Assigned Homework Problems (8th Edition)

These problems occur mostly in the text of the chapter, although there are also about 20 problems that are at the end of each chapter before the answers. The answers to all of the odd numbered problems are at the end of each chapter, and so almost all the problems I have assigned are odd numbered. If you feel like doing more problems, the even numbered problems are very similar to the odd numbered problems right before them (#12 is very similar to #11, for example).

Chapter 1: This material will be covered thoroughly in lab and will not be covered in lecture. There will be some of this material on the quizzes and exams. I know there are many different lab instructors, so to avoid any confusion, these problems cover the material I will expect you to know and that I will include on our lecture quizzes and exams.

1. I will not expect you to know significant figures.

2. You will be expected to memorize the metric prefixes kilo, deci, centi, milli, and micro; and to use them to do metric conversions. However, you don't have to memorize metric to American unit conversions (like 1 inch = 2.54 cm). These will be given to you on the exam or quiz.

3. Make sure you know how to do unit conversions. You should also be able to use density and specific gravity to convert between mL and g.

Reading Assignment: Sections 1.1 (metric system), 1.4 (prefixes and metric conversions), 1.5 (Conversion Factors), 1.6 (Density - think of this as a conversion factor - and Specific Gravity, which is just density without the units written down)

Problems: 1, 3, 5, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 63, 67, 69, 73 (watch the units!), 75.

Chapter 2. You will be expected to be able to do all of the following:

1. Know the names of the elements with these chemical symbols: H, C, N, O, F, Na, Mg, Al, Si, P, S, Cl, K, Ca, Fe, Cu, Au, Zn, Br, Ag, I, Hg, Pb, U. Many of these elements are in the health note on page 42.

2. Know what a group and a period are on the periodic table, know the names of Group 7A (Halogens) and Group 8A (noble gases) on the Periodic Table, and be able to classify an element as a metal or non-metal.

3. Determine the number of protons, electrons, and neutrons in a given isotope.

4. Determine the average atomic mass (also called the atomic weight) of an element if you are given the isotope percentages.

5. Determine the electron shell arrangement of an element.

You will be given a copy of the periodic table with your quizzes and exams.

Reading Assignment: All sections!

Problems: 1acde, 3abceg, 7a, 5, 9acde (classify only as metal, halogen, or noble gas), 11abde, 13, 15, 17, 19, 23, 25bcdgh, 27, 29, 31, 33, 35, 39, 41 (argon is Ar, silicon is Si), 43, 45, 47abcdf, 49, 51, 53, 55, 57, 63 (group numbers only), 65ab.

Additional problems:

1. If chlorine exists as 25% ^{37}Cl and 75% ^{35}Cl, show mathematically that the average atomic mass of Cl is approximately 35.5 amu.

2. An imaginary element has 3 isotopes. Let's call it element X. 60% is ^{98}X, 10% is ^{99}X, and 30% is ^{100}X. What is the average atomic mass of this imaginary element? (answer is 98.7)

Chapter 4. You will be expected to be able to do all of the following:

1. Understand the octet rule, know the valence electrons, electron dot structure (more correctly called the Lewis dot structure), and ions that elements in the "A" groups will have. Also know the electron arrangement, valence electrons, and electron dot structure of the Group "A" ions.

2. Know the formulae and names of these polyatomic ions. Remember to memorize the charges as well! OH^{-1}, NO_3^{-1}, NO_2^{-1}, CO_3^{-2}, HCO_3^{-1},SO_4^{-2}, PO_4^{-3}, NH_4^{+1}.

3. Know the names of compounds if I give you the formula, and determine the formula of a compound if I give you the name.

4. Know the polarity of a covalent bond between 2 atoms, and understand the meaning of the symbols "δ-" and δ+.

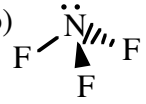
5. The only shape I will expect you to know is the tetrahedral shape, but you should be able to look at the structure of a covalent compound and determine if it is polar or non-polar.

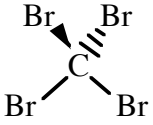
6. You **will not** be expected to draw the Lewis structures of covalent compounds, but you should know how many covalent bonds an element will form in a covalent compound.

Reading Assignment: All sections!

Problems: I know there are a lot of problems here, but repetition helps you learn the rules of naming compounds! 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29bcd, 31, 33, 35abc, 36abc, 37, 39, 41, 43bcde, 47, 49, 51, 53acd, 55, 57, 59, 61, 63, 65, 71b, 73, 77, 79, 81, 85, 87abcdeghil.

75. a) H—Br

b) 

c) 

Chapter 6. We will cover most of this chapter, **except** for section 6.6 – Chemical Equilibrium (pages 188-192). All of our calculations will be in calories or kilocalories – not in joules or kilojoules.

You will be expected to be able to do the following:

1. Understand the difference between potential and kinetic energy.

2. Know how to use specific heat, heat of fusion, and heat of vaporization in energy calculations.

3. Know the differences and similarities between calorie, kilocalorie, and Calorie (food calories) and be able to calculate the amount of Calories in foods with proteins, carbohydrates, and fats.

4. Know the properties of solids, liquids, and gases and know the terms for changes of state on a heating or cooling curve.

5. Understand the terms: exothermic reaction, endothermic reaction, activation energy, and catalyst. You should also know the factors that can affect the rate of a reaction.

Reading Assignment: All sections except for section 6.6, Chemical Equilibrium (188-192).

Problems: 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35acd, 45, 50, 51, 53.

Chapter 7 We will only be covering a few sections in this chapter. You should read sections 7.1, 7.2, 7.4, 7.5, and 7.8.

You will be expected to be able to the following:

1. Understand and apply the principles of the kinetic molecular theory.

2. Know the different units used for gas pressure.

3. Be able to predict what will happen to the pressure and volume when the temperature changes.

4. Understand the application of Dalton's law of partial pressures for mixtures of gases.

5. Be able to describe how gases dissolve in the blood and how they are transported around the body (see health note at the end of the chapter).

Reading Assignment: Sections 7.1, 7.2, 7.4,.7.5, 7.8. Also read the health notes at the end of the chapter on blood gas solubility and transport.

Problems: 1, 3abd, 5, 7, 23, 25, 27, 29, 31, 33, 45, 47, 49, 51, 55, 57, 61, 65

Chapter 8 Here is what I will expect you to know and to be able to do.

1. Know what "solute, solvent, and solution" refer to. Know the rules of solubility and the terms "saturated" and "unsaturated".

2. Know the difference between strong electrolytes, weak electrolytes, and non-electrolytes; and be able to write the equations for when they dissolve in water.

3. Be able to do calculations and dilutions with molarity (M), mass/volume percent (% m/v), and volume/volume percent (% v/v).

4. Know the difference between solutions, colloids, and suspensions. Understand the principles of osmosis and dialysis. You should know the terms "isotonic, hypertonic, hypotonic, crenation, and hemolysis". **However, I will not expect you to memorize which concentrations are isotonic with respect to our blood.**

5. Understand the concepts of osmolarity and equivalents.

Reading Assignment: All sections, with the following exceptions.

1. Skip the section on mass percent concentration (pg. 242-243).

2. Skip the table describing the different types of colloids – table 8.8 (pg. 253)

Problems: 1, 3, 5, 7, 9a, 11, 13, 15, 17, 19, 21, 23, 29, 31, 33, 35, 37, 39, 41, 43, 45, 49, 51, 53, 55, 57, 59, 61, 63, 65, 69, 71, 73, 77, 79, 81, 83.

Chapter 5. We will cover all of Chapter 5 **except** for parts of section 5.3, Types of Reactions (page 144-145: combination, decomposition, and replacement reactions). The only type of reactions you will be expected to know are combustion reactions, oxidation, and reductions.

You will be expected to be able to do the following:

1. Know the difference between a chemical and a physical change.

2. Balance a chemical reaction and classify a reaction as a combustion, oxidation, or reduction.

3. Know what a mole is and how to determine the molar mass of an element or a compound.

4. Know how to use mole and mass relationships in chemical equations.

Reading Assignment: All sections except for these parts of section 5.3, Types of Reactions: combination, decomposition, and replacement reactions (page 144-145)

Problems: 1bcdef, 3, 5, 7, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39 (mole relationships only), 41, 43, 45, 47, 49, 51 (balance only), 53, 55, 57, 59, 61, 63.

Chapter 9. We will cover all of chapter 9. One note about conventions: your book usually writes a free hydrogen ion in water [$H^+_{(aq)}$] as H_3O^+. To save time in lecture, I will usually just write it as H^+ or $H^+_{(aq)}$. Here is what I will expect you to know and to be able to do.

1. Know what the terms "acid, base, buffer, conjugate acid, and conjugate base" refer to.

2. Know the difference between a strong acid and a weak acid. Assume all acids are weak acids except for the strong acids listed in table 9.3. The only acids whose names and formulae you will be expected to know are: HCl, HBr, HNO_3, H_2SO_4, H_2CO_3, H_3PO_4.

3. Understand the pH scale, and be able to calculate [H^+] and [OH^{-1}] in an aqueous solution.

4. Be able to write down balanced reactions between acids and bases.

5. Know the relationship between hypoventilation and respiratory acidosis; and the relationship between hyperventilation and respiratory alkalosis. This is contained in the health note at the end of the chapter.

Reading Assignment: All sections!

Problems: 1, 3, 5acde, 7, 9, 11, 13, 15a, 16b, 17a, 21, 23 (hint: just look at the power of 10!), 25ab, 26ac, 27a, 28a, 29, 31, 33ac, 35 (just 1st, 2nd, 4th rows of the table), 37acd, 39, 41, 43, 45, 47abcd, 49, 51b, 55, 57, 59.

Chapter 10. We will cover all of chapter 10. For drawing structures, try to get familiar with the "stick" figures I use in class (your book only uses this convention for cyclic compounds and calls it "geometric figures"). They are easier, faster, and more clear than the condensed structures used in your book. When asked to draw structures on homework problems, I suggest using the "stick" figures. I have indicated these problems with an asterisk (*). On exams you can draw the structures in any fashion: expanded, condensed, or "stick" figures. However, you

must be consistent. You can't draw half the molecule with condensed and the other half with "stick" figures. Here is what I will expect you to know and to be able to do.

1. Know the difference between the properties of organic and inorganic compounds.

2. Identify and name alkanes, branched alkanes, and haloalkanes. Know the term "isomers".

3. Know the number of bonds carbon typically makes in an organic compound **(4 BONDS)**.

4. Be able to determine the number of hydrogens attached to a carbon when stick figures are used to draw the molecule.

5. Be able to write a balanced combustion reaction for alkanes.

6. You should know what a functional group is, but you **DO NOT** need to know the specific names of the functional groups until we cover the chapters devoted to them.

Reading Assignment: All sections!

Problems: 1, 3, 5, 7, 9, 11*, 13, 15, 17, 19, 21*, 23*, 25, 27*, 29, 31, 33, 37, 39, 41, 43, 45, 47*, 49*, 51.

Chapter 11 We will cover all of chapter 11, **except** for the reaction of water with alkenes (hydration reaction: bottom of page 342-343). Once again, try to get familiar with the use the stick figures when drawing structures. Problems where you should draw the stick figures are indicated with an asterisk. Here is what I will expect you to know and to be able to do.

1. Know the structures of these functional groups: alkenes (including the difference between *cis* and *trans* isomers), alkynes, benzene, and toluene.

2. Be able to draw structures if given a name or to provide the name if I give you the structures of the above functional groups.

3. Understand the hydrogenation reaction of alkenes and alkynes. Be able to give me the structures of the starting materials or the products of a hydrogenation reaction.

4. You will not be expected to memorize the structures of the polymers, but you should be able to draw the structure if I have given you the structure of the monomer (the individual alkene).

Problems: 1, 3, 5, 7*, 9, 11*, 13ade*, 15, 17*, 19, 21, 23*, 25*, 27, 28*, 29, 31*, 32ab*, 33, 34, 35.

Chapter 12 We will cover all of this chapter **except** for these parts:

1. No naming of thiols (bottom of pg. 361-362). You should be able to recognize the functional group, however.
2. Skip "Dehydration of Alcohols" (bottom of pg. 371-372).
3. No common names for ketones or aldehydes.

Here is specific information on what you should be able to do after finishing this chapter.

1. Recognize the structures of these functional groups: alcohols [be able to classify them as primary (1˚), secondary (2˚), or tertiary (3˚)], ethers, thiols, phenols, aldehydes, and ketones.

2. Be able to provide structures or names for alcohols, ethers (common names only for ethers), phenols, aldehydes, and ketones. The common names for ketones and aldehydes that you will be expected to know are: formaldehyde, benzaldehyde, and acetone.

3. Be able to draw the structures or products of oxidation reactions of alchols, thiols, and aldehydes. Also be able to do this for the reduction reactions of ketones and aldehydes.

4. Know the principles of solubility and boiling point comparisons of alcohols, aldehydes, and ketones.

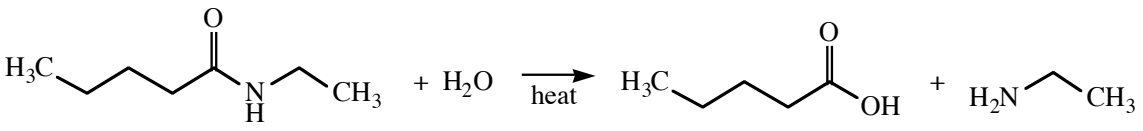
5. Know the concept of chirality, and be able to identify chiral carbons in a molecule.

6. Understand the Fischer projection method of drawing molecules.

Problems: 1, 3*, 5, 7, 11, 13*, 15, 17, 21*, 23, 25c, 27, 29bd*, 33, 35, 37*, 39 (chiral carbons only), 41, 43, 47, 49, 51*, 55, 57, 59bce*, 61, 63ac*, 65acde, 67abcef*, 69, 71, 73, 77.

Chapter 13 We will cover all of this chapter, but there will be a few things which we will not cover completely.

1. No basic hydrolysis of esters (pg. 424)
2. We will be naming amines only by the common names.
3. No ionization of amines in water (pg. 432, middle)
4. No memorization of any of the alkaloid structures.
5. Do not worry about the difference between the acidic or basic hydrolysis of amides (pg. 440). You should know the neutral hydrolysis of amides, an example of which is shown below.



Here is what you should be able to do after completing this chapter:

1. Know the nomenclature (names) and properties of carboxylic acids, esters, amides, and amines.

2. Show the condensation and hydrolysis reactions for acids, esters, and amides.
3. Show acid/base reactions between carboxylic acids and bases.
4. Classify an amine as primary (1˚), secondary (2˚), or tertiary (3˚). Also know the reactions of amines with acids.
5. Know these common names: Acetic acid and Benzoic Acid.

Problems: 3*, 5abd, 7*abcdf, 9*, 11, 13, 15, 17, 19ac, 21, 23bcd, 25acd, 29, 31bc, 33, 35 (common names), 37ac, 39, 41, 45, 47ab, 49bc, 51 (neutral hydrolysis only), 53 (IUPAC only), 55, 57, 59, 61, 63, 65d, 67, 69d.

The asterisks mean that you should draw the "skeleton" figures for those compounds.

Chapter 16 There are a few parts of this chapter which we will not cover completely.

1. No memorization of the different types of proteins classified in Section 16.1 (pg. 524)
2. No memorization of the structures of the 20 different amino acids. However, if you are given the structure, you should be able to classify an amino acid as nonpolar, polar, acidic, or basic.
3. No memorization of the classes of enzymes listed in table 16.8 (page 545).
4. No memorization of the metal ions as cofactors for specific enzymes in table 16.12 (pg. 556)
5. No memorization of the water soluble vitamins as coenzymes in table 16.13 (page 558)
6. No need to know the difference between the "lock and key" and the "induced fit" method of enzyme-substrate formation.

Here is what I will expect you to be able to do:

1. Classify amino acids as nonpolar, polar, basic, and acidic.
2. Show the hydrolysis and condensation reactions for amino acids and peptides.
3. Know the principles of primary, secondary, tertiary, and quaternary protein structure; and the attractions that cause their formation.
4. Know how to denature a protein.
5. Understand the role of enzymes in catalyzing reactions in our body. Also understand the principles of how enzymes work (active sites and enzyme-substrate formation).
6. Know the difference between competitive and non-competitive enzyme inhibition.
7. Know what a cofactor or coenyzme is.

Problems: (you will have to look up the structures of some of the amino acids in order to do some of these problems. The book uses names, not structures) 7, 13, 19, 21, 23, 25, 26, 29, 30, 31, 32, 35, 37ab, 41, 49, 53, 57, 63abcdefh, 65, 77, 85.

Chapter 14 We will cover all of this chapter. Here is what you should be able to do after completing this chapter:

1. Classify the carbohydrates as mono-, di-, or polysaccharides. Also be able to classify them by their functional groups (aldose or ketose); the number of carbons (triose, tetrose, etc.); and as a D or L sugar.

2. Be able to draw the cyclic structure (α or β) if you are given the open chain structure. And be able to draw the open chain structure if you are given the cyclic structure.

3. The only structures I will require you to memorize are: glucose, fructose, maltose, amylose, and cellulose. You should also know the difference between amylose, amylopectin, and glycogen.

4. Be able to classify the glycoside bonds (α-1,4, etc.), and be able to draw the structures of the disaccharides or poly-saccharides if you are told the nature of the glycoside bonds.

5. Know what a reducing sugar is.

Problems: 1, 3, 5, 7, 9, 10, 13, 15, 17, 19, 21bc, 23, 25, 27, 29, 31 (structure only), 35, 37, 41, 43, 49, 55, 57

Chapter 15 We will cover most of the sections of this chapter in detail. Here are the specifics.

1. You should skip the section on saponification (pg. 503), but should make sure you read the section on soaps (chapter 13, page 425).

2. I will not require you to memorize the names and structures of specific fatty acids, prostaglandins, or steroids, but you should know the general structure of waxes, fats, oils, phospholipids, cell wall membranes, and steroids. However, in order to do some of the problems, you will need to look up some of the structures of the fatty acids (the book uses names rather than structures in many of the problems).

3. I will not require you to know the structure or function of the lipoproteins (HDL and LDL).

Here is what I will expect you to be able to do:

1. Know the general structure of waxes, fats, oils, phospholipids, cell wall membranes, and steroids.
2. Be able to draw the condensation and hydrolysis products for triglycerides.
3. Know the differences in structures and properties of saturated and unsaturated fatty acids and triglycerides (fats and oils).
4. Know the role of phospholipids in forming cell wall membranes.

Problems: 3, 5, 9, 11, 13, 19, 21, 25, 27, 29, 31a, 35, 37, 43, 55, 57, 65.