Covalent Bond: Overlap of Orbitals
Two singly occupied s orbitals each containing one electron

Two singly occupied p orbitals each containing one electron

Overlapped s orbitals, sharing the pair of electrons, both doubly occupied

Overlapped p orbitals, sharing the pair of electrons, both doubly occupied

Two singly occupied orbitals (one s, one p) each containing one electron

Overlapped orbitals (one s, one p), sharing the pair of electrons, both doubly occupied
$\text{Cl} - \text{Be} - \text{Cl}$

$\text{BeCl}_2$

**Be**
- $1\uparrow$
- $2s^2$
- $2p$

**promotion**
- $1\uparrow$
- $2s^1$
- $2p^1$

**Cl**
- $1\uparrow$
- $3s^2$
- $3p^5$

**Cl**
- $1\uparrow$
- $3s^2$
- $3p^5$

**2s** and **3p**

**2p** and **3p**
Be*  

$\begin{align*}
\text{2s} & : 1 \\
2p & : 2p
d\text{hybridization} \\
\text{sp} & : 1 \\
\text{sp} & : 1 \\
2p & : 2p
\end{align*}$

$\begin{align*}
\text{2s} & \quad + \\
2p & \quad \rightarrow \\
\text{sp} & \quad \text{sp}
\end{align*}$

$\begin{align*}
x & : \\
y & : \\
z & :
\end{align*}$
<table>
<thead>
<tr>
<th>Regions of Electron Density</th>
<th>Arrangement</th>
<th>Hybridization</th>
<th>180°</th>
<th>120°</th>
<th>109.5°</th>
<th>90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>linear</td>
<td>$sp$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>trigonal planar</td>
<td>$sp^2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>tetrahedral</td>
<td>$sp^3$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>trigonal bipyramidal</td>
<td>$sp^3d$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>octahedral</td>
<td>$sp^3d^2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>