

## Organic Chemistry 2

### Undergraduate 3 credit course in Polymer Engineering curriculum

#### Amirkabir University of Technology

**Chapter 1: A review on Organic Chemistry 1** (organic molecules, bonding, reactivity, stereo chemistry, reactions).

**Chapter 2: Alkynes** (nomenclature of alkynes, physical properties, industrial importance, triple bond reactivity, acidity of alkynes, acetylide ions, alkyne reactions, addition reactions, oxidation).

**Chapter 3: Alcohols** (structure and classification, nomenclature, physical properties, phenols, alcohols synthesis, Grignard reagents, thiols, alcohol reactions, oxidation, nucleophile substitution and elimination, reduction, reaction with hydrohalic acids, reaction with phosphorus halides, reaction with thionyl chloride, esterification, diol's reaction, alkoxide reactions).

**Chapter 4: Ethers, epoxides and thioethers** (nomenclature, physical properties, Williamson reaction, ether reactions, ether cleavage, auto-oxidation of ethers, epoxides, epoxide synthesis, acid-catalyzed epoxide ring opening reaction, base-catalyzed epoxide ring opening reactions, Grignard reactions, thioethers).

**Chapter 5: Aromatic compounds** (structure and physical properties, aromatic, anti-aromatic and non-aromatic compounds, Hückel's rule, heterocycle aromatic compounds, multi center aromatic compounds, carbon aromatic allotropes, fused heterocycle compounds, benzene derivatives, aromatic compounds reactions, electrophilic substitution, benzene halogenation, nitration, sulfonation, substituents effect on nitration, benzene active and de-activation, Ortho, Para and Meta-directing, substituent effect on electrophilic reactions, Friedel-Crafts alkylation, Friedel-Crafts Acylation, nucleophilic substitution reactions, addition reaction of benzene derivatives).

**Chapter 6: Ketones and Aldehydes** (nomenclature, physical properties, industrial importance, ketone and aldehyde reactions, synthesis, imine formation, acetal formation, Wittig reaction, oxidation and reduction of aldehydes, reduction of ketones).

**Chapter 7: Amines** (nomenclature, physical properties, basicity of amines and affecting factors, amine reactions, alkylation, acylation, sulfonamide formation, Hoffman elimination, Cope reaction, amine synthesis).

**Chapter 8: Infrared, ultraviolet and mass spectroscopy** (theory, electromagnetic spectrum, IR spectroscopy, infrared regions, molecular vibrations, IR-active and IR-inactive vibrations, reading and interpreting IR spectrum, finger print region, single bonds regions, double bonds regions, triple bonds regions, UV spectroscopy, diene compounds and conjugation, molecular orbitals of allylic systems, colored organic compounds, conjugated systems analysis by UV spectroscopy, mass spectroscopy, molecular formula determination by mass spectroscopy, fragmentation patterns in mass spectroscopy).

**Chapter 9: Nuclear magnetic resonance spectroscopy** (theory, shielding and de-shielding, chemical shifts, number of signals, areas of peaks, spin-spin splitting).

#### References:

1. K. Peter C. Vollhardt, N. Schore, "**Organic Chemistry: Structure and Function**", Macmillan Learning, **2018** (8<sup>th</sup> Ed)
2. L. G. Wade, J. W. Simek, "**Organic Chemistry**", Pearson, **2017** (9<sup>th</sup> Ed)
3. D. R. Klein, "**Organic Chemistry As a Second Language: First Semester Topics**", John Wiley & Sons, **2017** (4<sup>th</sup> Ed)
4. D. R. Klein, "**Organic Chemistry As a Second Language: Second Semester Topics**", John Wiley & Sons, **2016** (4<sup>th</sup> Ed)
5. MIT open courses in Organic Chemistry by Prof. Barbara Imperiali and Dr. Sarah Tabacco