Classifying $sp^3$ Carbon Atom Type by C-C Connectivity

<table>
<thead>
<tr>
<th>Carbon Type</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary carbon</td>
<td>$1^\circ$ bonded to one other C</td>
</tr>
<tr>
<td>Secondary carbon</td>
<td>$2^\circ$ bonded to two other C</td>
</tr>
<tr>
<td>Tertiary carbon</td>
<td>$3^\circ$ bonded to three other C</td>
</tr>
<tr>
<td>Quaternary carbon</td>
<td>$4^\circ$ bonded to four other C</td>
</tr>
</tbody>
</table>

```
R-CH2-CH3  R-CH=CH2  R-CH2-CH2-CH3  R-C6H5
1°        2°      3°              4°
```
Classifying $sp^3$ carbon-atom-type by C-H connectivity

-methane-
-methyl-
-methylene-
-methine-
Comparing Classification Schemes

![Chemical structures showing different types of carbon atoms and their terminology: methyl, methylene, methine, and quaternary. The structures are labeled with angles 1°, 2°, 3°, and 4°.](Image)
Classifying hydrogen-atom-type by C-C connectivity

1° hydrogen

2° hydrogen

3° hydrogen
Classifying Halides and Alcohols by C-C Connectivity

X = -F, -Cl, -Br, -I
X = -OH

1° halide
2° halide
3° halide

Used for naming compounds that contain butyl structural units:

n-butyl alcohol
isobutyl alcohol (i-butyl alcohol)
sec-butyl chloride (s-butyl chloride)
tert-butyl bromide (t-butyl bromide)
Classifying $sp^3$ nitrogen-atom-type by C-N connectivity

For amines and amides, the notation 1°, 2°, 3°, and 4° refers to the number of N-C bonds.

- The __ium__ suffix denotes “+” charge: **quaternary ammonium ion**
- The __ide__ suffix denotes “-” charge