission.
- 5) I.d. types of nuclear decay.
- 6) Radiation measurement.
- 7) Definition and calculation using half-life of a radioisotope.
- 8) Medical applications of radioactivity.
- 9) Nuclear fission and fusion, definitions and i.d. equations, chain reaction, nuclear reactors.

#### Chapter 11

- 1) Names and draw structures of simple organic compounds, alkanes, cycloalkanes, alkanes with halo substituents, prefixes in names, methyl, ethyl, and propyl substituent groups.
- 2) Isomers.
- 3) Combustions
- 4) Solubility, density, and geometry.
- 5) I.d. , define, or draw functional groups, or classify type of organic compound.
- 6) Cis-trans isomers, definition or id.
- 7) Addition reactions.
- 8) Id., define or write products for Hydrogenation & Hydration reactions.

#### Chapter 12

- 1) Solubility of alcohols.
- 2) Id., define or write products for Dehydration reactions.
- 3) Id., define, chiral & achiral molecules, enantiomers.
- 4) Id. Fischer Projections.

#### Chapter 13

- 1) Carbohydrates, monosaccharides, disaccharides, polysaccharides, glycosidic bond, cyclic structure of monosaccharides.

#### Chapter 14

- 1) Carboxylic acids are weak acids, hydrolysis.

#### Chapter 15

- 1) Lipids, fatty acids, cis & trans fatty acids, monounsaturated, polyunsaturated, saturated, hydrogenation, hydrolysis, cell membranes and lipid bilayer.

#### Chapter 16

- 1) Proteins, amino acids, peptide bonds, classification of proteins and their functions, an acid and base in an amino acid.
- 2) Primary, secondary, tertiary, and quaternary structures.
- 3) Denaturation of proteins and causes.
- 4) Enzymes are proteins that act as catalysts.