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Lecture: 10:50am – 11:40am MWF, Kalkin Building, Rm 001

Organic Chemistry Study Guide and Solutions Manual 6th ed., Loudon and Parise, Roberts and Co., 2016 (ISBN: 978-1936221868)

Sapling Learning account: account can be purchased as part of book order, or separately

Techniques and Experiments for Organic Chemistry 6th Ed., Ault, "University Science Books, 1998. Purchase or Rent from: University Science Books: <http://www.uscibooks.com/>"

Tgeq o o gpfgf"Eqwtug"O cvgtkenu<"

Molecular Structure Models (e.g.: ISBN: 0471-362719)"

Dqqmu"qp"tgugtug"kp"nkdtct{"vjcv" o c{"dg"wughwn:

Organic Chemistry I as a Second Language: Translating the Basic Concepts 2nd ed., D. Klein; ISBN: (978-0470-12929-6)

Organic Chemistry II as a Second Language: Second Semester Topics 2nd ed., D. Klein; ISBN: (978-0-471-73808-4)

The Art of Writing Reasonable Organic Reaction Mechanisms R.B. Grossman ISBN:0-387-95468-6

Writing Reaction Mechanisms in Organic Chemistry A. Miller ISBN: 0-12-496711-6

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Eqwtug" Rtgtswkukvg< Chem 31/32 or two years of high school chemistry (AP or Honors).

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Monday, Wednesday, Thursday: 1:30 – 2:30
 or by appointment

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1. Students will demonstrate general knowledge in chemistry and will be able to apply chemical and physical principles in the solution of qualitative and quantitative chemical problems.
2. Students will understand the interplay of observational data, hypotheses, and hypothesis-driven experimentation through application of the scientific method.

according to the rules set forth in The University of Vermont's

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Chapter 1. Chemical Bonding and Chemical Structure.

Sections: All sections

Suggested Problems: 1.3-1.6, 1.8, 1.9, 1.12, 1.13, 1.22-1.25, 1.30-1.32, 1.44, 1.48

Chapter 3. Acids and Bases: The curved arrow notation

Sections: 3.1-3.6

Suggested Problems: 3.1-3.15, 3.18, 3.19, 3.24-3.45, 3.54-3.55, 3.58

Chapter 2. Alkanes.

Sections: 2.1-2.5, 2.8

Suggested Problems: 2.1, 2.3-2.18, 2.23, 2.24, 2.26-2.39, 2.47-2.50

Chapter 4. Introduction to Alkenes: Structure and Reactivity

Sections: All sections

Suggested Problems: 4.2-4.10, 4.13, 4.14, 4.16-4.48, 4.50-4.60a, 4.61, 4.62, 4.64-4.67

Chapter 5. Addition Reactions of Alkenes

Sections: All sections

Suggested Problems: 5.1-5.52a, 5.52d-g

Chapter 6. Principles of Stereochemistry

Sections: All sections

Suggested Problems: 1-6, 9, 11, 15, 16, 19-22, 26-31, 34-39, 45-59

Chapter 7. Cyclic Compounds: Stereochemistry of reactions

Sections: All Sections

Suggested Problems: 1, 5-13, 15-22, 25-24, 36-38, 40-51, 53-60, 63-65, 69-71

Chapter 8. Noncovalent Intermolecular Interactions

Sections: 8.1-8.3

Suggested Problems: 1-8, 15, 28, 32

Chapter 9. The Chemistry of Alkyl Halides

Sections: All Sections

Suggested Problems: 1-5, 11-16, 21-25, 44c,d,e,f, 45a-e, 46b,-f, 49, 50a,c, 51-56, 61, 67

Chapter 10. The Chemistry of Alcohols and Thiols

Sections: 10.1-10.7

Suggested Problems: 3-17, 19-21, 23-26, 28, 30-31, 38-40, 45, 47-51, 57, 59, 67, 68

Chapter 11. The Chemistry of Ethers, Epoxides, Glycols, and Sulfides.

Sections 11.1-11.6, 11.8, 11.10, and Chapter 14 Section 14.8

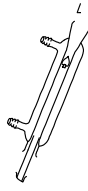
Suggested Problems: 1-28, 32, 38-40a,b,d, 44-45c-j, 46, 48, 50, 51, 53-60, 61a-c,e-k, 62-65, 69, 70, 72, 74, 77, 79, 80

Concepts you must understand from High School / General Chemistry:

- Properties of covalent bonds
- The octet rule
- Structural isomers
- Lewis dot structures
- Formal charges
- Resonance
- Electronegativity and bond polarity
- VSEPR (Valence Shell Electron Pair Repulsion)
- Hybridization

Key's to success in Organic Chemistry:

- Do not try to cram!
- You will see many new concepts in this course. Try to write out an explanation of the concepts in your own words as if explaining them to someone else.
- Work as many practice problems as possible. Practice problem reinforce the new concepts and are the only way to test your understanding of the material.
- Do not look at a problem's answer until you have really tried the problem. After seeing the answer it often seems obvious and you may assume you understand.
- ~~Work as many practice problems as possible.~~



The lab report should contain the following sections:

Prelab: The T.A. will verify that a prelab has been satisfactorily completed before any lab work will begin. If the prelab is not satisfactorily completed it will be assigned a grade of zero for its portion of the overall grade for this lab and **the student will not begin lab work until the prelab is complete to the T.A.'s satisfaction.** At a minimum the prelab must include: the date; a statement about the purpose of the lab; a schematic drawing of the reaction to be done (or a drawing of the important chemical structures to be purified); a table showing the molecular weight, density (for liquids), number of moles, number of grams, and number of mL to be used for each substance used in the lab; *a list of po*

Sept. 25	Handout	Solvent Recycling (Simple distillation)	62-78; 138-149
Oct. 2	Handout	Fractional distillation, GLC	70-72; 122-128
Oct. 16	Handout	Thin layer chromatography	116-119
Oct. 23	Handout and 28.2 (p.242) 29.11 (p. 261) 29.13 (p. 263)	Bromination of an alkene and qualitative organic analysis	239-241 247-248 266-272
Oct. 30	Handout	Extraction of carboxylic acid derivatives from neutral compounds	92-106
Nov. 6	Handout	Caffeine from Vivarin (recrystallization)	48-59; 317-318;
Nov. 13	Handout	Synthesis of 5,10,15,20- tetraphenylporphyrin and Column Chromatography	109-116
Nov. 27	E25 (pg 402-403)	Preparation of an <i>n</i> -alkylbromide	402-403
Dec. 4	E18 (pg 381-384)	Dehydration of methyl-cyclohexanol	381-384

Laboratory Experiment Abstracts:

Introduction, Safety, Check-in, ChemDraw Tutorial. Be sure to check your equipment carefully. Any missing or broken (cracked, chipped or otherwise in less than perfect shape) items should be replaced by the stockroom. Make sure your glassware is clean and dry before you begin your first experiment next week. A demonstration of how to use ChemDraw drawing software will be given.

Melting point and Solventless aldol. The purpose of this lab is to explore the technique of melting point determination and the effect of impurities on melting point. You will achieve this by determining the melting point of three solid samples that will be provided. You will also run a reaction that is an example of an “Aldol condensation reaction”; a reaction in which two molecules are combined into one product with extrusion of water. This particular reaction is unique in that no solvents are used. Solventless reactions are not always possible, but when it is possible to omit solvents it makes the reaction more environmentally friendly (“green”). You will collect the product of this reaction by filtration, dry it, determine the reaction yield and measure its melting point. **Give your sample to the TA for storage for use in the 7th experiment!**

Solvent Recycling: In this experiment you will be given dirty acetone (acetone is a common organic solvent used in many different cleaning applications) that must be purified so that we can use it throughout the rest of the semester as a cleaning agent. In this process you will learn the experimental

setup for simple distillation, which is a technique commonly used for the purification of liquid chemicals. Recycling this solvent through purification by distillation is an effective means of limiting the volume of hazardous waste that has to be disposed.

Fractional distillation, GLC. Fractional distillation is more effective than simple distillation at separating compounds that have similar boiling points. In this lab you will be assigned a mixture of liquids for separation by fractional distillation. Save 1 mL of this mixture for GLC analysis and fractionally distill the remainder using a stainless steel sponge-packed column. Be careful not to cut your hands on the stainless steel wire; it is sharp and very strong and should only be cut with scissors.

Thin layer chromatography (TLC). Here you will identify the components of common analgesics by comparing the retention factor (RF) of the components to the RF of standards. Silica gel TLC plates will be provided to you.

Extraction of carboxylic acid derivatives from neutral compounds. This experiment highlights extraction as an isolation and purification technique. It also emphasizes the concepts of pKa, solubility, and resonance.

Bromination of an alkene and qualitative organic analysis: This experiment highlights an alkene addition reaction. Bromine will be added to either E- or Z-stilbene to give a dibromide product. These stereoisomeric products will be compared by TLC and melting point analysis. In addition, three qualitative chemical tests will be performed to test for the incorporation of bromine in the product.

Caffeine from Vivarin. This lab introduces extraction and recrystallization as purification techniques. You will also recrystallize the product formed in the first experiment, determine the melting point of the purified material, and compare it to the melting point of the impure material.

Synthesis of 5,10,15,20-tetraphenylporphyrin. This experiment introduces column chromatography as a purification technique. In this experiment you will synthesize 5,10,15,20-tetraphenylporphyrin from pyrrole and benzaldehyde. This reaction occurs in the gas phase at high temperature and thus is another example of a green (solventless) reaction. These reaction conditions are also green because they avoid the use of a strong acid promoter, which is typically required to effect this transformation under standard reaction conditions. Can you identify a non-green aspect to his experiment?

Preparation of an

exposure to hazardous (toxic or corrosive) substances. Caution, as well as careful thought and knowledge of the characteristics of what one is working with are necessary to avoid accidents and injuries.

