Homework Problems for

General, Organic, and Biochemistry (4th Preliminary Edition)

One of the strengths of this textbook is that it has MANY problems for you to do. I am assigning all of the problems that cover material I will expect you to know on the exams and quizzes. I will not be collecting these homework problems, but in order to learn the material well (and do well on the exams and quizzes) you will need to DO these homework problems (at least once, probably two or three times).

HUGE WARNING HERE!!!! The most common mistake students make in this class is in reading the textbook. **DO NOT JUST READ** the textbook. You **WILL NOT** learn the material properly if you **ONLY** read the textbook. The **ONLY** way to learn the material well is to **DO PROBLEMS.** This is so fundamental and so true and so important that I'm going to put it all here again, changed only slightly so it is a mantra for you to repeat over and over.

DO NOT JUST READ the textbook. I **WILL NOT** learn the material properly if I **ONLY** read the textbook. The **ONLY** way I will learn the material well is if I **DO PROBLEMS.**

OK, I got that out of my system. Sorry about that, but trust me, it's important!!

Now, about the problems....There are two types of problems I have assigned.

1) Section problems: These occur in the text of the chapter. The answers to all of these problems are at: www.ccsf.edu/chemistry/armstrong/chem_32/ There is also a link to this URL at my homepage for chemistry 32 lecture: http://fog.ccsf.cc.ca.us/pherrman/32lecture.htm

2) Cumulative problems: These are located at the end of the chapter. The URL listed above only has answers to the odd numbered problems, so I have only assigned the odd numbered problems.

The textbook also has many **sample problems** which take you through the solution step by step. These can be quite helpful.

I have assigned **lots** of problems. Some of them may seem repetitive to you, but you should do as many of them as many times as it takes to feel comfortable with taking the quizzes and exams. If you do this, you should do quite well in the class. I will not be throwing you any curve balls on the exams.

Chapter 1: This material will be covered thoroughly in lab and will not be covered in lecture. This material will definitely be on the quizzes and exams.

1. You should know the meaning of and the base units in the metric system for: mass ("**g**" for gram), volume ("**L**" for Liter), and distance ("**m**" for meter).

2. You will be expected to memorize the metric prefixes kilo (**k**), deci (**d**), centi (**c**), milli (**m**),

and micro (**μ**). You should also be able 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.

4. Recognize the different units commonly used for temperature: Fahrenheit (˚**F**), Celsius (˚**C**), and Kelvin (**K**). Any formulae you need to convert between these units will be given to you on the exam or quiz.

Reading Assignment: Read all of chapter 1. Also read section B.1 in Appendix B and do section problems B.1 and B2.

Section Problems: 6, 7, 8, 9, 12 – 17, 19 – 22, 24 – 29.

Cumulative Problems: 31, 37, 39, 41, 43, 49, 51, 57, 59, 61, 63, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 105.

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, He, C, N, O, F, Na, Mg, Al, Si, P, S, Cl, K, Ca, Fe, Cu, Ag, Au, Br, I, Hg, Pb, U.

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, whether the element is neutral or is an ion (has a positve or negative charge).

4. Know the terms: atomic number and mass number.

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

6. Determine the electron shell arrangement of the first 18 elements, know which electrons are valence electrons, and understand the relationship between the "A" groups and the number of valence electrons.

7. Be able to draw the Lewis Structure for an element.

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

Reading Assignment: The whole chapter, except for section 2.1 You should only read page 2-7 in section 2.1!

Section Problems: 7a-e, 8, 9, 10, 11, 13 – 25, 27a, 28 – 32.

Cumulative Problems: 39, 41, 43, 45, 49, 51, 53, 55, 57, 59, 61, 65, 67, 69, 75, 77, 79, 81, 85.

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 3. You will be expected to know or be able to do all of the following:

1. Understand the octet rule, know the valence electrons, and predict the number of bonds an element will make in a covalent compound.

2. Draw Lewis Structures for simple covalent compounds. I will always indicate the central bonding atom (the atom to which all of the other elements are connected) if I require you to draw a Lewis Structure.

3. Know the term "electronegativity" and use this to predict whether or not a covalent bond is polar. If a covalent bond is polar, you should know the direction of the polarity of this bond (understand the meaning of the symbols "δ-" and δ+).

4. Use the octet rule to predict the charges of the ions made by elements in the "A" groups of the periodic table.

5. 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}.

6. Know the names of simple covalent and ionic compounds if I give you the formula, and determine the formula of a compound if I give you the name. You should also be able to establish if a compound is ionic or covalent by looking at the chemical formula.

Reading Assignment: All sections!

Section Problems: 1, 2, 3, 4, 5ab, 7, 8bc, 9 – 23, 24abc, 25, 26, 27, 29, 30.

Cumulative Problems: 31, 33, 35, 37abcde (C is the central bonding atom in d and e), 39, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77abcdefh, 79, 81, 83, 85, 87.

Chapter 4. We will cover most of this chapter, but I will not expect you to know the difference between kinetic and potential energy. In addition, 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. Know the difference between thermal energy and temperature.

2. Know how to use specific heat, heat of fusion, and heat of vaporization in energy calculations. Be able to understand the heating curve for a typical substance.

3. You should know the general differences between solids, liquids, and gases. However I **will not** expect you to know the general densities of solids, liquids, and gases.

4. Understand and apply the principles of the kinetic molecular theory, particularly in relation to gas law properties.

5. Know the different units used for gas pressure and be able to predict what will happen to the pressure and volume when the temperature changes.

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

7. Describe the attractive forces between molecules or ions; and relate the strengths of these forces to the relative boiling points of compounds when asked to compare them. You should also know the relationship between boiling point and atmospheric pressure.

Reading Assignment: All of chapter 4. In addition, read sections B.2, B.3, and B.4 in appendix B. Remember that when using gas laws, all temperatures must be in Kelvin (K)! We will not be using the combined gas law (in section B.3, but it is useful to read before reading section B.4).

Section Problems: 1, 3, 4, 5, 7, 10, 11, 12, 15, 17, 19, 22, 23, 25, 26, 27, 28

Cumulative Problems: 31abc, 35, 37, 39, 41, 43, 45, 53, 57, 59, 63, 65 (watch units!), 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89.

Also do problems B.4, B.5, B.7, B.8 in Appendix B. Here are the answers to these problems:

B.4: a) Boyles Law, which relates changes in P and V if T is constant, b) the volume at the bottom of the pool is 3.1 L.

B.5: a) Charles Law, which relates changes in V and T if P is constant (Your book switches the names of Charles Law and Gay-Lussac's Law), b) the temperature of the oxygen is 255 K, or –18 ˚C. Remember that temperatures must be in K when doing gas law problems.

Chapter 5: We will cover all of this chapter. 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 relationship between the structure of covalent molecules and their solubility in water. Know the terms "saturated" and "unsaturated". Understand the effects of temperature on the solubility of both solids and gases in water.

2. Know the difference between electrolytes and non-electrolytes; and be able to write the equations for when they dissolve in water. Understand dissociation and solvation.

3. Be able to convert between moles and grams. Know the terms molar mass (units are g/mole) and formula weight (units are amu).

4. Be able to do calculations and dilutions with molarity (M), weight/volume percent (% w/v), volume/volume percent (% v/v), parts per million (ppm), and parts per billion (ppb).

5. Be able to do dilution problems, and know the term Equivalents (Eq).

6. Understand the principles of diffusion, osmosis, and dialysis. Be able to calculate the total molarity of solute particles of ionic compounds in water (osmolarity). You should know the terms "osmotic pressure, isotonic, hypertonic, hypotonic, crenation, and hemolysis". **However, I will not expect you to memorize which concentrations are isotonic with respect to our blood.**

Reading Assignment: All sections!

Section Problems: 3, 5 – 19, 20abcd, 21 – 34, 35 – 38 (watch units in these problems), 39, 40, 41 (lactose does not dissociate), 42 – 56.

Cumulative Problems: 57, 59, 65, 67, 71, 73, 75, 77, 79, 85bcd (HCl is a gas between 0-60 ˚C), 87, 89, 93abde, 95, 97, 99*, 101, 103, 109, 111ac, 115, 117, 119, 121, 123, 125, 129, 131, 133*, 135*, 137, 141, 143, 145, 149, 151, 153, 155, 157, 159, 161, 163, 165abd, 167*, 169d, 173, 175, 177*, 179, 181, 183, 185.

Chapter 6: We will cover all of this chapter except precipitation reactions (bottom of page 6-29 to page 6-33). Here is what I will expect you to know and to be able to do.

1. Balance a chemical reaction and do mass and mole relationships based on the coefficients in a balanced chemical reaction.

2. Know the following terms about energy and how they relate to an energy diagram for a chemical reaction: exothermic reaction, endothermic reaction, activation energy (and how this relates to the rate of a reaction). Also know how a catalyst can affect the activation energy.

3. The difference between food Calories (Cal) and normal calories (cal). 1 Cal = 1000 cal You **do not** need to know the caloric content of fats, carbohydrates, or proteins. This will be given to you on the exam or quiz.

4. The products in a typical combustion reaction (and be able to balance a combustion reaction).

5. LeChatelier's principle and chemical equilibrium.

Reading Assignment: All sections except for Precipitation Reactions (bottom of page 6-29 to page 6-33)

Section Problems: 1,2, 5, 6, 7, 8, 11 – 21, 28, 29, 33, 34.

Cumulative Problems: 37, 45abd, 47, 49, 51, 53ab, 55b, 61, 63, 65, 69, 71ab, 73, 75, 77, 83, 85, 87, 89, 91, 99, 101, 103, 105, 109bd, 113, 115, 117, 119, 123, 125.

Chapter 7: We will cover all of this chapter. We will be showing acidity and acid base reactions in a slightly different manner than the textbook. Here are the key differences between what we will do in class and what is shown in the textbook.

1) We will only do pH calculations with H^+ and OH^- concentrations with even powers of 10 (the pH values will be integers only).

2) We will only do the molecular versions of acid/base reactions.

3) We will not cover pKa or use pKa values.

4) We will not use H_2O in our ionization reactions. I will show such a reaction this way:

$$HCl \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$$

Your textbook shows it this way: $HCl + H_2O \rightarrow H_3O^+ + Cl^-_{(aq)}$

Here are the details of what I will expect you to be able to do:

1. Know the definition of an acid and a base and be able to recognize one when you see it. Know the difference between a strong acid and a weak acid.

2. Understand pH and the pH scale.

3. Know the terms conjugate acid and conjugate base. Be able to complete and balance acid/base reactions using the molecular versions of these equations.

4. Know what a buffer is, what its function is, and what compounds make up a buffer solution.

Reading Assignment: Read all sections.

Section Problems: 5, 6, 7, 8, 9, 10ab, 13 – 17, 19 – 22, 24 – 27, 29, 30, 32 – 36, 38, 42 – 46.

Cumulative Problems: 49, 51, 67, 69, 75, 77, 79, 85, 91, 93, 97, 99, 101, 103, 105, 107, 111, 113, 115bc, 119, 121, 123, 125, 129, 131, 133, 135, 141, 147, 149, 151, 153.

Additional Problems: Complete and **balance** (using coefficients) the following neutralization reactions. Assume that all of the acidic hydrogens react in each reaction.

a) $HBr + KOH \rightarrow$ _____ + _____

b) $H_2SO_4 + NaOH \rightarrow$ _____ + _____

c) $H_3PO_4 + NaOH \rightarrow$ _____ + _____

d) $H_2SO_4 + NaHCO_3 \rightarrow$ _____ + _____

e) $HCl + Mg(OH)_2 \rightarrow$ _____ + _____

Answers (added coefficients in bold):

a) $HBr + KOH \rightarrow H_2O + KBr$

b) $H_2SO_4 + \mathbf{2}\ NaOH \rightarrow \mathbf{2}\ H_2O + Na_2SO_4$

c) $H_3PO_4 + \mathbf{3}\ NaOH \rightarrow \mathbf{3}\ H_2O + Na_3PO_4$

d) $H_2SO_4 + \mathbf{2}\ NaHCO_3 \rightarrow \mathbf{2}\ H_2CO_3 + Na_2SO_4$ Then: $\mathbf{2}\ H_2CO_3 \rightarrow \mathbf{2}\ H_2O + \mathbf{2}\ CO_2$

e) $\mathbf{2}\ HCl + Mg(OH)_2 \rightarrow \mathbf{2}\ H_2O + MgCl_2$

Chapter 8: We will cover all of this chapter. Here is what I will expect you to know and to be able to do.

1. Know and recognize the structural features of alkanes. Be able to name branched structures of alkanes.

2. Know what a functional group is and be able to recognize the functional groups that correspond to alkenes, alkynes, and aromatic compounds (benzene). You should also be able to name these compounds as well.

3. Be familiar with the line drawing format for organic compounds. We will use this format early and often!

4. Remember that carbon makes 4 bonds!! Use this to determine the number of hydrogens in a compound which has been drawn using the "line drawing" format.

5. Understand what isomers are, and the difference between structural and geometric isomers.

6. Remember that chemists love to burn things! Be able to write a balanced combustion reaction for a given organic compound.

Reading Assignment: Read all sections.

Section Problems: 1, 2, 3, 5-40!!, 42, 43, 44.

Cumulative Problems: 47, 49, 51, 53, 55, 57, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 93, 95, 97, 99, 101, 103, 105.

Chapter 9: We will cover all of this chapter. I will also expect you to know how to name alcohols with branches. See the additional problems below for the naming of branched alcohols. However, I will not expect you to know the "Markovnikov Rule" for the selectivity of the hydration reaction of alkenes.

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

1. Be able to draw the hydration products of an alkene to form alcohols. Also be able to draw the dehydration product of an alcohol to form an alkenes.

2. Know the general functions and properties of enzymes.

3. Recognize chiral carbons and chiral compounds.

4. Be able to name alcohols and phenols (including branches).

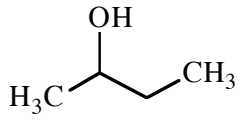
5. Recognize the thiol functional group (but no formal nomenclature).

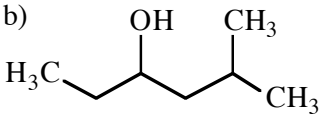
Reading Assignment: Read all sections.

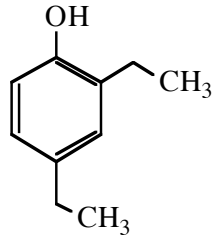
Section Problems: 1, 3, 5-11, 14-21.

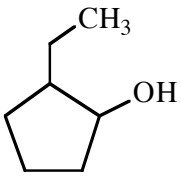
Cumulative Problems: 25, 29, 31, 33, 35abcdf, 39, 41, 43, 45, 47, 49, 51, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77.

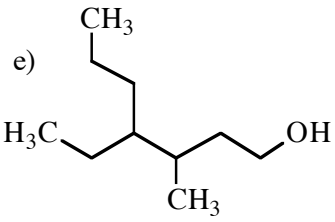
Here are some extra nomenclature problems for branched alcohols and phenols. I have given you a blank line below each structure on which you can write the name.

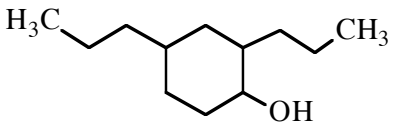
a) 

b) 

c) 

d) 

e) 

f) 

g) What is the structure of 2,6-dimethyl-2-octanol?

ANSWERS

a) 2-butanol

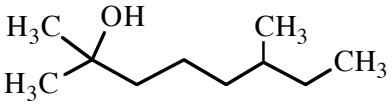
b) 5-methyl-3-hexanol

c) 2,4-diethylphenol

d) 2-ethylcyclopentanol

e) 4-ethyl-3-methyl-1-heptanol

f) 2,4-dipropylcylcohexanol

g) 

Some explanations:

1) For b), remember that the functional group (the OH) gets the lowest number.

2) For c), if the OH is attached to a benzene ring, it is a phenol. The carbon the OH is attached to is always carbon #1.

3) For d) and f), if the OH is on a ring, that carbon is always carbon #1. With rings, you can begin numbering at any carbon, so the functional group will always be #1. Therefore, you don't need to put the "1" in your name. If it's a ring, carbon #1 is always assumed to be the carbon the functional group is attached to.

4) For e), remember that the longest chain does not always go from left to right. The longest chain here starts with the OH carbon, but then goes up at the second branch.

Chapter 10: We will cover all of this chapter except for section 10.7 (introduction to metabolic pathways). I will also expect you to know how to name aldehydes, ketones, and carboxylic acids with branches. See the additional problems below for naming these compounds.

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

1. Understand hydrogenation and dehydrogenation reactions. Be able to draw the missing products or starting materials of these reactions.

2. Understand oxidation and reduction reactions that convert alcohols to carbonyls (and *vice versa*), and the oxidation and reduction reactions that convert thiols to disulfides (and *vice versa*). Be able to draw the missing products or starting materials of these reactions.

3. Know how to name branched aldehydes, ketones, and carboxylic acids. See the problems below. Also know the structures for these compounds (normally named with these common names): formic acid, formaldehyde, acetic acid, acetone, and benzoic acid.

4. Be able to classify alcohols as primary (1°), secondary (2°), or tertiary (3°).

5. Understand the relative boiling points and water solubility of alcohols, aldehydes, ketones, and carboxylic acids.

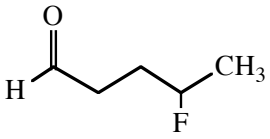
6. You do not need to know the structures of the redox coenzymes (NAD^+, FAD, and NADPH), but you should know their roles in biological redox reactions as shown in the table on page 10-35.

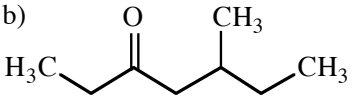
Reading Assignment: Read all sections except for section 10.7 (introduction to metabolic pathways).

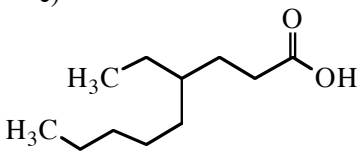
Section Problems: 1-8, 9b, 10-21.

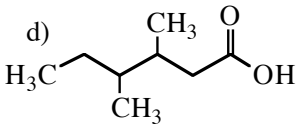
Cumulative Problems: 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75.

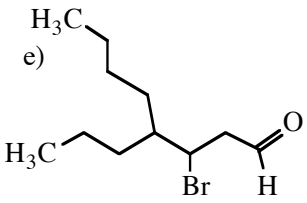
Here are some extra nomenclature problems.

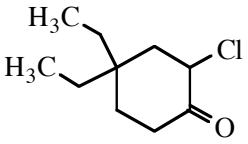
a) 

b) 

c) 

d) 

e) 

f) 

g) What is the structure of 2,6-dimethyl benzoic acid?

ANSWERS

a) 4-fluoropentanal

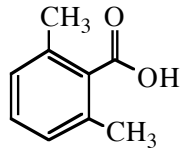
b) 5-methyl-3-heptanone

c) 4-ethylnonanoic acid

d) 3,4-dimethylhexanoic acid

e) 3-bromo-4-propyloctanal

f) 2-chloro-4,4--diethyl-cyclohexanone

g) 

Some explanations:

1) Halogens are treated exactly as branches. The ending is changed from "ine" to "o". For acids and aldehydes in chains, the functional group is always on C#1, so no number for the functional group is needed in the name.

2) For b), remember that the functional group (the C=O) gets the lowest number.

3) For c) and e), be careful when finding the longest chain. The longest chain does not always go from left to right.

3) For f): Normally you need a number to indicate where the C=O is for a ketone, but since the ketone is in a ring,, that carbon is always carbon #1, so you don't need to put the "1" in your name. Then you number to give the branches the lowest possible number.

4) For g): In benzoic acid, carbon #1 is the carbon to which the acid functional group is attached.

Chapter 11: We will cover all of this chapter except for section 11.2 (Decarboxylation reactions). You should know the structures of phenols and thiols, but we **will not** cover acid/base reactions of phenols and thiols. You **will not** be expected to classify amines as phenyl ethyl amines or tryptamines.

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

1. Write the products of the acid/base reaction of a carboxylic acid with a base such as hydroxide ion or an organic base such as an amine. Also know how to name the conjugate base of a carboxylic acid.

2. Name amines using the common (or traditional) method, classify amines as 1°, 2°, or 3°, and understand the physical properties and the reactions of amines with acids. You should also know the structure of aniline.

3. Know the structures of carboxylic acids and amines at physiological pH of your blood (typically close to pH 7.3). Know the zwitterion structure of amino acids. You **will not** be expected to know the structures of organic phosphates at this pH, however.

Reading Assignment: Read all sections except for section 11.2 (Decarboxylation reactions).

Section Problems: 1b, 2, 3, 5, 10, 11, 13-23, 25, 26.

Cumulative Problems: 29, 31b, 33, 35, 37, 39, 41, 43, 55, 57, 59, 61, 63, 65, 67, 69, 71bc, 73, 75, 77, 79, 81, 85a, 87, 89b, 91, 93, 95, 97, 103, 105 (reactions 1, 2, 3 only), 109, 111, 113, 115, 117.

Chapter 12: We will cover all of this chapter, except that we will not cover any reactions of thioesters. However, we will do the nomenclature of esters, which is not covered in this chapter. I have included a few nomenclature problems of esters below.

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

1. Write the products of these condensation reactions: a) the condensation of two alcohols to form an ether, b) the condensation of a carboxylic acid and an alcohol to form an ester, c) the condensation of a carboxylic acid and an amine to form an amide, and d) the condensation of an a phosphate and an alcohol to form a phosphoester. Reactions b), c), and d) are all **VERY** similar.

2. Name ethers using the common (or traditional) method, and name esters by the IUPAC method. Also understand how condensation polymers are formed and the structure of soap.

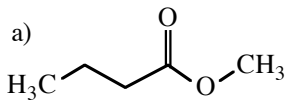
3. Know the hydrolysis reactions that are the reverse of all four reactions in **#1** above. We will do the neutral hydrolysis reactions for all of them and the basic hydrolysis of esters. You should know the structures of the products under these conditions.

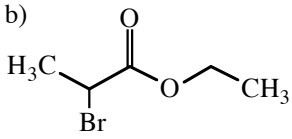
Reading Assignment: Read all sections.

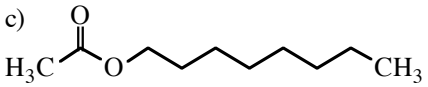
Section Problems: 1-14, 16-20.

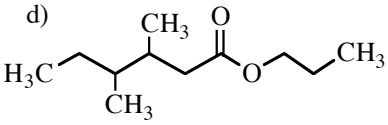
Cumulative Problems: 21, 23, 25, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 67, 69, 71, 75, 77, 79, 81, 87, 89, 91, 93.

ADDITIONAL PROBLEMS ON NOMENCLATURE OF ESTERS

a) 

b) 

c) 

d) 

e) What is the structure of butyl benzoate?

f) What is the structure of methyl-3-fluorooctanoate?

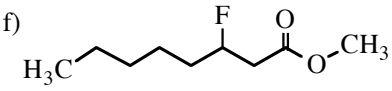
ANSWERS

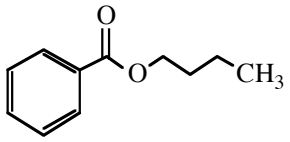
a) methyl butanoate

b) ethyl-2-bromopropanoate

c) octyl acetate or octyl ethanoate

d) propyl-3,4-dimethylhexanoate

f) 

e) 

Some explanations:

1) Esters are named exactly as the conjugate base of the carboxylic acids - the "ic acid" is turned into "ate". The only difference is that there is an alkyl branch connected to the neutral "O", while with the conjugate base, there is a positive ion next to the negative charge on the O.

2) Remember that C#1 is always the C=O carbon of the ester. Then remember that the first thing written is always the alkyl branch connected to the O.

3) For c), the corresponding acid can be called either "acetic acid" (common name), or ethanoic acid (IUPAC name). Hence, the ester can be either octyl acetate (common name) or octyl ethanoate (IUPAC name).

4) For e), the name of the corresponding acid is benzoic acid, so the ester is benzoate. The "butyl" tells us that there is a 4 carbon branch attached to the "O" of the ester.

Chapter 13: We will cover all of this chapter, except that we will not cover anything about nitrogen fixation or the nitrogen cycle (page 52-53). We will cover all the other 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 structures of the 20 different amino acids.

2. No memorization of the metal ions that are cofactors for enzymes, and no memorization of the vitamins that are coenzymes..

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. Also know the difference between essential and non-essential amino acids (but no memorization of which amino acids are considered essential and which are non-essential).

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, except the one and half pages on the nitrogen cycle and nitrogen fixation (52-53).

Section Problems: 1-10, 12-20, 22-30, 32-36, 38-43, 45, 46, 49.

Cumulative Problems: 57, 59, 61, 63, 65, 67, 69, 71, 75, 79, 81, 83, 85, 87, 89, 91, 95, 97, 99, 103, 109, 111, 113, 115, 117, 119, 123, 125, 139.

Chapter 14: We will cover all of this chapter, except that we will not cover the following subjects.

1. We will not cover anything about active vs. passive transport across cell membranes.
2. We will not cover the omega naming system for fatty acids.
3. We will not cover anything in section 14.9 (sources of carbohydrates and fats).

We will cover all the other concepts in this chapter, and we will cover the **following material that is not** in the book.

1. We will cover classification of the straight chain monosaccharides. I have given you a handout with the structures of all the aldoses. You should be able to classify any monosaccharide as an aldose or ketose, and as a triose, tetrose, pentose, or hexose. You should also be able to classify a monosaccharide as a D or an L sugar.

2. We will cover how to draw the closed ring (pyranose or furanose) structure of fructose and the aldohexoses.

3. You will be expected to memorize the structures of glucose and fructose.

Here are the rest of the topics we will cover that **are covered in the book** and that I will expect you to be able to do after completing this chapter:

1. Recognize the anomeric carbon in the closed ring structures of monosaccharides and classify it as an alpha or beta isomer. You should also be able to classify the glycosidic linkages of a di- or polysaccharide.

2. Know the structures of the disaccharides maltose and cellubiose. In addition, know the similarities and differences in the structures of the following polymers of glucose: amylose, amylopectin, glycogen, and cellulose.

3. Know what a reducing sugar is and how to recognize it from the structure.

4. Know the term lipid and be able to recognize the basic structure of the following lipids: fatty acids, triglycerides, saturated vs. unsaturated fatty acids and triglycerides, steroids, and the structure of oils vs. fats.

5. Understand the physical properties of oils vs. fats, know the reactions that form them from glycerol and fatty acids, and understand how a hydrogenation reaction can convert an oil into a fat.

6. Know the structures of the glycerophospholipids and their role in forming the lipid bilayer of our cell membranes.

Reading Assignment: All sections, except section 14.9.

Section Problems: 2, 4-8, 11-16, 18, 20, 21, 23, 24, 25 (amylose vs. cellulose), 26, 27, 28a, 29, 30, 32, 33, 34, 36, 39-44, 48, 51, 54, 56, 57, 58.

Cumulative Problems: 59, 61, 63, 65, 71, 75, 77, 79, 85, 87, 95, 97, 103, 109, 111, 113, 115, 119, 121, 123, 125, 127, 129 (structure only), 131, 133, 135, 141, 153, 157, 163.