Atomic Charges

proton
neutron
electron
Isotopes

Carbon
6 Protons
6 Neutrons
Nuclear number
= 6 + 6
= 12

Carbon-13
6 Protons
7 Neutrons
Nuclear number
= 6 + 7
= 13

Carbon-14
6 Protons
8 Neutrons
Nuclear number
= 6 + 8
= 14
Radioisotopes

nucleus of $^{14}\text{C}$, with 6 protons, 8 neutrons

nucleus of $^{14}\text{N}$, with 7 protons, 7 neutrons
Atomic Shells

A The first shell
2 Openings

B The second shell
8 Openings

C The third shell
8 Openings
Free Radical

\[
\text{Cl} \quad \text{17p} \quad \text{proton (p)} \quad \text{electron (●)} \quad \text{Cl} \quad \text{17p} \quad \text{Cl} \quad \text{Cl} \quad \text{17p}
\]
Ions

**A**

**Sodium atom**

\[ 11p^+ \]
\[ 11e^- \]
\[ \text{charge: 0} \]

**Sodium ion**

\[ 11p^+ \]
\[ 10e^- \]
\[ \text{charge: +1} \]

**B**

**Chlorine atom**

\[ 17p^+ \]
\[ 17e^- \]
\[ \text{charge: 0} \]

**Chlorine ion**

\[ 17p^+ \]
\[ 18e^- \]
\[ \text{charge: -1} \]
Ionic Bonds

Sodium ion

\[
\begin{align*}
11p^+ \\
10e^- \\
\text{charge: } +1
\end{align*}
\]

Chloride ion

\[
\begin{align*}
17p^+ \\
17e^- \\
\text{charge: } -1
\end{align*}
\]

ionic bond
Ionic Bonds

positive charge \rightleftharpoons negative charge

Na\(^{+}\)  Cl\(^{-}\)

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Covalent Bonds

MOLECULAR HYDROGEN (H—H)

MOLECULAR OXYGEN (O=O)

WATER (H—O—H)
Water’s Polar Covalent Bonds

slight negative charge

slight positive charge
Water’s Hydrogen Bonds

a hydrogen bond

[Diagram of water molecules showing a hydrogen bond]
Water is an excellent solvent
Water has cohesion
Water stabilizes temperature
\[ H_2O \xrightarrow{\text{water}} H^+ + \text{hydrogen ions} \]
\[ \text{OH}^- \xrightarrow{\text{hydroxide ions}} H_2O \text{ water} \]
<table>
<thead>
<tr>
<th>pH Value</th>
<th>Times Acidity or Alkalinity Exceeds That of Pure Water (7.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acidic</strong> 0</td>
<td>10,000,000</td>
</tr>
<tr>
<td>1</td>
<td>1,000,000</td>
</tr>
<tr>
<td>2</td>
<td>100,000</td>
</tr>
<tr>
<td>3</td>
<td>10,000</td>
</tr>
<tr>
<td>4</td>
<td>1,000</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><strong>Neutral</strong> 7</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
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<tr>
<td>11</td>
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<td>12</td>
<td>100,000</td>
</tr>
<tr>
<td>13</td>
<td>1,000,000</td>
</tr>
<tr>
<td><strong>Alkaline</strong> 14</td>
<td>10,000,000</td>
</tr>
</tbody>
</table>
In alkaline medium, amino acid acts as an acid and releases $\text{H}^+$.

In acidic medium, amino acid acts as a base and absorbs $\text{H}^+$. 

Neutral pH