

# 2302687 – Heterocyclic Compounds – Part I

## Lecture 2-1

### Heteroaromatic Synthesis via Condensation Part 1

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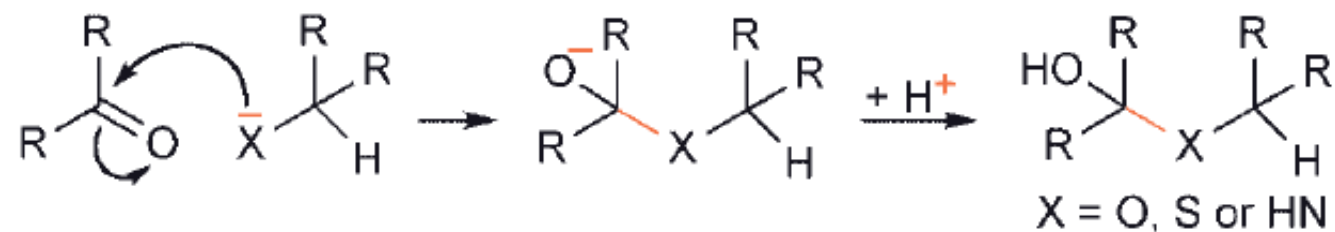
*E-mail: [tanatorn.k@chula.ac.th](mailto:tanatorn.k@chula.ac.th)*

#### **Recommended Textbook:**

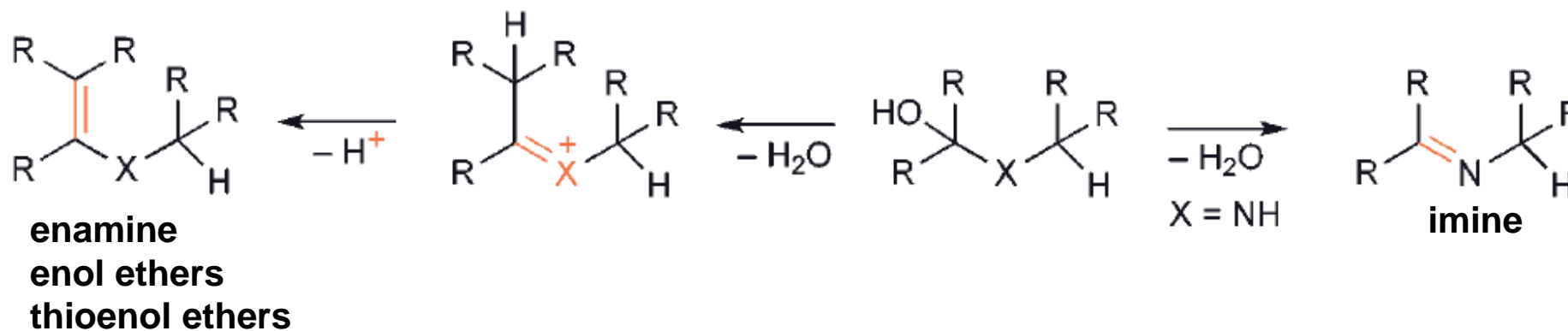
*Heterocyclic Chemistry*, 5<sup>th</sup> Edition, J. A. Joule, K. Mills, **2010**, Wiley

# Synthesis – Condensation at Carbonyl Group

- By far the **most frequently** used process is the **addition of a nucleophile to a carbonyl** carbon followed by **removal of water**
- If the nucleophile is an **heteroatom** (either anionic ( $X^-$ ) or neutral ( $XH$ )); the process leads to **C–heteroatom bond formation**

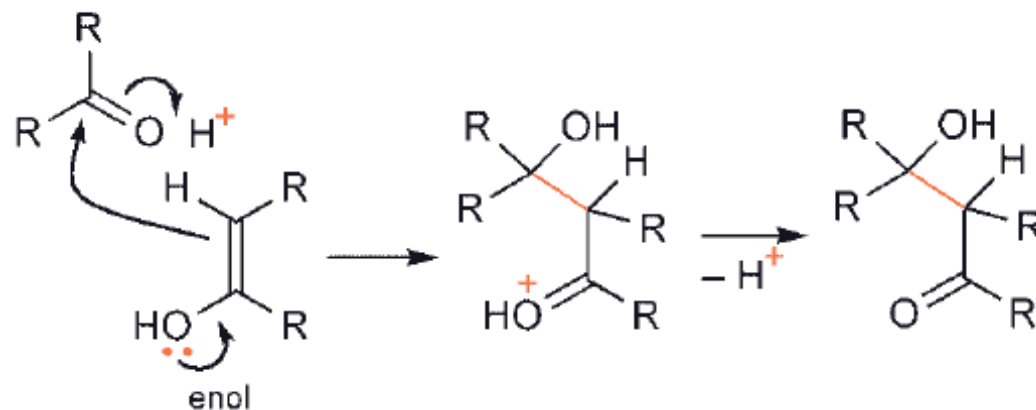


- Subsequent **loss of water** produces a double bond, either a  $C=C$  (imine) or a  $C=\text{heteroatom}$  (enamine/enol ethers/thioenol ethers) double bond

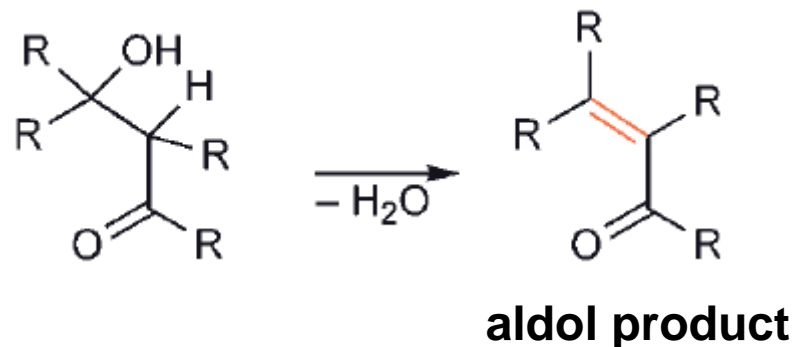


## Synthesis – Condensation at Carbonyl Group

- If the nucleophile is the  $\beta$ -carbon of an **enol** or an **enolate** anion; then the process leads to **C–C bond formation**

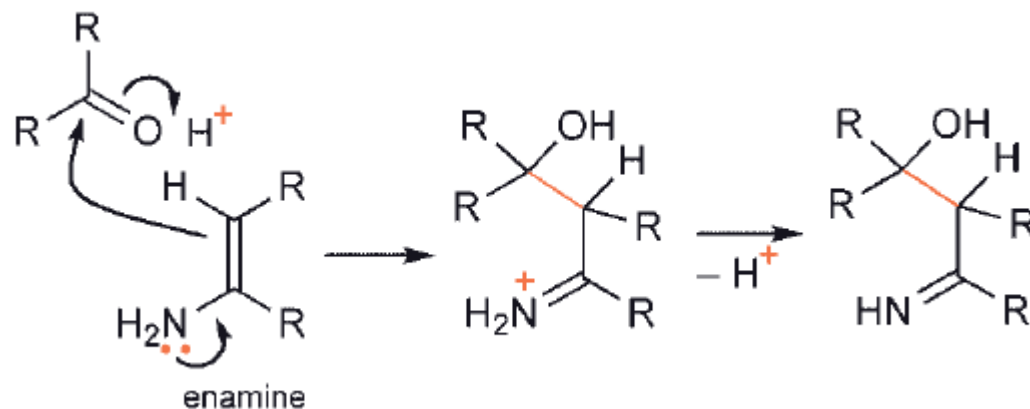


- Subsequent **loss of water** produces a C=C double bond (aldol product)

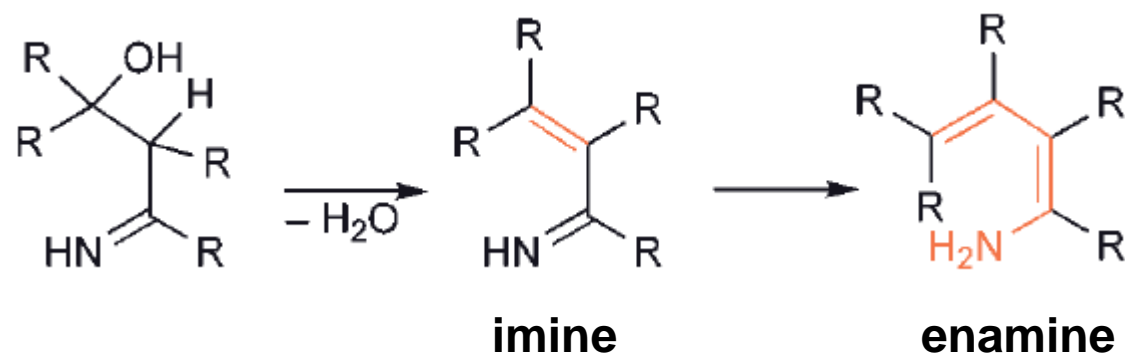


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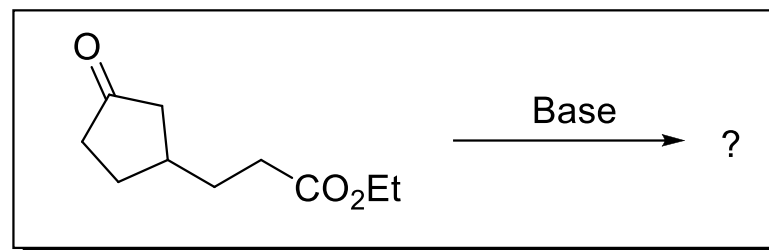
- If the nucleophile is the  $\beta$ -carbon of an **enamine**; then the process also leads to **C–C bond formation**



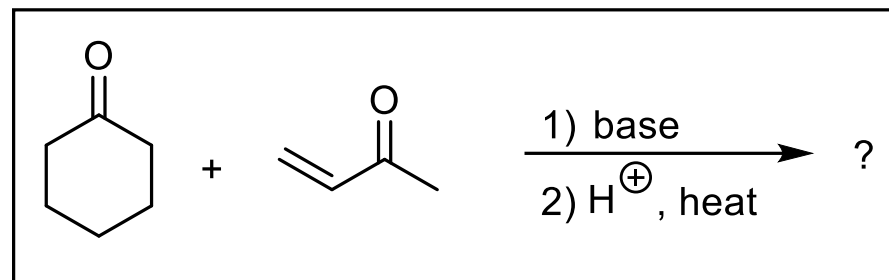
- Subsequent **loss of water** produces a C=C double bond (imine/enamine)



## Condensation at Carbonyl Group – Examples



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