Hey guys! Hope all of your O-Chem II exams went well and you are ready to start reviewing new material for the next test! 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 Wednesday from 6:45 to 7:45 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. I hope to see you there!

**Key Words:** Nomenclature of Aromatics, Aromaticity, Benzene, Birch Reduction

### TOPIC OF THE WEEK:

**AROMATIC COMPOUNDS**

What makes a compound aromatic?

Can be a derivative of Benzene

**OR** follows **2 Criteria for Aromaticity:**

1. The compound must contain a ring comprised of continuously overlapping p orbitals (think conjugated pi systems- refer to Week 6 Resource for review)

2. The number of π electrons in the ring must follow Hückel’s Rule (4n + 2)

If the molecule fails to satisfy the 1st Criterion, it is **nonaromatic**

If the molecule satisfies the 1st criterion but has fails to satisfy Hückel’s rule, it is **antiaromatic**
More Examples of Aromatic, Nonaromatic, and Antiaromatic Compounds:

- **nonaromatic** – not in a ring
- **nonaromatic** – doesn’t have continuously overlapping p-orbitals
- **antiaromatic** – violates Huckels rule, 4 pi electrons
- **aromatic** – 6 pi electrons
- **antiaromatic** – violates Huckels rule, 8 pi electrons
- **aromatic** – 10 pi electrons
- **nonaromatic** – doesn’t have continuously overlapping p-orbitals
- **aromatic** – 10 pi electrons
- **aromatic** – 6 pi electrons, localized lone pair is not in conjugated system

Nomenclature for Monosubstituted Aromatic Compounds:
Use benzene as the parent and add the substituent as a prefix; If the substituent exceeds 6 carbons, use a phenyl substituent when naming.
Common Monosubstituted Aromatic Compound Names to Know:

<table>
<thead>
<tr>
<th>Phenol</th>
<th>Toluene</th>
<th>Anisole</th>
<th>Aniline</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Phenol" /></td>
<td><img src="image2" alt="Toluene" /></td>
<td><img src="image3" alt="Anisole" /></td>
<td><img src="image4" alt="Aniline" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Benzoic Acid</th>
<th>Benzaldehyde</th>
<th>Acetophenone</th>
<th>Styrene</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Benzoic Acid" /></td>
<td><img src="image6" alt="Benzaldehyde" /></td>
<td><img src="image7" alt="Acetophenone" /></td>
<td><img src="image8" alt="Styrene" /></td>
</tr>
</tbody>
</table>

Nomenclature for Polysubstituted Aromatic Compounds:
1. Identify and name the parent (refer to common aromatic compounds above)
2. Identify and name the substituents
3. Assign a locant to each substituent
4. Arrange substituents alphabetically

Reactions at the Benzylic Position: Any carbon attached directly to a benzene ring is called a **benzylic position**

**Oxidation**

- ![Reaction 1](image9)
- ![Reaction 2](image10)
- ![Reaction 3](image11)

No reaction because **benzylic position lacks a proton**
<table>
<thead>
<tr>
<th>Free Radical Bromination</th>
<th><img src="image1" alt="Reaction" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitution</td>
<td><img src="image2" alt="Reaction" /></td>
</tr>
<tr>
<td>Elimination</td>
<td><img src="image3" alt="Reaction" /></td>
</tr>
<tr>
<td>Hydrogenation</td>
<td><img src="image4" alt="Reaction" /></td>
</tr>
</tbody>
</table>

**HIGHLIGHT #1: The Birch Reduction**

1. Single electron is transferred from the cation (Na) to the aromatic ring, giving a radical anion
2. Anion is protonated, which gives a radical intermediate
3. Radical intermediate takes another proton from the cation (Na), which generates another radical anion
4. Anion is protonated and creates an isolated diene

Electron Donating Groups destabilize the radical anion and so a double bond must remain adjacent to the group within the ring

Electron Withdrawing Groups stabilize the radical intermediate and so a double bond will not be adjacent to the group within the ring

**THINGS YOU MAY STRUGGLE WITH:**

1. Identifying aromatic, nonaromatic, and antiaromatic compounds is a difficult concept to master. Be familiar with the common benzene derivatives given and commit the 2 Criteria to MEMORY! Try out Problems 18.36 and 18.38 in the back of the chapter for extra practice on differentiating between these 3 types of compounds.

2. Recognizing what changes in a synthesis reaction and predicting reagents. SYNTHESIS IS HARD! It is vital that you work on synthesis in EACH CHAPTER! Try brushing up old reagents because they will come up again (as it does on practice problem #2 above). Start with what you know and see what you end with, access whether any carbons were added and what functional groups changed. Then trying to piece the problem together via forward synthesis and retrosynthesis. Synthesis will come up repeatedly, and it just takes practice!

**PRACTICE PROBLEMS:**

1. Predict the product

   ![Chemical Structure Image]

   1. KMnO₄, H₂O, Δ
   2. L AH

2. Propose a synthesis

   ![Chemical Structure Image]
ANSWERS TO PRACTICE PROBLEMS:

1. 

\[
\begin{align*}
\text{arylalkane} & \xrightarrow{1. \text{ } \text{KMO}_{4}, \text{H}_{2}O, \Delta} \text{aromatic alcohol} \\
& \xrightarrow{2. \text{ } \text{LAH}} \text{aromatic alcohol}
\end{align*}
\]

2. 

\[
\begin{align*}
\text{phenyl bromide} & \xrightarrow{1. \text{ } \text{MgO}} \text{phenyl ketone} \\
& \xrightarrow{2. \text{ } \text{H}_{2}O} \text{phenol} \\
& \xrightarrow{3. \text{ } \text{H}_{2}O} \text{phenol} \\
& \xrightarrow{4. \text{ } \text{conc. H}_{2}SO_{4}, \Delta} \text{E1}
\end{align*}
\]

All diagrams, tables, and external information is property of Organic Chemistry by David Klein, unless otherwise specified.