Hey guys! Hope midterms went well last week! If you have any questions or need study tips, please do not hesitate to reach out to me at Megan_Hudson2@baylor.edu!

In-person group tutoring sessions will take place **every Thursday from 5:15 - 6:15 pm in Sid Rich Rm. 75**! In these sessions I will provide practice problems and be available for specific questions. To reserve a spot, go to [https://baylor.edu/tutoring](https://baylor.edu/tutoring). I hope to see you there!

**Key Words:** Diels-Alder, Electrocyclic Reactions, Heterocycles, Aromaticity

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**TOPIC OF THE WEEK:**

**PERICYCLIC REACTIONS (CH. 17 Review)**

3 Types of Pericyclic Reactions:

1. **Cycloaddition: Diels-Alder Reaction**
   - Break 3 pi bonds, form 2 sigma bonds and 1 pi bond
   - Diene (electron rich) + Dienophile (electron poor) = cyclic ring
   - Retain stereochemistry

![Diels-Alder Reaction Diagram](image1.png)

![Diels-Alder Reaction Diagram](image2.png)

![Diels-Alder Reaction Diagram](image3.png)
Endo Preference:
- When Cyclopentadiene is the starting diene, a bridged bicyclic compound is produced, but the endo cycloadduct product is favored due to the favorable interaction between the electron-withdrawing groups (EWG's) in the transition state.
- You want the developing double bond to be close and interact with the EWG's.

Check this link out for more explanation:

2. Electrocyclic Reaction: 1 pi bond forms sigma bond
3. Sigmatropic Rearrangements: sigma bonds rearrange; one sigma bond is made, and one is lost

![Claissen Rearrangement](image)

![Cope Rearrangement](image)

HIGHLIGHT #1: AROMATIC HETEROCYCLES (CH. 18)

What is a heterocycles and how do I identify it?
A heterocycle is a cyclic molecule containing a type of heteroatom (S, N, or O)

2 Common Heterocycles to note are Pyridine and Pyrrole

Pyridine
![Pyridine](image)

Pyrrole
![Pyrrole](image)

Nitrogen is $\text{Sp}^2$ hybridized, but to achieve continuity of overlapping $\text{p}$-orbitals, lone pair must occupy a $\text{p}$-orbital and is therefore delocalized.

Pyrrole as a result of the delocalized lone pair cannot act as a base.

Aromatic Pyridine

(Lone pair on N occupies $\text{sp}^2$ orbital and is not a part of the conjugated system)

Maintains aromaticity
Notice where the charge of the electrons are located; it is localized to the front of the pyridine molecule and in pyrrole, the electrons are involved in resonance and are delocalized (charge is distributed throughout the molecule).

**THINGS YOU MAY STRUGGLE WITH:**

1. Identifying aromatic, nonaromatic, and antiaromatic compounds is a difficult concept to master. Considering heterocycles and their aromaticity is even more difficult. REMEMBER THE 2 CRITERIA FOR AROMATICITY AND USE THESE EACH TIME YOU SOLVE A PROBLEM POSSIBLY INVOLVING AROMATICS! This is important because you need to access whether the lone pairs are participating in aromaticity in order to satisfy Huckel’s Rule.

2. Recognizing patterns for the electrocyclic reactions is difficult to see when reagents are positioned in an abnormal way. Look for a diene in a s-cis confirmation and see if another reagent has a double bond and possibly an EWG (not always present but having an EWG makes Diels-Alder proceed faster) that could act as the dienophile. REMEMBER: It is a [4+2] cycloaddition, the diene has 4 pi electrons, and the dienophile has 2 pi electrons.
PRACTICE PROBLEMS:

1. Predict the product
   ![Chemical Structure]

2. Propose a synthesis
   \[ \text{Δ} \rightarrow \text{Product} \]

3. \[ \text{Δ} \rightarrow \text{Product} \rightarrow \text{Product} \]

4. \[ \text{ } + \text{ } \rightarrow \text{Product} \]
ANSWERS TO PRACTICE PROBLEMS:

1. **(Diene)**  
   **(Dienophile)**  
   Trans Alkene produces a trans distributed ring

2. Recognize your diene & dienophile products, so see this as a retro Diels-Alder reaction
   Diene is retained as bottom 6 carbons with 1 original double bond and 1 new double bond. Dienophile carbons become top 2 carbons in reactant.

So...
3.

\[
\begin{align*}
\text{Δ} & \quad \rightarrow \quad \text{hv} \\
\text{heat} & \quad \rightarrow \quad \text{hv} \\
\text{HOMO} & \quad \rightarrow \quad \text{HOMO}
\end{align*}
\]

4.

\[
\begin{align*}
\text{℃} & \quad + \quad \text{COOH} \\
\text{H} & \quad \rightarrow \quad \text{HOH} \\
\text{HO} & \quad \rightarrow \quad \text{HOH}
\end{align*}
\]