Chapter 24
Phenols
24.1 Nomenclature
Nomenclature

5-Chloro-2-methylphenol

named on basis of phenol as parent

substituents listed in alphabetical order

lowest numerical sequence: first point of difference rule
Nomenclature

1,2-Benzenediol
(common name: pyrocatechol)

1,3-Benzenediol
(common name: resorcinol)

1,4-Benzenediol
(common name: hydroquinone)
Nomenclature

$p$-Hydroxybenzoic acid

name on basis of benzoic acid as parent

higher oxidation states of carbon outrank hydroxyl group
24.2
Structure and Bonding
phenol is planar

C—O bond distance is 136 pm, which is slightly shorter than that of CH$_3$OH (142 pm)
The OH group of phenols allows hydrogen bonding to other phenol molecules and to water.
Hydrogen Bonding in Phenols

![Diagram of hydrogen bonding in phenols]
Compared to compounds of similar size and molecular weight, hydrogen bonding in phenol raises its melting point, boiling point, and solubility in water.

Physical Properties (Table 24.1)
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<table>
<thead>
<tr>
<th></th>
<th>C&lt;sub&gt;6&lt;/sub&gt;H&lt;sub&gt;5&lt;/sub&gt;CH&lt;sub&gt;3&lt;/sub&gt;</th>
<th>C&lt;sub&gt;6&lt;/sub&gt;H&lt;sub&gt;5&lt;/sub&gt;OH</th>
<th>C&lt;sub&gt;6&lt;/sub&gt;H&lt;sub&gt;5&lt;/sub&gt;F</th>
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<tbody>
<tr>
<td><strong>Molecular weight</strong></td>
<td>92</td>
<td>94</td>
<td>96</td>
</tr>
<tr>
<td><strong>Melting point (°C)</strong></td>
<td>−95</td>
<td>43</td>
<td>−41</td>
</tr>
<tr>
<td><strong>Boiling point (°C, 1 atm)</strong></td>
<td>111</td>
<td>132</td>
<td>85</td>
</tr>
<tr>
<td><strong>Solubility in H&lt;sub&gt;2&lt;/sub&gt;O (g/100 mL, 25°C)</strong></td>
<td>0.05</td>
<td>8.2</td>
<td>0.2</td>
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