

CHAPTER OVERVIEW

19: KETONES AND ALDEHYDES

LEARNING OBJECTIVES

After reading this chapter and completing ALL the exercises, a student can be able to

- describe the structure and physical properties of aldehydes and ketones (section 19.1)
- determine the structure of aldehydes and ketones from their elemental analysis and spectral data (MS, IR ^1H NMR & ^{13}C NMR) (section 19.2)
- predict the products and specify the reagents to synthesize aldehydes and ketones for reactions studied to date (section 19.3)
- predict the products and specify the reagents to synthesize aldehydes and ketones for new reactions (section 19.4)
- write the general mechanism for nucleophilic addition reactions with aldehydes and ketones (sections 19.5 to 19.11, 19.13, & 19.15)
- predict the relative reactivity of carbonyl compounds to nucleophilic addition reactions (sections 19.5 to 19.13, & 19.15)
- predict the relative equilibrium constant & rates of hydration for aldehydes and ketones (section 19.6)
- show the general mechanism for the Wittig reaction (section 19.13)
- predict the products and specify the reagents for oxidation and reduction reactions of aldehydes and ketones (section 19.14 and 19.15)
- combine the reactions studied to date to develop efficient and effective multiple-step synthesis including the use of acetals/ketals as protecting groups (sect 19.12)

Please note: IUPAC nomenclature and important common names of aldehydes and ketones were explained in Chapter 3.

Topic hierarchy

- 19.1: Carbonyl Compound Structure and Properties
- 19.2: Spectroscopy of Ketones and Aldehydes
- 19.3: Review of Ketone and Aldehyde Synthesis
- 19.4: 19.4 New Synthesis of Aldehydes and Ketones
- 19.5: Nucleophilic Addition Reactions of Ketones and Aldehydes
- 19.6: Nucleophilic Addition of Water (Hydration)
- 19.7: Nucleophilic Addition of Cyanide and Acetylide
- 19.8: Nucleophilic Addition of Grignards
- 19.9: Nucleophilic Addition of Amines (Imine and Enamine Formation)
- 19.10: Nucleophilic Addition of Hydrazine (Wolff-Kishner Reaction)
- 19.11: Nucleophilic Addition of Alcohols (Acetal Formation)
- 19.12: Acetals as Protecting Groups
- 19.13: Nucleophilic Addition of Phosphorus Ylides (The Wittig Reaction)
- 19.14: Oxidation of Aldehydes
- 19.15: Reductions of Ketones and Aldehydes
- 19.16: Additional Exercises
- 19.17: Solutions to Additional Exercises

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