Activating substituents

Most activating

-\( \text{-NH}_2 \)
-\( \text{-NHR} \)
-\( \text{-NR}_2 \)
-\( \text{-OH} \)
-\( \text{-OR} \)

Moderately activating

-\( \text{-NHCR} \)
-\( \text{-O} \)
-\( \text{-OCR} \)
-\( \text{-R} \)

Weakly activating

-\( \text{-Ar} \)
-\( \text{-CH=CHR} \)

Ortho/para directing

Standard of comparison → \( \text{-H} \)

Deactivating substituents

Weakly deactivating

-\( \text{-F} \)
-\( \text{-Cl} \)
-\( \text{-Br} \)
-\( \text{-I} \)

Moderately deactivating

-\( \text{-O} \)
-\( \text{-CH} \)
-\( \text{-CR} \)
-\( \text{-COR} \)

Meta directing

-\( \text{-COH} \)
-\( \text{-CCl} \)
-\( \text{-C≡N} \)
-\( \text{-SO}_2\text{H} \)

Strongly deactivating

-\( \text{-NH}_3 \)
-\( \text{-NHR}_2 \)
-\( \text{-NR}_3 \)
-\( \text{-NO}_2 \)

Most deactivating
### TABLE 14.1 The Effects of Substituents on the Reactivity of a Benzene Ring Toward Electrophilic Substitution

#### Activating substituents

<table>
<thead>
<tr>
<th>Donor by res to have lone pairs</th>
<th>NH₂</th>
<th>NHR</th>
<th>NR₂</th>
<th>OH</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdraw by electron negativity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Donor by res to go in 
1/2 H | NHCR | OCR | R | Ar | CH=CR₂ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inductive electron donation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Deactivating substituents

<table>
<thead>
<tr>
<th>Inductive withdraw electrons</th>
<th>F</th>
<th>Cl</th>
<th>Br</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electron withdrawal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electron withdrawal</th>
<th>O</th>
<th>CR</th>
<th>CO</th>
<th>COH</th>
</tr>
</thead>
<tbody>
<tr>
<td>C has no electrons to pull into ring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Can pull electrons out of benzene ring by res</th>
<th>NH₃</th>
<th>NHR₂</th>
<th>NH₂R</th>
<th>NR₂</th>
<th>NO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdraw by inductive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Standard of comparison**

**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 makes easier for H to fall off

(aka more acidic)