**Reactivity**

\[ \text{CH}_3\text{C} = \text{C} > \text{CH}_3\text{C} = \text{C} > \text{CH}_3\text{C} = \text{C} > \text{CH}_3\text{C} = \text{C} > \text{CH}_3\text{C} = \text{C} > \text{CH}_3 \]

<table>
<thead>
<tr>
<th>Conjugate Acid</th>
<th>( \text{pK}_a )</th>
<th>( \text{BP} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ig</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Why is ___ more reactive than ___

1. 
2. 
3. 

*#1 Rule:*

1. 
\[ \text{CH}_3\text{C} = \text{C} + 2\text{NH}_2\text{CH}_3 \rightarrow \]

   - Why 2 amines?

2. 
\[ \text{C}_6\text{H}_5\text{C} = \text{C} + \text{CH}_3\text{OH} \rightarrow \]
3. Estar Hydrolysis (Acid cat)
\[ \text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{H} + \text{H}_2\text{O} \xrightarrow{\text{HCl}} \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_2\text{CO}_2\text{H} \]

-What does the catalyst do? (2 slow steps)
  1.
  2.

4. Hydroxide-Ion Promoted Estar Transesterification (Conjugate Base)

\[ \text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_3 + \text{CH}_3\text{OH} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_3\text{OCH}_3 \]

What does the conjugate base do?
  1.
  2.

5. \[ \text{30 Esters} \]
\[ \text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_3 + \text{HOCH}_2\text{CH}_3 \xrightarrow{\text{HCl}} \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_3\text{OCH}_2\text{CH}_3 \]
6. \[ \text{C} = \text{O} + \text{CH}_3\text{OH} \xrightarrow{\text{H}^+} \]

What does X8 CH3OH do?

7. \[ \text{CH}_3\text{C} = \text{OH} + \text{NH}_2\text{CH}_3 \xrightarrow{\text{?}} \]

8. \[ \text{CH}_3\text{C} = \text{OH} + \text{Cl} \xrightarrow{\text{?}} \text{Cl} - \text{P} - \text{Cl} \]

9. \[ \text{CH}_3\text{CO} = \text{OH} + \text{Br} \xrightarrow{\text{?}} \text{Br} - \text{P} - \text{Br} \]

10. \[ \text{NH}_2\text{NH}_2 + \text{HOC} = \text{H} \xrightarrow{\text{HCl}} \]

What does acid do?

1.

2.

11. \[ \text{NH}_2\text{NH}_2 \xrightarrow{\text{P} \text{O} \text{S}} \xrightarrow{\text{H}_2\text{O}} \]
What kind of reaction is this?

13. 

14.

4.5

15.

16.

17.

18.
20. 

\[
\text{CH}_3\text{CH}_2\text{C}=\text{O} + \text{NH}_2\text{CH}_3 \xrightarrow{\text{N}_{2}\text{H}_4} \text{CH}_2\text{CH}_3
\]

The change is known as a ____________

21. Wolff-Kishner Reaction

\[
\text{CH}_3\text{C}-\text{CH}_3 + \text{NH}_2\text{NH}_2 \xrightarrow{\text{OH}\text{t}} \text{NH}_2\text{N}_2\text{H}_2
\]

22. 

\[
\text{H}-\text{C}\backslash\text{H} + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{H}^+ \text{CH}_3
\]

If the \([\text{H}]\) were \(\text{CH}_3\), how would this reaction be different? Why?
1. 
2. 

What is this called?
23. \[ \text{CH}_3\text{CH}_2\text{C} - \text{H} \quad \text{CH}_3\text{OH} \xrightarrow{\text{HCl}} \]

One -OH and one -OCH_3 group is called _____

Two -OCH_3 groups is called _____

Why is this stable

24. \[ \text{C}_6\text{H}_5\text{C} - \text{CH}_3 + \text{HOCH}_2\text{CH}_2 \xrightarrow{\text{HCl}} \]

[Diagram of chemical structures]

[Diagram showing conversion of one structure to the other]
List reagents used
Don't forget cats.
Is the product o/p or m??

- Halogenation:
- Sulfonation:
- Friedel-Crafts:
- Nitration:

Things to remember about Nitr:

 ولوظفة: 

- List reagents used
  - Don't forget cats.
  - Is the product o/p or m??

- Halogenation:
- Sulfonation:
- Friedel-Crafts:
- Nitration:
TABLE 14.1 The Effects of Substituents on the Reactivity of a Benzene Ring

Toward Electrophilic Substitution

**Activating substituents**
- Donate by res
  - to have lone pairs
- Withdraw by electronegativity

**Deactivating substituents**
- Electron withdraw
  - Electrons to pull into ring
- Can pull electrons out of benzene ring by res!

**Activators:**
- Some how putting electrons into benzene ring
  - Make O-H bond stronger
  - Harder for H to fall off

**Deactivators:**
- Some how pulling electrons out of benzene ring
  - Weaken the O-H bond make easier for H to fall off

**Standard of comparison**

<table>
<thead>
<tr>
<th>Substituent</th>
<th>Most activating</th>
<th>Strongly activating</th>
<th>Moderately activating</th>
<th>Weakly activating</th>
<th>Most deactivating</th>
</tr>
</thead>
<tbody>
<tr>
<td>-NH₂</td>
<td>-NHR</td>
<td>-NR₂</td>
<td>-OH</td>
<td>-OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-NHCR</td>
<td>-OCR</td>
<td>-R</td>
<td>-RC</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>-H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Ortho/para directing**

**Meta directing**

**Acidity**

- Activators:
  - Some how putting electrons into benzene ring
  - Make O-H bond stronger
  - Harder for H to fall off

- Deactivators:
  - Some how pulling electrons out of benzene ring
  - Weaken the O-H bond make easier for H to fall off

(aka more acidic)