

## CH1020 Course Outline

Text: “*General, Organic, and Biochemistry*” By I. Blei and G. Odian, W. H. Freeman and Co., New York, 2000.

### I. Review from last semester

- A. Overview of organic chemistry, pp. 286-293.
- B. Alkanes, pp. 293-223.
- C. Unsaturated Hydrocarbons, pp. 329-341.

### II. Reactions of alkenes

- A. Addition reactions of alkenes, pp. 341-349.
  - 1. Addition of symmetric reagents: Hydrogenation and halogenation, pp. 341-343.
  - 2. Addition of unsymmetric reagents: Water and acids, pp. 343-347.
  - 3. Addition polymerization, pp. 346-349.
- B. Oxidation of alkenes, pp. 349-351.
- C. Alkynes, p. 351.
- D. Aromatic compounds
  - 1. Structure and bonding, pp. 352-356.
  - 2. Nomenclature, pp. 354-357.
  - 3. Electrophilic aromatic substitution reactions, pp. 357-359.
  - 4. Aromatic compounds other than benzene, p. 360, 469, and class notes.
- E. Problems. In Chapter: 12.1-12.13. pp. 362-368. 12.1-12.22, 12.25-12.28, 12.31-12.43, 12.45-12.46, 12.48-12.56, 12.61-12.68.

### III. Alcohols, Phenols, Ethers, and their Sulfur Analogs

- A. Alcohols
  - 1. Structure, pp. 369-373
  - 2. Nomenclature of alcohols, pp. 373-375
  - 3. Physical properties, pp. 375-381.
  - 4. Reactions
    - a. Acidity and basicity, p. 381.
    - b. Dehydration to alkenes, pp. 381-384.
    - c. Oxidation, pp. 384-388.
- B. Phenols
  - 1. Structure and nomenclature, pp. 388-391.
- C. Ethers
  - 1. Structure and nomenclature, pp. 391-394.
  - 2. Formation of ethers by dehydration of alcohols, pp. 394-395.
  - 3. Sulfur analogs, pp. 395-396.
- D. Problems. In chapter: 13.1-13.17. pp. 398-402: 13.1-13.8, 13.15-13.18, 13.21-13.24, 13.27-13.28, 31.31-13.41, 13.46-13.50, 13.55-13.63.

### IV. Aldehydes and Ketones

- A. Structure of Aldehydes and Ketones pp. 404-408.
- B. Nomenclature of Aldehydes and Ketones pp. 409-411.
- C. Physical properties of Aldehydes and Ketones pp. 411-414.
- D. Reactions of Aldehydes and Ketones
  - 1. Oxidation, pp. 414-416.
  - 2. Reduction, pp. 416-422.
  - 3. Acetal and Hemiacetal Formation pp. 423-246.
- E. Spectroscopy of Aldehydes and Ketones pp. 417-419, class notes.
- F. Problems. In chapter: 14.1-14.4, 14.6-14.12. pp. 428-432: 14.1-14.12, 14.15-14.55

### V. Carboxylic Acids, Esters and other Derivatives of Carboxylic Acids

- A. Structure of carboxylic acids and their derivatives, pp. 434-436.

- B. Naming carboxylic acids and their derivatives, pp. 437,438, 442,447,448, 452.
- C. Acidity of Carboxylic Acids, pp. 439-442.
  - 1. Salts of Carboxylic Acids, pp. 442-443.
  - 2. Soaps and detergents, pp. 443-445.
- D. Synthesis of Carboxylic Acids, p. 436.
- E. Esters
  - 1. Synthesis from carboxylic acids, pp. 445-446.
  - 2. Polyesters, pp. 449-450.
  - 3. Hydrolysis of esters, pp. 450-452.
- F. Acid chlorides and anhydrides, pp. 452-453.
- G. Phosphoric acids and their derivatives, pp. 453-456.
- H. Problems. In chapter: 15.1-15.5, 15.7-15.14. pp. 458-462. 15.1-15.10, 15.13-15.22, 15.24-15.34, 15.36-15.68.

## VI. Amines and Amides

- A. Structure of Amines and Amides, pp. 464-466, 480-481.
- B. Nomenclature of Amines and Amides, pp. 466-469, 477, 484-485.
- C. Physical properties of amines, pp. 469-472.
- D. Amines as bases, pp. 472-475.
  - 1. Amine salts, pp. 477-480.
- E. Amides
  - 1. Synthesis, pp. 481-483.
  - 2. Polyamides, pp. 483-484.
  - 3. Physical properties and basicity of amides, pp. 485-486.
  - 4. Hydrolysis of amides, pp. 486-488.
- F. Problems. In chapter: 16.1-16.11. pp. 490-494. 16.1-16.10, 16.13-16.22, 16.24-16.38, 16.40-16.65.

## VII. Stereoisomerism

- A. Isomerism in Chemistry, pp. 496-497.
- B. Chiral compounds
  - 1. Recognizing and drawing enantiomers, pp. 497-503.
  - 2. Naming enantiomers, pp. 504-505.
  - 3. Physical properties on enantiomers - optical activity and specific rotation, pp. 506-508.
  - 4. Chemical properties of enantiomers, pp. 508-510.
- C. Compounds with more than one asymmetric center, pp. 510-515.
  - 1. Chiral cyclic compounds, pp. 515-517.
  - 2. Synthetic and natural chiral compounds, pp. 511-512.
- D. Problems. In chapter: 17.1-17.3, 17.5,17.6. pp. 518-522. 17.1-17.22, 17.27-17,43.

## VIII. Carbohydrates

- A. Classification and nomenclature of carbohydrates, pp. 526-531.
- B. Cyclic hemiacetal structures, pp. 531-534.
- C. Reactions of monosaccharides, pp. 534-538.
- D. Disaccharides, pp. 538-543.
- E. Polysaccharides, pp. 544-548.
- F. The biochemistry of carbohydrates, pp. 543, 545-546, 548-552.
- G. Problems. In chapter: 18.1-18.5. pp. 553-555. 18.1-18.73.

## IX. Lipids

- A. Fatty acids and triglycerides, pp. 558-562.
  - 1. Reactions of triglycerides, pp. 562-567.
- B. Phospholipids, pp. 568-571.
- C. Other important lipids

1. Steroids, pp. 570-575.
  2. Eicosanoids, pp. 575-576.
  3. Fat soluble vitamins, pp. 576-577.
- D. Biological membranes
1. Structure, pp. 576-580.
  2. Transport through membranes, pp. 580-582.
- E. Problems. In chapter: 19.1-19.7. pp. 583-586. 19.1-19.91.
- X. Amino acids, peptides and proteins
- A. Overview of protein chemistry. pp. 588-589.
- B.  $\alpha$ -Amino acids
1. Structure and nomenclature, pp. 589-594.
  2. Synthesis of amino acids, class notes.
- C. Peptides
1. The peptide bond, pp. 597 and class notes.
  2. Structure and nomenclature of peptides, pp. 594-597.
  3. Reactions of peptides, pp. 599-600.
- D. Proteins
1. Three-dimensional structure of proteins, pp. 600-612.
  2. Protein denaturation, pp. 614-616.
  3. Examples of the biological role of proteins, pp. 612-616 and class notes.
  4. Problems. In chapter: 20.1-20.4. pp. 617-621. 20.1-20.101.
- XI. Nucleic acids
- A. The structure and nomenclature of nucleotides, pp. 623-625.
1. Nucleic acid formation from nucleotides, pp. 626-628.
- B. The three dimensional structure of DNA, pp. 628-631.
1. Base pairs in DNA, pp. 629-630.
- C. RNA, pp. 631-633.
- D. The mechanism of DNA replication, pp. 633-635.
- E. The role of nucleic acids in protein synthesis
1. Transcription, pp. 636-638.
  2. Translation and the genetic code, pp. 638-642.
- F. Nucleic acid mutations, pp. 643-646.
- G. Viruses, pp. 648-651.
- H. Genetic engineering, pp. 650-655.
- I. Problems. In chapter: 21.1-21.8. pp. 656-659. 21.1-21.108.
- XII. Overview of Metabolism
- A. The structure of cells, pp. 661-663.
- B. The general nature of metabolism, pp. 664-669.
- C. The role of enzymes in biochemical processes, pp. 669-675.
- D. Carbohydrate metabolism, pp. 674,675, 679-691, 704-705.
1. Glycolysis, pp. 679-684.
  2. Acetyl-S-CoA formation, pp. 684-687.
  3. The citric acid cycle, pp. 687-691.
- E. Fatty acid metabolism, pp. 709-714.
- F. Biosynthesis of fatty acids, triglycerides, and lipids, pp. 714-722.
- G. Amino acid metabolism, pp. 726-735.
- H. Problems: pp. 676,677, 22.1-22.40. p. 706, 23.1-23.23, 23.47-23.49. pp. 723-724, 24.1-24.40. p. 738, 25.1-25.27.