Assigned Homework Problems – 9th Edition

These problems occur mostly in the text of the chapter, although there are also 20-30 problems at the end of each chapter. The answers to all of the odd numbered problems are at the end of each chapter. Almost all of the problems I have assigned are odd numbered. If you decide that you need to do more problems, the even numbered problems after the odd numbered problems are very similar (#12 is similar to #11, etc.).

Chapter 1: This material will be covered thoroughly in lab and will not be covered in lecture. **All of the material listed below will be on the quizzes and exams**. There are many different lab instructors, so the problems I have listed below cover all the material I will expect you to know.

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

2. You will be expected to memorize the metric prefixes kilo (k), deci (d), centi (c), milli (m), and micro (μ); and to use them to do metric conversions. However, you don't have to memorize metric to American unit conversions (such as: 1 inch = 2.54 cm). These will be given to you on the exams and quizzes.

3. Make sure you know how to do unit conversions. You should also be able to to use density and specific gravity to convert between mL and g. Think of density as a conversion factor between mL and g. Remember that specific gravity is the same thing as density, except that the units are not included with the number. For example: the density of mercury is 13.6 g/mL. The specific gravity of mercury is 13.6.

Reading Assignment: Sections 1.1 (metric system), 1.4 (prefixes and metric conversions), 1.5 (Conversion Factors), 1.6 (problem solving), 1.7 (Density and specific gravity).

Problems: 1, 3, 5, 23, 25, 27a-d, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 59, 61, 63, 67(be careful with units!), 69.

Chapter 3: We will cover all of this chapter **except** for the sections on Atomic Size and Ionization Energy (page 99-101). Here are specific details.

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, Zn, Br, Ag, Au, I, Hg, Pb, U. Many of these elements are in the health note on page 79.

2. Know what a group and a period are on the periodic table. We will be using the "A" and "B" type of group classifications. The only group names I will expect you to know are 7A (Halogens) and 8A (Noble gases). You should also be able to classify an element as a metal or a 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 percentages of each isotope.

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 except for the sections on Atomic Size and Ionization Energy (page 99-101).

Problems: 7abcdeg, 9abcdeg, 11, 13a, 15 (classify only as metal, nonmetal, halogen, or noble gas), 17ab, 19abcdefh, 21, 23, 25, 29, 31bcdfgh, 33, 35, 37, 39, 41, 43, 45abce, 47acdef, 49, 51, 53, 55abcd, 57, 59, 61, 75ab, 77ab, 79abde, 85, 89, 91, 93abc, 97ae.

Additional problems:

1. If chlorine exists as 25% ^{37}Cl and 75% ^{35}Cl, show that the average atomic mass shown on the periodic table 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 that would be on the periodic table for this imaginary element? (answer is 98.7 amu)

Chapter 4: We will cover all of this chapter. Here are the details.

1. Understand the octet rule, valence electrons, electron dot structure (more correctly called the Lewis dot structure), and the charges of the ions for the elements in the "A" groups. You should also know the valence electrons, electron dot structures, and the electron shell arrangements of these "A" group ions.

2. Know the formulae, names, and charges of these polyatomic ions. 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: 1, 3, 5, 7, 9bce, 11, 13abc, 15, 17, 19abcd, 21bcd, 23, 25a-e, 27abc, 29, 31, 33, 35bce, 39, 41, 43, 45acd, 47, 49, 53, 55, 57, 65, 69, 71, 73, 75a-e, 77, 79, 81, 85, 87.

Chapter 2: We will cover most of this chapter. You will not be asked to do conversions between ˚C and ˚F. So you do not have to read most of the material in section 2.3 – Temperature Conversions. All of our calculations will be in calories, kilocalories – not in joules or kilojoules. Here are the details.

1. Understand the difference between potential and kinetic energy.

2. 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.

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

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

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 the pages on converting between ˚C and ˚F in section 2.3 – Temperature Conversions (page 48 – top half of 50). Also read a section from Chapter 5. Read section 5.9 – Energy in Chemical Reactions (page 183-186).

Problems (All from Chapter 2): 3, 5a, 7, 9, 17, 19, 21 (Cal only), 23, 25, 31, 33, 35 (units!), 37, 39, 41, 43, 45, 47, 57, 59.

Problems (All from Chapter 5): 59bcd, 61, 63, 65, 67.

Chapter 6: We will only be covering about half of this chapter. We will cover sections 6.1, 6.2, 6.4, 6.5, and 6.8. These sections will cover the following and you will be expected to do these things.

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

2. Know the different units for gas pressure, and know that **all gas law calculations use K as the temperature units.**

3. Be able to predict what will happen to the pressure or the 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 notes at the end of the chapter)

Reading Assignment: Sections 6.1, 6.2, 6.4, 6.5, and 6.8. Also make sure you read and understand 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, 47, 49, 51, 53, 57, 59, 61, 63 (units!), 65, 67.

Chapter 7: We will cover almost all of this chapter. We will not cover the section on mass/mass % (% m/m). You will not have to memorize the concentrations that are isotonic with respect to our blood. However, we will be covering Osmolarity (which is not in this chapter. I will give you a handout with problems on this material. I will cover it thoroughly in lecture). Here are the details.

1. Understand the terms: solute, solvent, and solution. Know the rules of solubility and the terms "saturated" and "unsaturated".

2. Know the difference between strong electrolytes, weak electrolytes, and non-electrolytes. You should also be able to write the equations for when these types of compounds 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. Understand and be able to do calculations of equivalents (eq) and osmolarity (osmol).

5. Know the differences between solutions, colloids, and suspensions. You should also understand the principles of osmosis and dialysis. You should know the terms: isotonic, hypertonic, hypotonic, crenation, and hemolysis. As noted above, you will not have to memorize the concentrations which are isotonic with respect to our blood.

Reading Assignment: All sections, with the following exceptions. Skip the section on mass/mass percent (% m/m – page 239-240). Also skip the table describing the different types of colloids – table 7.10, page 253. You

Problems: 1, 3, 5, 7, 9, 11, 13, 15, 19, 21, 23, 27, 33, 35, 37, 39, 41 (units!), 43, 45, 47, 49, 53, 55, 61, 63, 65, 67, 69, 71, 73, 77, 79, 81, 85 (units!), 89, 91, 99.

Chapter 5: We will cover all of chapter 5 except for section 5.3 – Types of Reactions (page 158-top half of 162), and section 5.9 – Energy in Chemical Reactions (page 183-186). The only types of reactions you should be able to recognize are oxidations and reductions. Here are the specific details about what you should know after chapter 5.

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

2. Balance a chemical reaction and recognize oxidations and reductions.

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

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

Reading Assignment: All sections except for section 5.3 – Types of Reactions (page 158-top half of 162), and section 5.9 – Energy in Chemical Reactions (page 183-186).

Problems: 1bcdef, 3, 5, 7, 13, 15, 17, 19, 21, 23, 27ab, 29, 31, 33, 35, 37, 39, 41, 43 (mole relationships only), 45, 47, 49, 51, 53, 55, 57, 71, 75, 77, 79, 81, 83.

Chapter 8: We will cover all of this chapter with the exception of acid/base titration (bottom of page 287-289). One note about conventions. Your book usually writes a free hydrogen ion in water as H_3O^+. To save time in lecture (and to hopefully be more clear), I will usually just write it as H^+ or $H^+_{(aq)}$. Here are the details.

1. Know and understand the terms: acid, base, buffer, conjugate base, and conjugate acid.

2. Know the difference between a strong acid and a weak acid. Assume all acids are weak acids unless they are one of the strong acids listed in table 8.3. The only acids whose names and formulae you will be expected to know are: HCl, HBr, HNO_3, H_2SO_4, H_2CO_3, and 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 balanced equations for acid/base neutralization reactions.

5. Know the relationship between hypoventilation and respiratory acidosis; and the relationship between hyperventilation and respiratory alkalosis.

Reading Assignment: All sections **except** for the material on acid/base tiration (bottom of page 287-289)!!

Problems: 1, 3, 5acde, 7, 9abcd, 11, 13, 15a, 16b, 17a, 21, 23 (hint: focus on the power of 10), 25ab, 26ac, 27a, 28a, 29, 31, 33ac, 35 (1^{st}, 2^{nd}, and 4^{th} rows of the table), 37acd, 39, 41, 47, 53, 59, 61, 69.

Chapter 10: We will cover all of this chapter. When drawing structures, be sure to get familiar with the "stick" or "line" figures I use in class (your book calls this method: "geometric figures" and only uses this convention for cyclic compounds). It is much easier and faster to use this method. 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 cannot draw half the molecule with condensed and the other half with "stick" figures. In addition, if you draw structures with the expanded or condensed method, you must show all hydrogens. If you have an incorrect number of hydrogens on any carbon, points will be deducted each time you make an error.

When drawing stick figures, you only have to show the hydrogens on the functional groups. So it is not only easier, but it also makes sense – pointwise – to use the stick figures! Here are the details on what you should be able to do after completing this chapter.

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

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

3. Know the number of bonds carbon typically makes in an organic compound (**4!**), and use this to determine the number of hydrogens attached to a carbon when stick figures are used to draw the molecule.

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

5. You should know what a functional group is, but you **DO NOT** need to know the 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, 35, 37, 39, 41, 43*, 45*, 47.

Chapter 11: We will cover all of this chapter **except** for the reaction of water with alkenes (the hydration reaction, page 371). Again, when drawing structures, be sure to get familiar with the "stick" or "line" figures I use in class. When asked to draw structures on homework problems, I suggest using the "stick" figures. I have indicated these problems with an asterisk (*). Here are the details on what you should be able to do after completing this chapter.

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 the structures if given a name or to provide the name if you are given the structure for all of the functional groups listed above.

3. Understand the hydrogenation reaction of alkenes and alkynes. Be able to provide the structures of either 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 of the polymer if I have given you the structure of the monomer.

Reading Assignment: All sections except for page 371 (hydration reaction of water with an alkene).

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

Chapter 12: We will cover all of this chapter **except** for the following parts.

1. Skip "Dehydration of Alcohols" (page 395)

2. No common names for ketones or aldehydes.

When asked to draw structures on homework problems, I suggest using the "stick" figures. I have indicated these problems with an asterisk (*). Here are the details on what you should be able to do after completing 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 only 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 of the products or starting materials of oxidation reactions of alcohols, thiols, and aldehydes. Also be able to do the same thing 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.

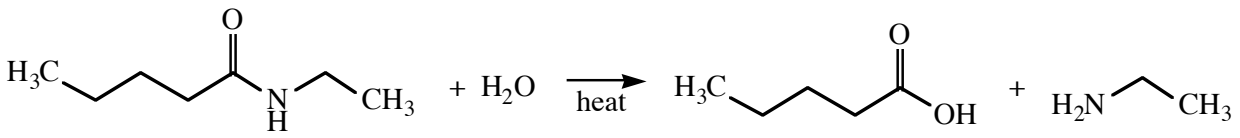
6. Understand the Fischer projection method of drawing molecules.

Reading Assignment: All sections **except** for "Dehydration of alcohols" (page 395).

Problems: 1, 3*, 5, 7, 9, 11*, 13, 15, 19, 21, 23c, 25, 27*, 29, 31, 33*, 35, 37, 41, 43, 45, 47abcef, 53bce, 55, 59acde, 61aef, 63, 65, 67, 71.

Chapter 13: We will cover all of this chapter **except** for the following parts.

1. No basic hydrolysis of esters (bottom of page 438-439)
2. We will be naming amines only by the common names.
3. No ionization of amines in water (middle of page 445)
4. No memorization of any of the alkaloid structures.
5. Do not worry about the difference between the acidic or basic hydrolysis of amides (page 452). 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 and properties of carboxylic acids, esters, amides, and amines.

2. Show the products or starting materials for 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.

Reading Assignment: All sections **except** for the basic hydrolysis of esters (bottom of page 438-439), and the ionization of amines in water (middle of page 445).

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

Chapter 16: We will cover all the concepts in this chapter, but there are quite a few specific details that you will not have to memorize. Here are the specifics.

1. No memorization of the different classes of proteins that are classified by function in Table 16.1 on the top of page 534.

2. No memorization of the structures of the 20 different amino acids.

3. No memorization of the classes of enzymes listed in table 16.8 (page 552).

4. There is no need to worry about the difference between the "lock and key" and the "induced fit" method of enzyme substrate formation. They are just different degrees of the same general enzyme-substrate formation.

5. No memorization of the metal ions that are cofactors for enzymes (table 16.12, page 562).

6. No memorization of the specific information about water soluble vitamins that are coenzymes, nor the function of the fat soluble vitamins. All of this information is in table 16.13 on page 563.

Here is what I will expect you to be able to do after completing this chapter:

1. Classify a given amino acid as acidic, basic, polar, or non-polar if I give you the structure.

2. Show the products or starting materials for the hydrolysis and condensation reactions for amino acids and peptides.

3. Know the principles of primary, secondary, tertiary, and quatenary protein structure. Also know the types of 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, enzyme-substrate formation, etc.)

6. Know the difference between competitive and non-competitive enzyme inhibition.

7. Know what a cofactor or coenzyme is.

Reading Assignment: All sections**!**

Problems: Note: 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. Here are the problems. 3, 7, 13, 15, 17, 19, 21, 23, 25, 26, 27, 29, 30, 31a, 32, 35, 37ab, 41, 49, 53, 57, 63, 65, 67, 77, 85b, 89 (type of crosslink only).

Chapter 14: We will cover all of this chapter. Here are the details on 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 the monosaccharides 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 (pyranose) structure (α or β) of the monosaccharides if you are give 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 differences and similarities between amylose, amylopectin, and glycogen.

4. Be able to classify the glycoside bonds and be able to draw the structures of the di- or polysaccharides if you are told the nature of the glycoside bonds.

5. Know what a reducing sugar is.

Reading Assignment: All sections!

Problems: 1, 3, 5, 7, 9, 10, 13, 15, 17, 19, 21bc, 23, 25, 27, 29, 31 (structure only), 33, 35, 39, 41, 45, 47, 55.

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

1. Skip the section on saponification (bottom of page 511), but review the section on the action of soaps from chapter 13 (page 440)

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 after completing this chapter:

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 or starting materials for reactions of triacylglycerols.

3. Know the differences in structures and properties of saturated and unsaturated fatty acids and triacylglycerols. Also know the products or starting materials of hydrogenation reactions of the triacylglycerols.

4. Know the role of phospholipids in forming cell wall membranes.

Reading Assignment: All sections **except** for saponification (bottom of page 511).

Problems: 1, 3, 5, 9, 11, 13, 19, 21, 25, 27, 29, 31a, 35, 37, 43, 55, 57, 65.