**Primary Structure**

The peptide chain is written from the N-terminus to the C-terminus. (1)

The peptide bonds are resonance bonds, which are stronger than single bonds but weaker than double bonds. This results in the whole structure being slightly more rigid, but not too rigid. (2)

Non-polar

<table>
<thead>
<tr>
<th>Glycine</th>
<th>Alanine</th>
<th>Valine</th>
<th>Leucine</th>
<th>Isoleucine</th>
<th>Phenylalanine</th>
<th>Proline</th>
<th>Methionine</th>
<th>Tryptophan</th>
</tr>
</thead>
</table>

Polar and neutral

<table>
<thead>
<tr>
<th>Serine</th>
<th>Cysteine</th>
<th>Tyrosine</th>
<th>Asparagine</th>
<th>Glutamine</th>
<th>Threonine</th>
</tr>
</thead>
</table>

Polar and acidic

<table>
<thead>
<tr>
<th>Aspartic Acid</th>
<th>Glutamic Acid</th>
</tr>
</thead>
</table>

Polar and basic

<table>
<thead>
<tr>
<th>Histidine</th>
<th>Lysine</th>
<th>Arginine</th>
</tr>
</thead>
</table>

**Kinds of Amino Acids (4)**

- Non-polar: Glycine, Alanine, Valine, Leucine, Isoleucine, Phenylalanine, Proline, Methionine, Tryptophan
- Polar and neutral: Serine, Cysteine, Tyrosine, Asparagine, Glutamine, Threonine
- Polar and acidic: Aspartic Acid, Glutamic Acid
- Polar and basic: Histidine, Lysine, Arginine

**Bibliography:**


5. Trans arrangement of the alpha Cα. [Diagram.](http://biowiki.ucdavis.edu/Biochemistry/Proteins/Protein_Conformation)

Max Shramuk and Mara Cardona

This is the alpha carbon, meaning it’s the carbon off of which the R group is bound.

Terminal carbons, the carbons that end a peptide chain, are in the cis conformation. (1)

**Internal carbons tend to be in the trans conformation. (1)**

**Fig. 1:** The general 3D structure of the primary structure of a protein. Note that not everything is in the same plane. Also note the torsion angles; the measurements of these angles will vary between -180 degrees and 180 degrees depending on the R group. (1) However, it will never go to a conformation that is geometrically impossible in the secondary structure. (1) Picture: (3)

**Fig. 2:** An example of the difference between cis conformation and trans conformation in an amino acid. Cis means the alpha carbon is on the same side as that of an adjacent amino acid while trans means that alpha carbon is on the opposite side. Picture: (5)

The alpha carbon, Amino group, and carboxyl group are planar. Adjacent alpha carbons between amino acids are also planar. (2)

The R group and lone hydrogen are in a different plane than the Amino Group, the Alpha carbon, and the carboxyl group. (2)