1. (4) Complete the following reaction by placing H or Br in the provided boxes (1 pt each box):

\[
\begin{array}{c}
\text{H}_2\text{N} \begin{array}{c} \text{C} \\
\text{H} \end{array} \text{C} \text{NO}_2 \\
\text{H} \begin{array}{c} \text{H} \\
\text{H} \end{array} \text{Br} \\
\text{H}_2\text{N} \begin{array}{c} \text{C} \\
\text{H} \end{array} \text{C} \text{NO}_2 \\ 
\text{Br}_2 (1 \text{ mol}) \text{ room temp.} \\
\end{array}
\end{array}
\]

2. (9) Circle the **major product** in each of the following reactions (3 pts each):

- **HNO_3, H_2SO_4**, heat
- **H_3C \begin{array}{c} \text{NO}_2 \\
\end{array} \text{Br}_2, \text{FeBr}_3**, heat
- **CH_3CH_2Cl, \text{H}_2\text{CrO}_4**, heat

<table>
<thead>
<tr>
<th><strong>Product</strong></th>
<th><strong>Product</strong></th>
<th><strong>Product</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>benzenesulfonic acid</td>
<td>nitrophenol</td>
<td>p-nitrophenol</td>
</tr>
<tr>
<td>aniline</td>
<td>m-nitrobenzenesulfonic acid</td>
<td>nitrobenzene</td>
</tr>
<tr>
<td>3-bromo-4-methylaniline</td>
<td>3-bromo-4-nitrotoluene</td>
<td>p-bromotoluene</td>
</tr>
<tr>
<td>3-bromo-4-aminobenzonitrile</td>
<td>2-bromo-4-nitrotoluene</td>
<td></td>
</tr>
<tr>
<td>p-bromoethylbenzene</td>
<td>o-bromoethylbenzene</td>
<td></td>
</tr>
<tr>
<td>p-ethylbenzoic acid</td>
<td>m-chlorobenzoic acid</td>
<td></td>
</tr>
<tr>
<td>p-bromobenzoic acid</td>
<td>m-bromobenzoic acid</td>
<td></td>
</tr>
</tbody>
</table>

3. (6) Show the reagents that are required to convert the reactant to the indicated product (2 pts each):

- **Cl- \begin{array}{c} \text{NO}_2 \\
\end{array} \text{H}_2\text{SO}_4, \text{heat}**, 2

4. (3) Circle the structure of the **intermediate** in the reaction of benzene with SO_3 and H_2SO_4:

5. (3) Circle the structure of the **intermediate** in the reaction of p-chlorotoluene with NaOH/H_2O at 300°C and high pressure:

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**Overall Score:** ___________