

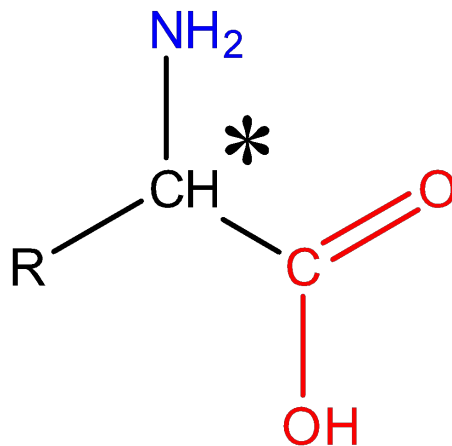
Zaporizhia State Medical University
Department of organic and bioorganic chemistry

Lecture

α -Aminoacids, peptides, proteins

α -Aminoacids.

α -Aminoacids – class of organic compounds, which may be considered as derivatives of carboxylic acids, in which hydrogen atom in position 2 substituted by amino group.

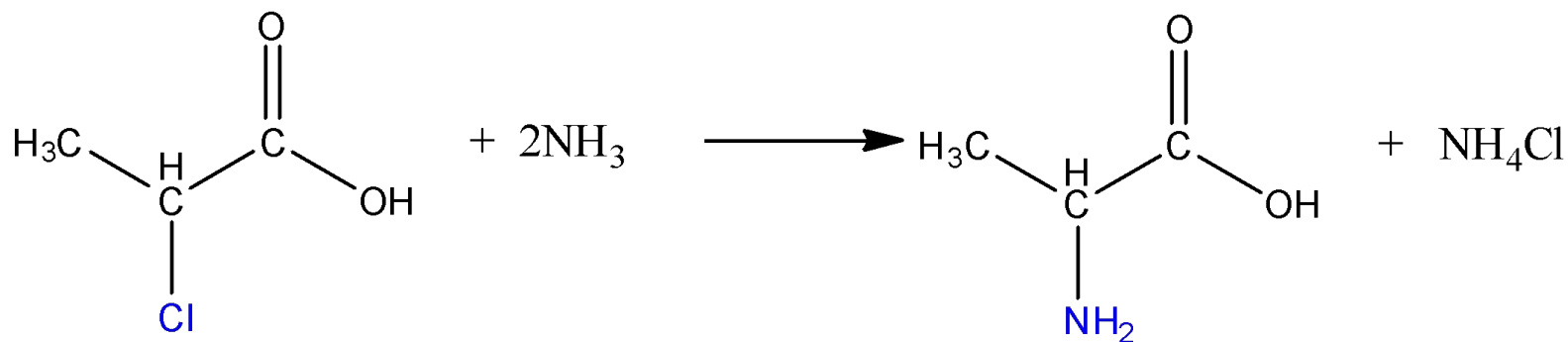


Almost all α -aminoacids, except glycine (2-aminopropanoic acid) contain asymmetric carbon, it means that optical isomerism is typical for mentioned class of compounds.

Preparation of α -aminocarboxylic acids.

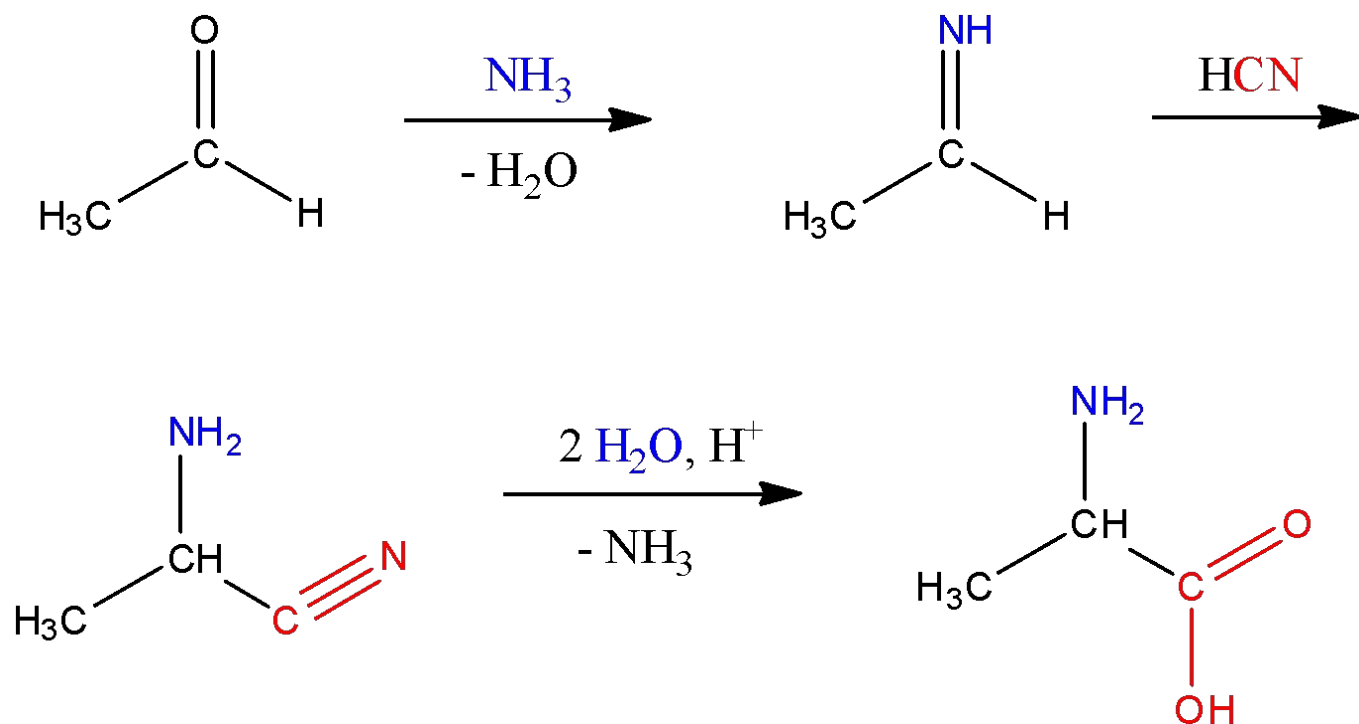
1. Isolation from native sources.

2. Aminolysis α -halogencarboxylic acids

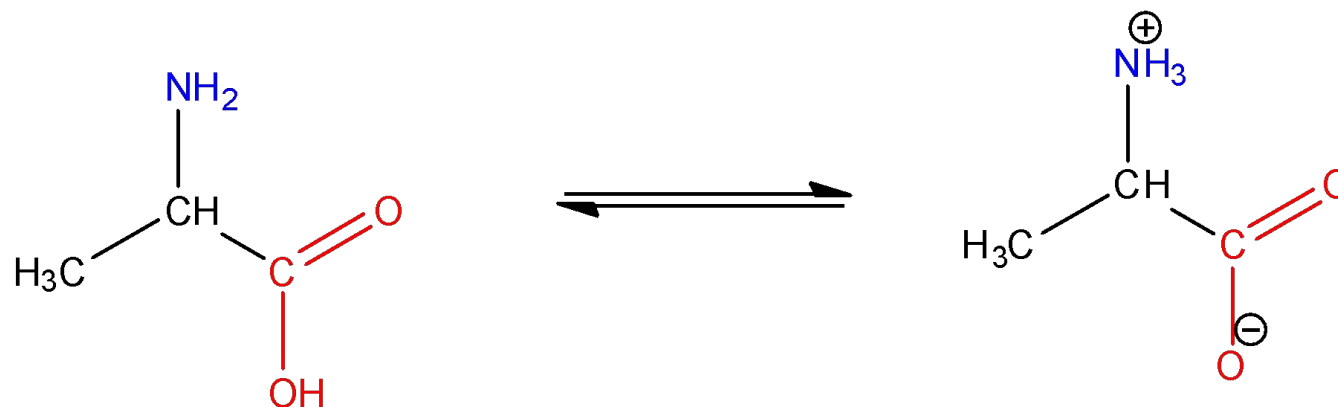


Preparation of α -aminocarboxylic acids.

3. Strecker method

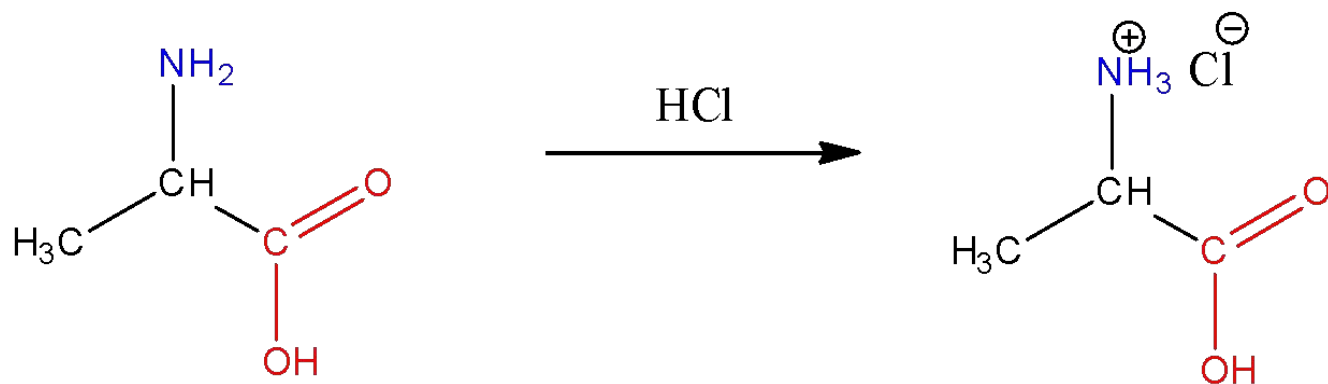
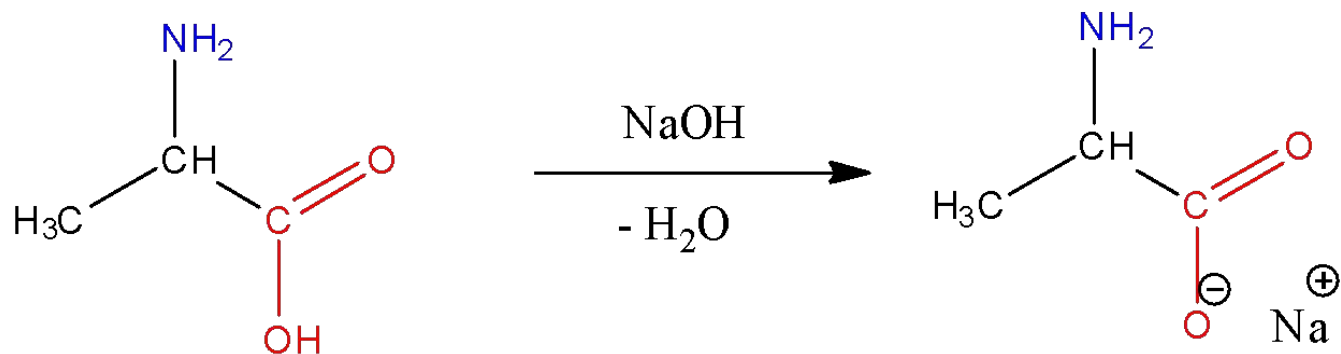


Chemical properties of α -aminocarboxylic acids.
Formation of intramolecular salts



pH of aqueous solutions ≈ 7

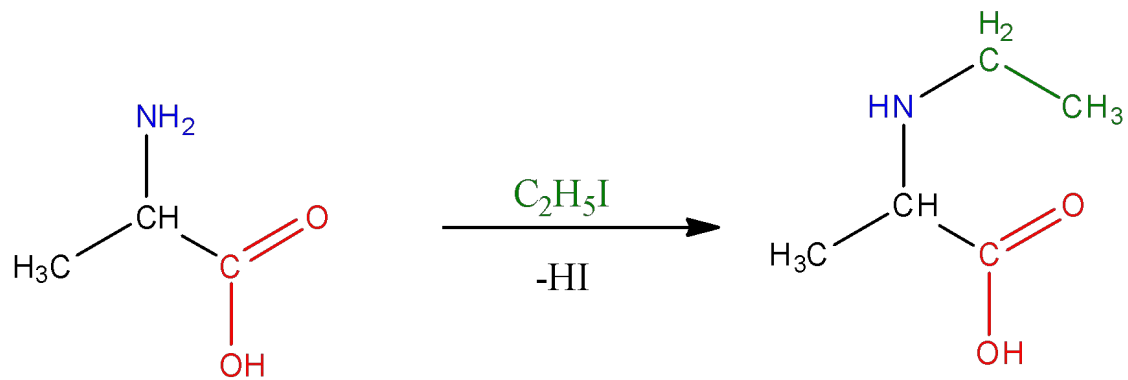
Chemical properties of α -aminocarboxylic acids.
Formation of salts.



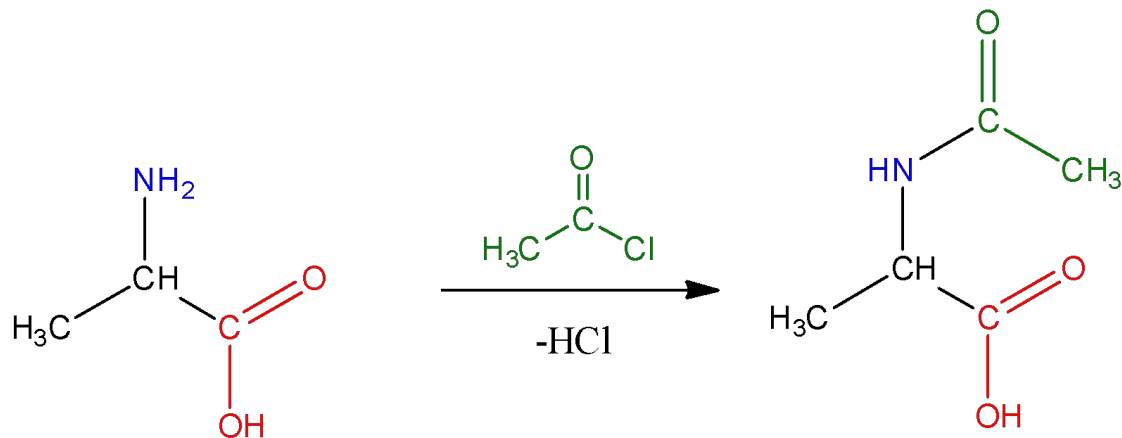
Chemical properties of α -aminocarboxylic acids.

Properties of amino-group.

1. Alkylation

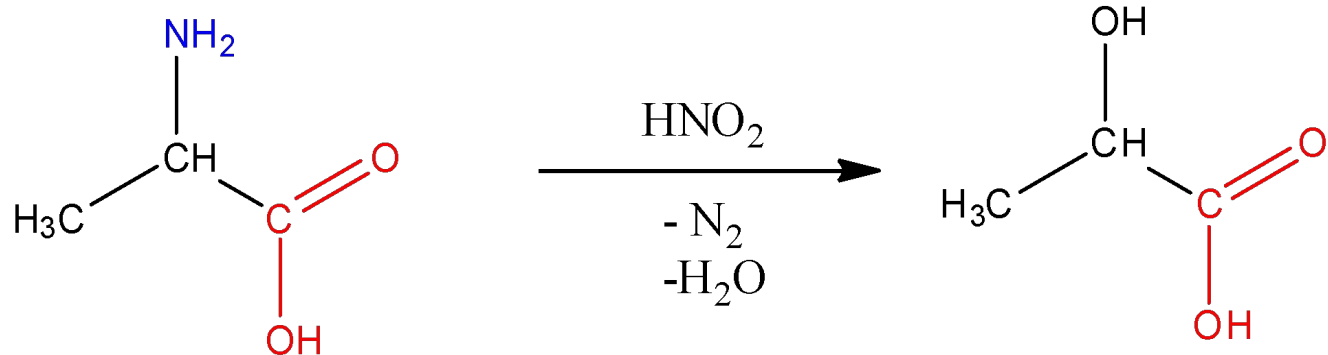


2. Acylation



Chemical properties of α -aminocarboxylic acids.
Properties of amino-group.

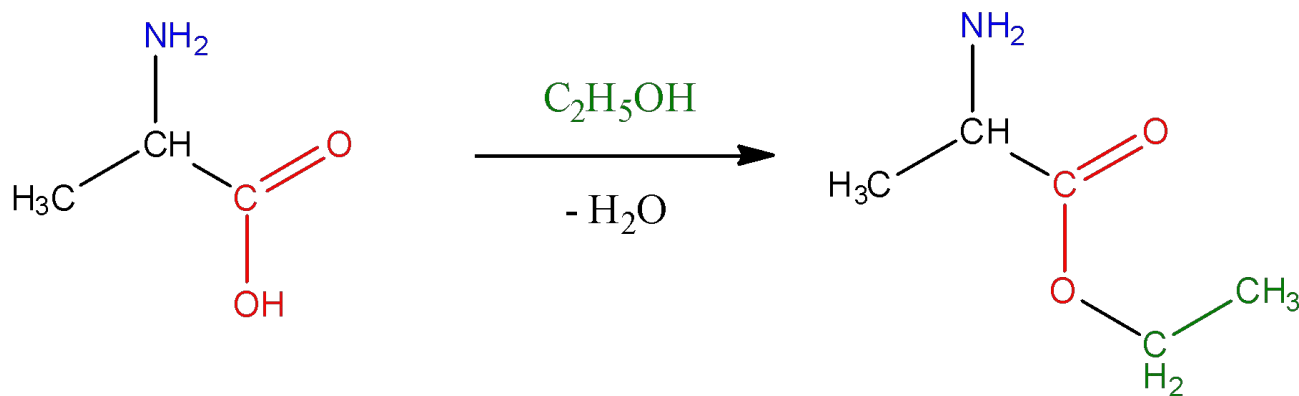
3. Reaction with nitrous acid.



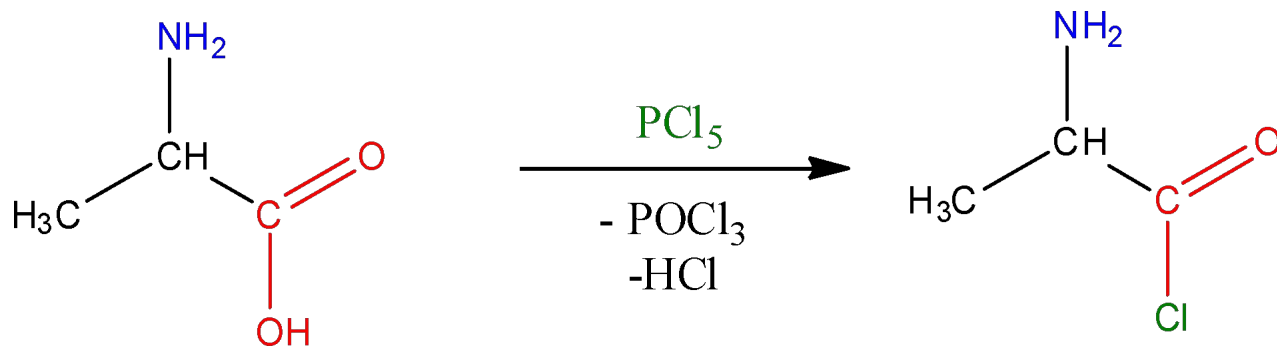
Chemical properties of α -aminocarboxylic acids.

Properties of carboxylic groups.

1. Formation of esters.

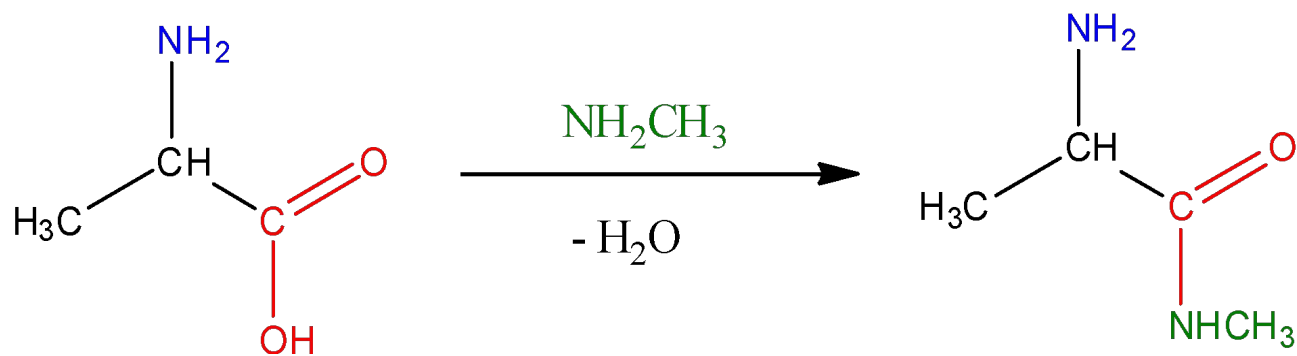


2. Formation of halogenanhydrides.



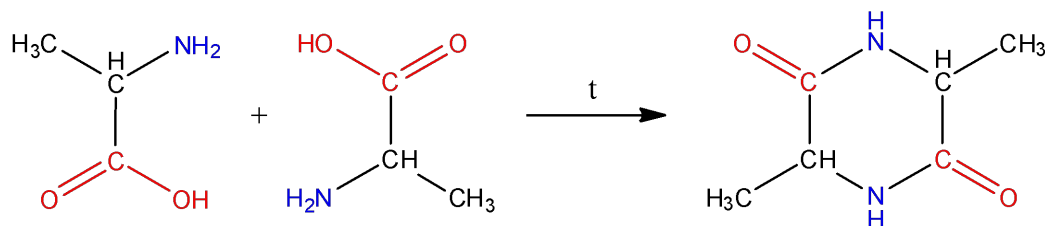
Chemical properties of α -aminocarboxylic acids.
Properties of carboxylic groups.

3. Formation of amides.

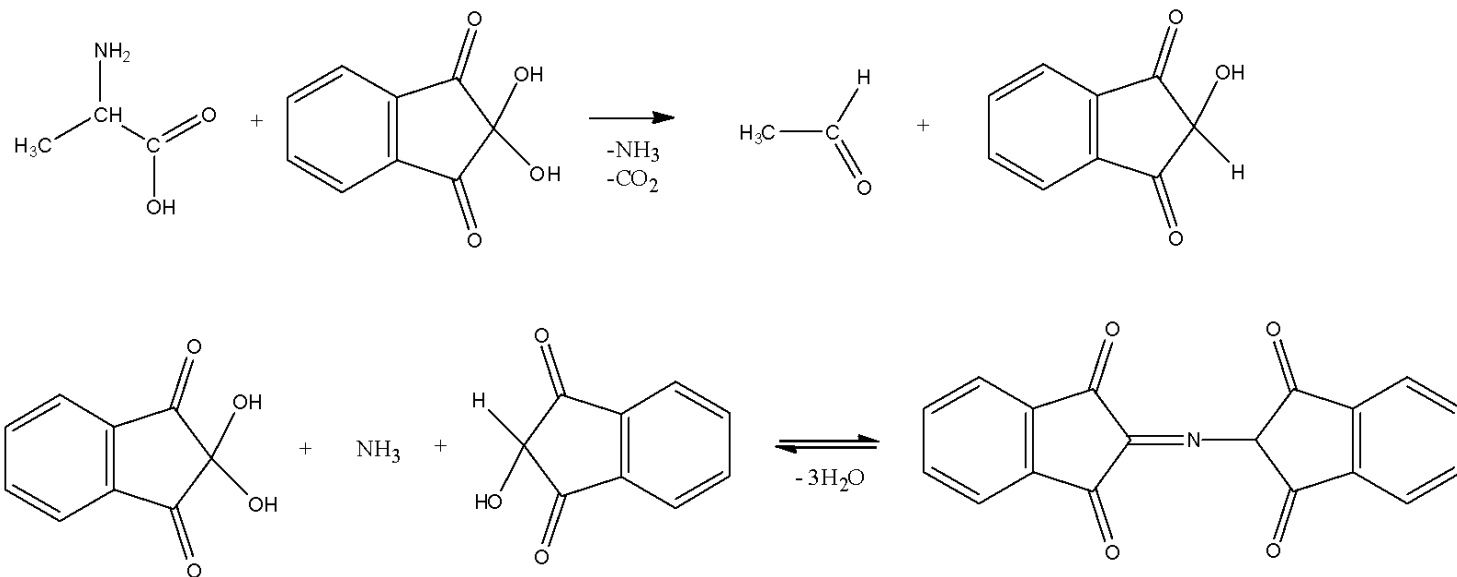


Chemical properties of α -aminocarboxylic acids. Specific properties.

1. Intramolecular dehydration.

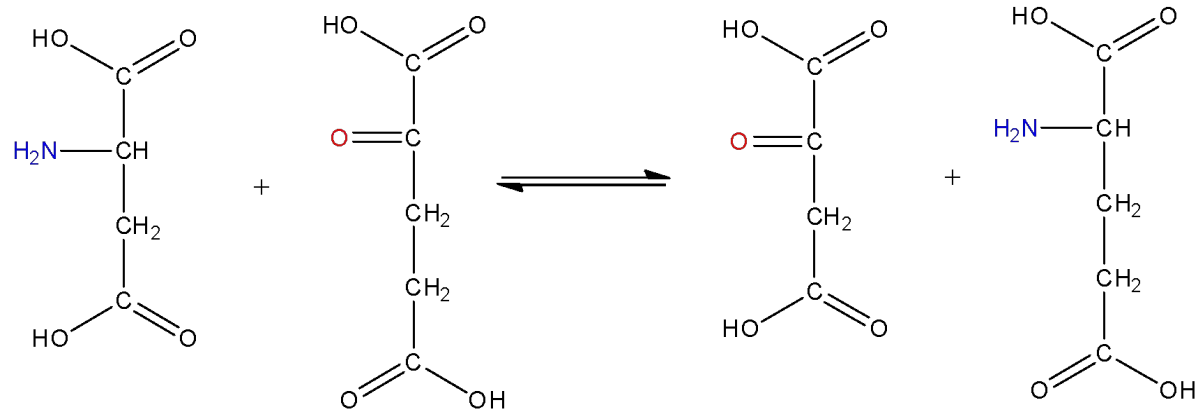


2. Reaction with ninhydrin.

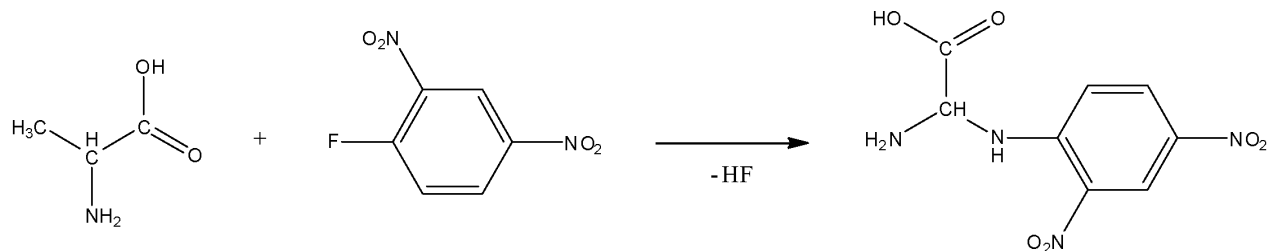


Chemical properties of α -aminocarboxylic acids. Specific properties.

4. Transamination

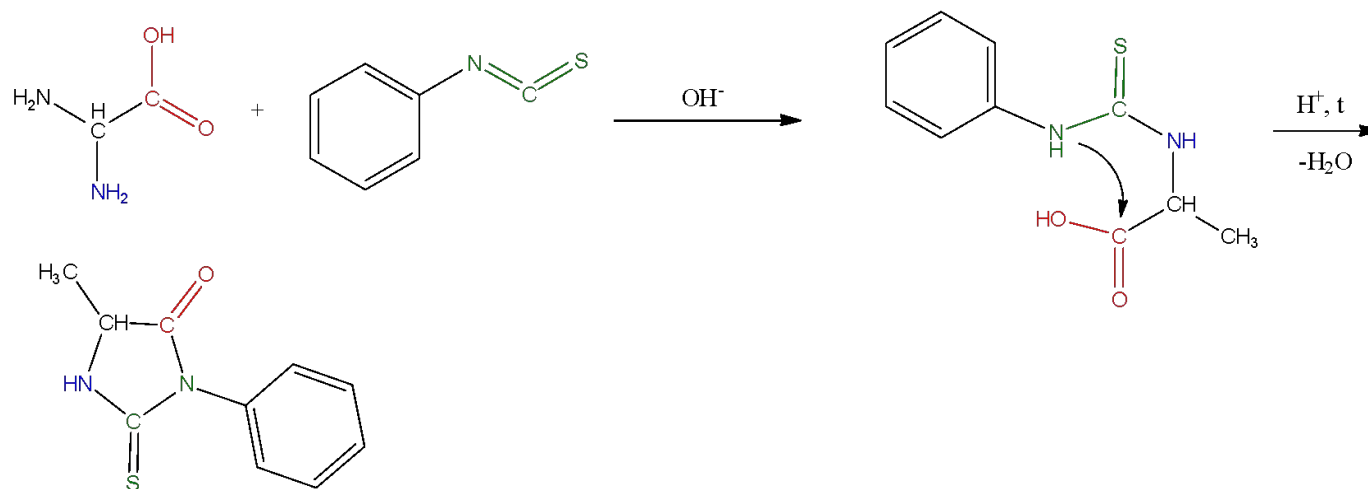


5. Reaction with c 2,4-dinitrofluorobenzene (Sanger reactive)

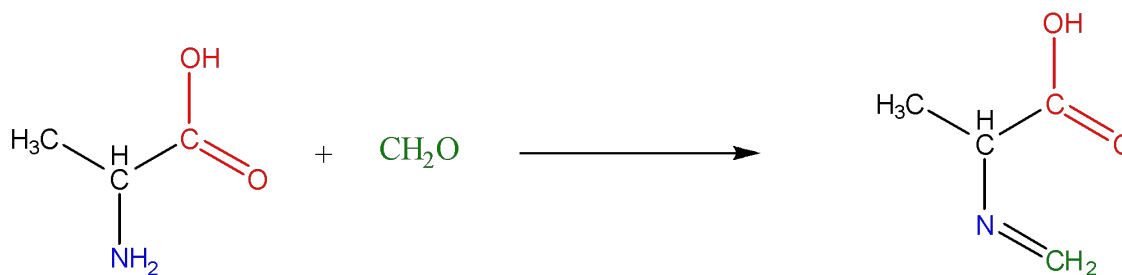


Chemical properties of α -aminocarboxylic acids. Specific properties.

6. Reaction with phenylisothiocyanate (Erdman reaction)

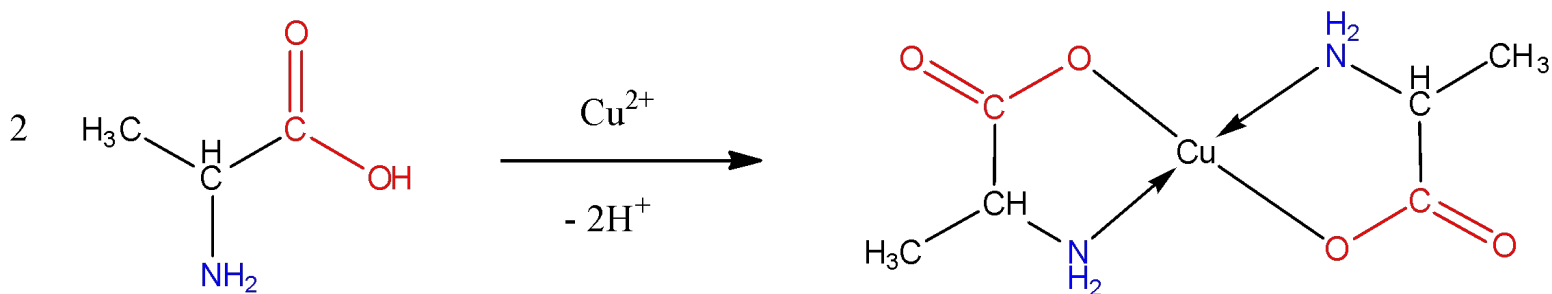


7. Reaction with compounds which contains carbonyl fragment

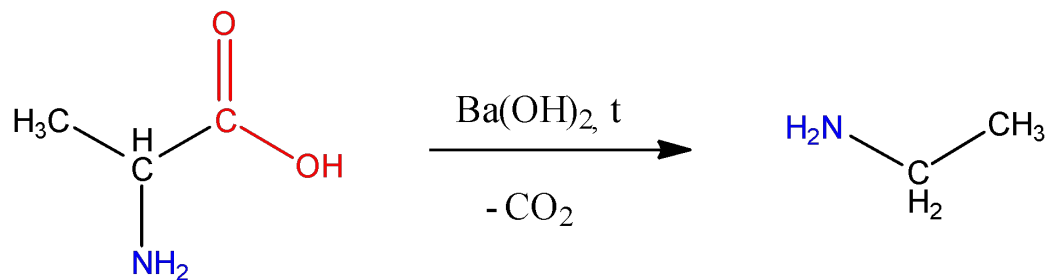


Chemical properties of α -aminocarboxylic acids. Specific properties.

8. Formation of complex compound



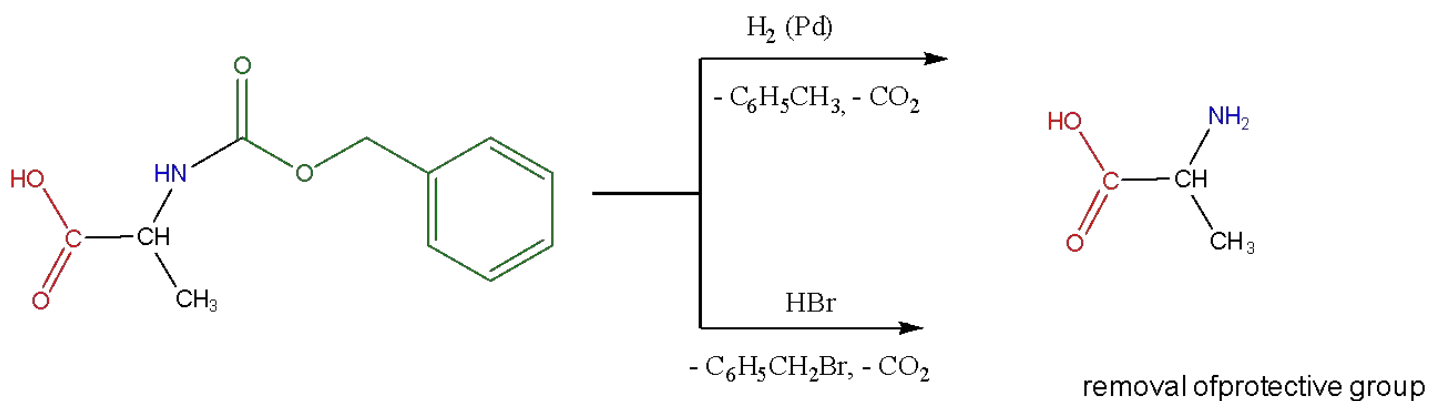
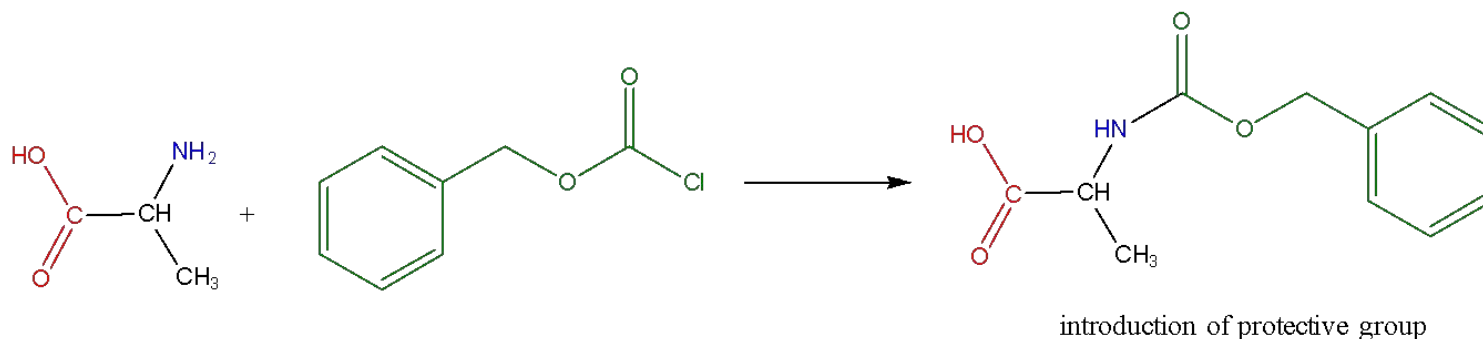
9. Decarboxylation



Chemical properties of α -aminocarboxylic acids.

Protection of amino-group in aminoacids.

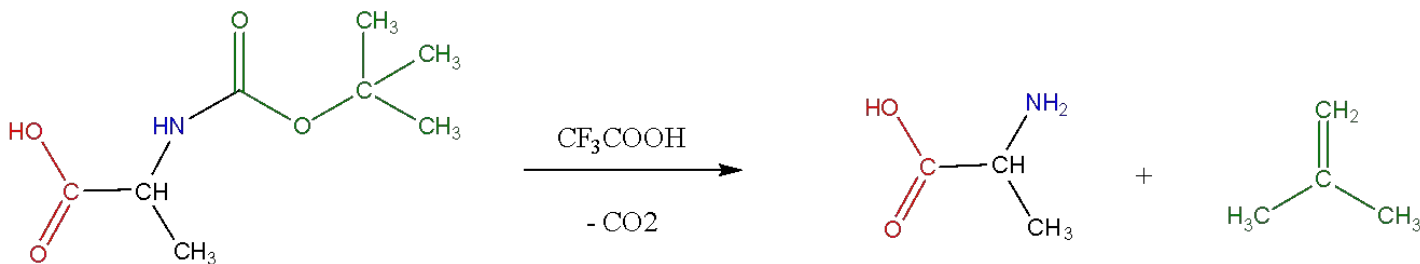
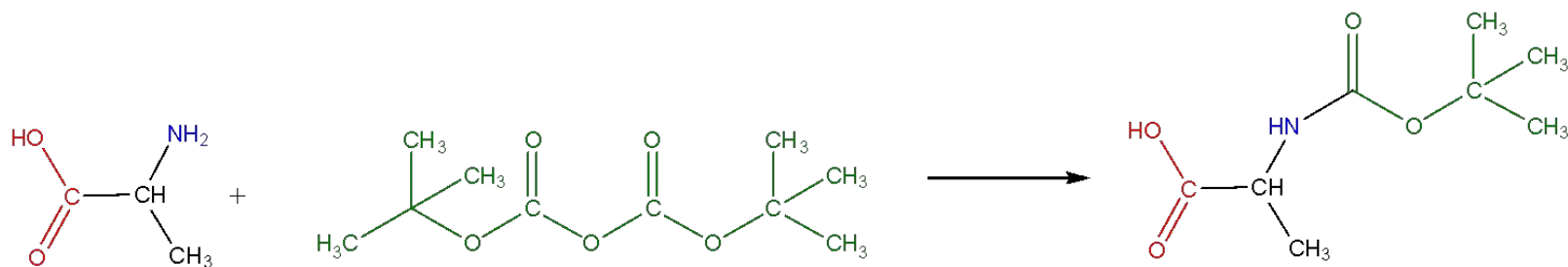
1. Protection by benzyloxycarbonyl chloride.



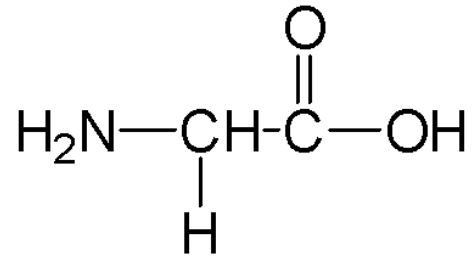
Chemical properties of α -aminocarboxylic acids.

Protection of amino-group in aminoacids.

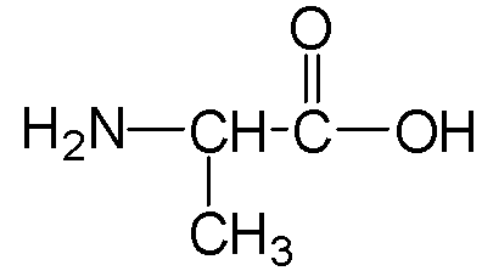
1. Protection by di-tert-butyl dicarbonate.



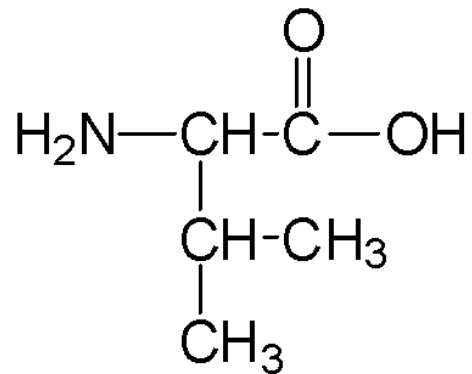
Proteinogenic aliphatic α -amino acids.



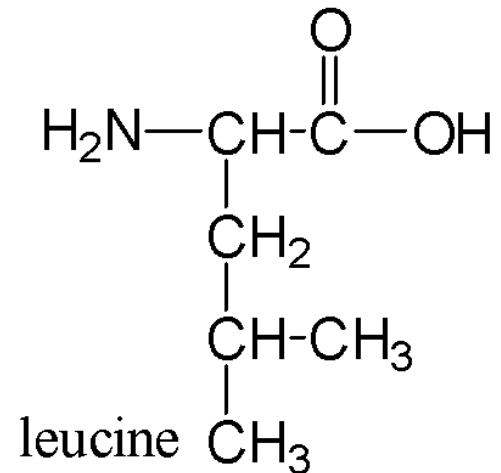
glycine



alanine

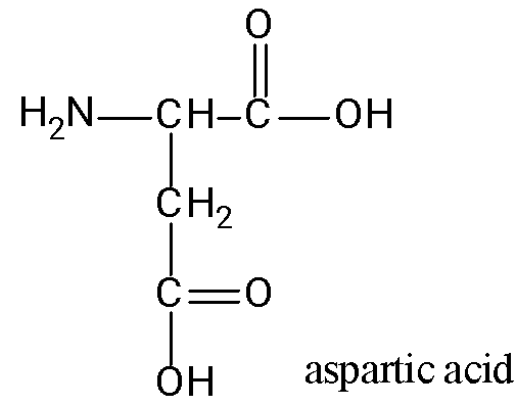
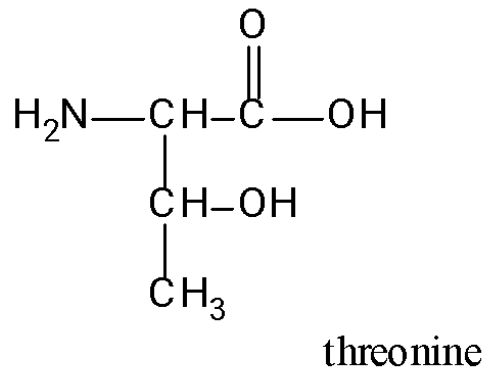
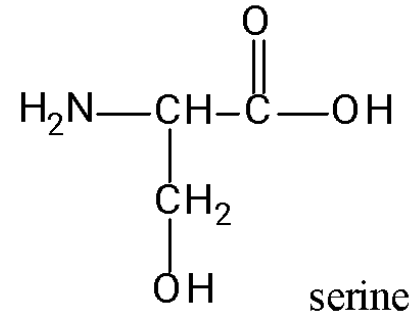
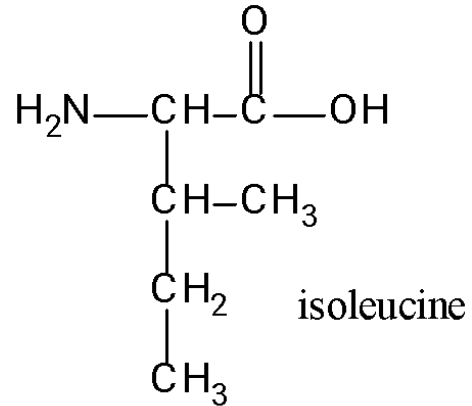


valine

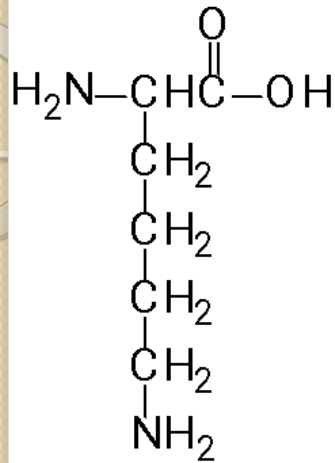


leucine

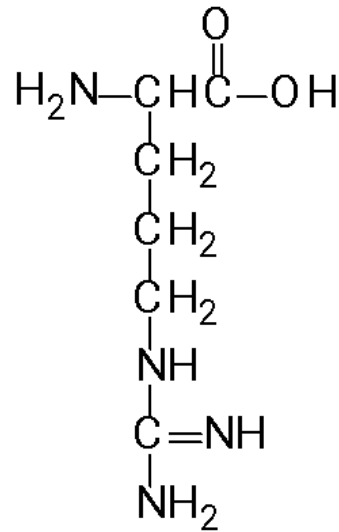
Proteinogenic aliphatic α -amino acids.



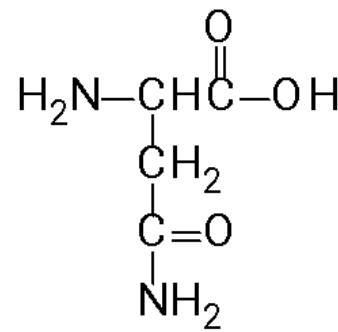
Proteinogenic aliphatic α -amino acids.



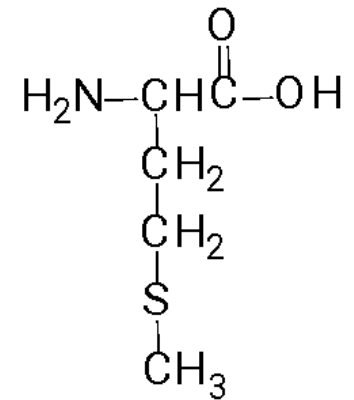
lysine



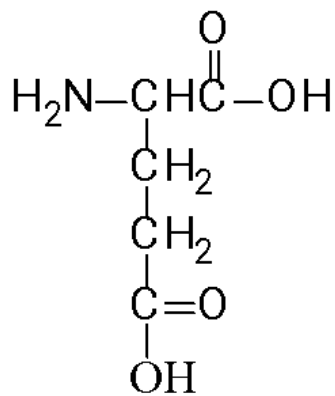
arginine



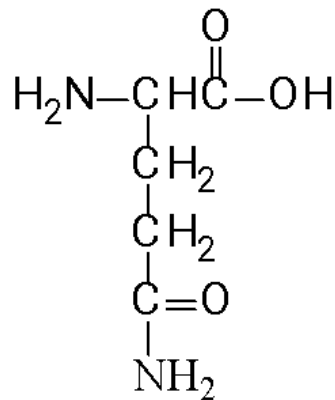
asparagine



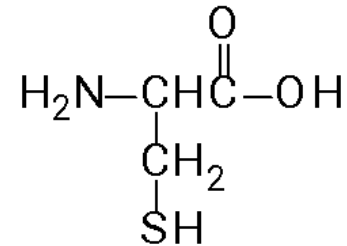
methionine



glutamic acid

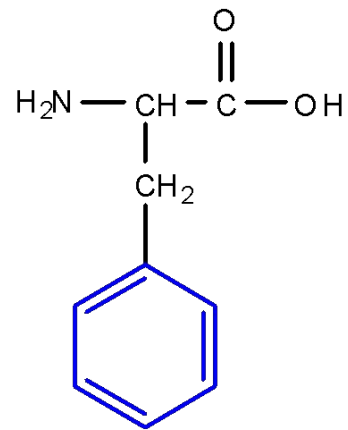


glutamine

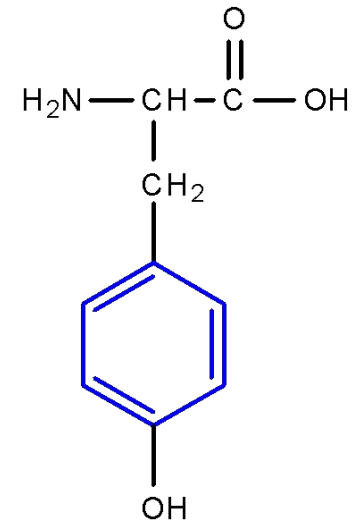


cysteine

Proteinogenic aromatic α -amino acids.

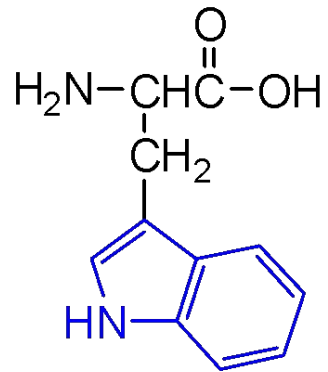


phenylalanine

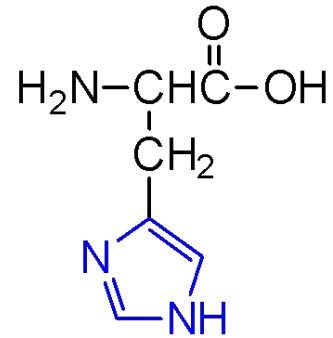


tyrosine

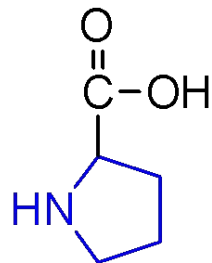
Proteinogenic heterocyclic α -amino acids.



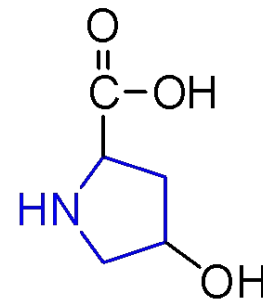
tryptophan



histidine

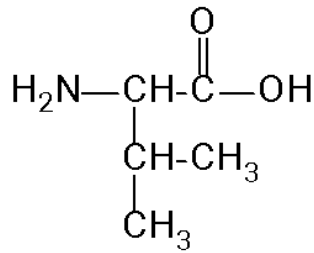


proline

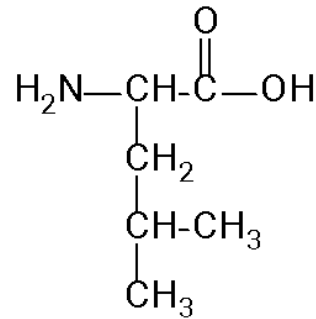


oxyproline

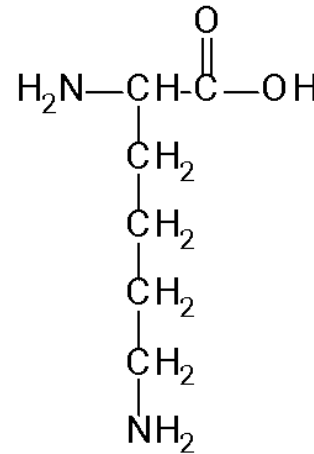
Essential α -aminoacids.



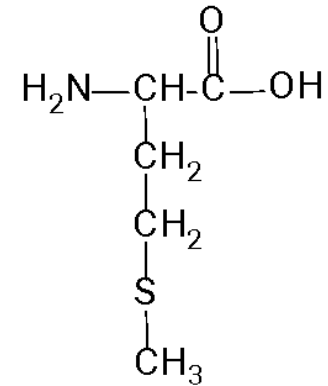
valine



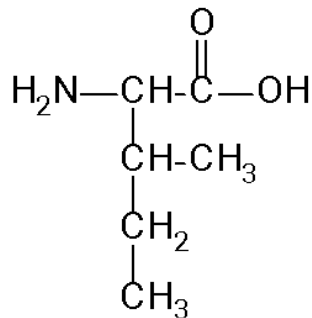
leucine



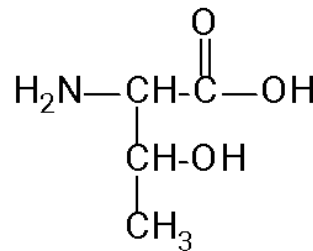
lysine



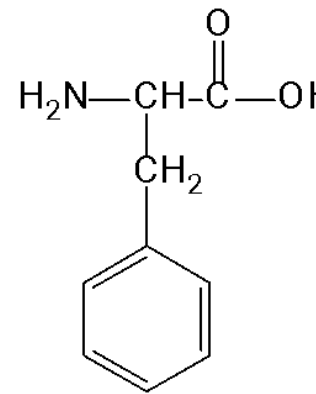
methionine



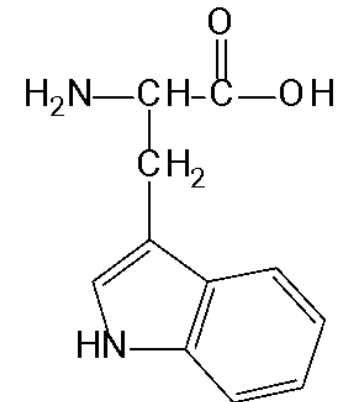
isoleucine



threonine

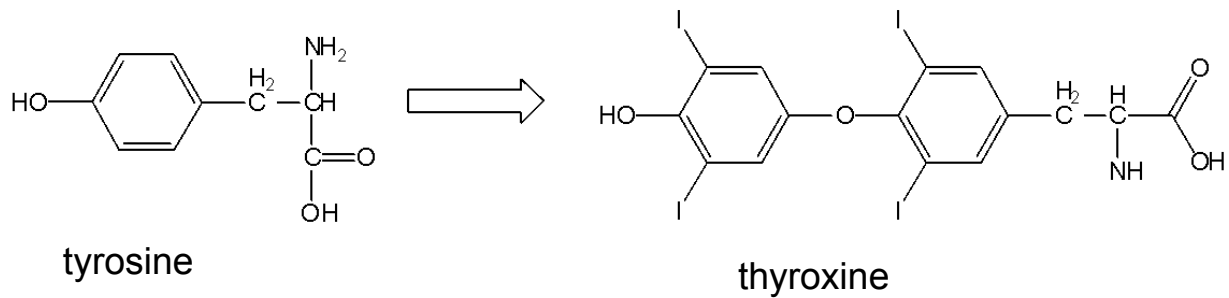
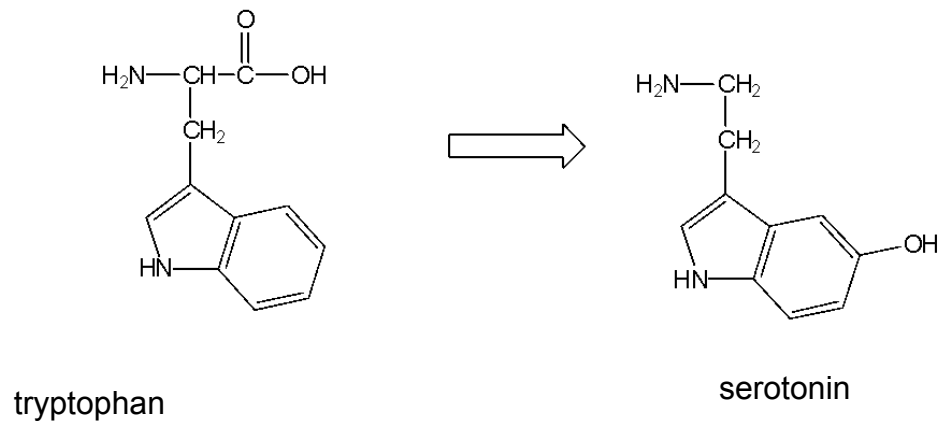
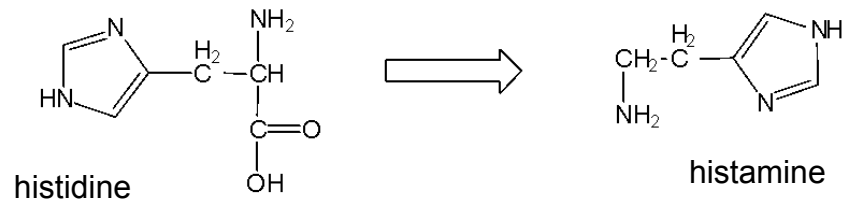


phenylalanine



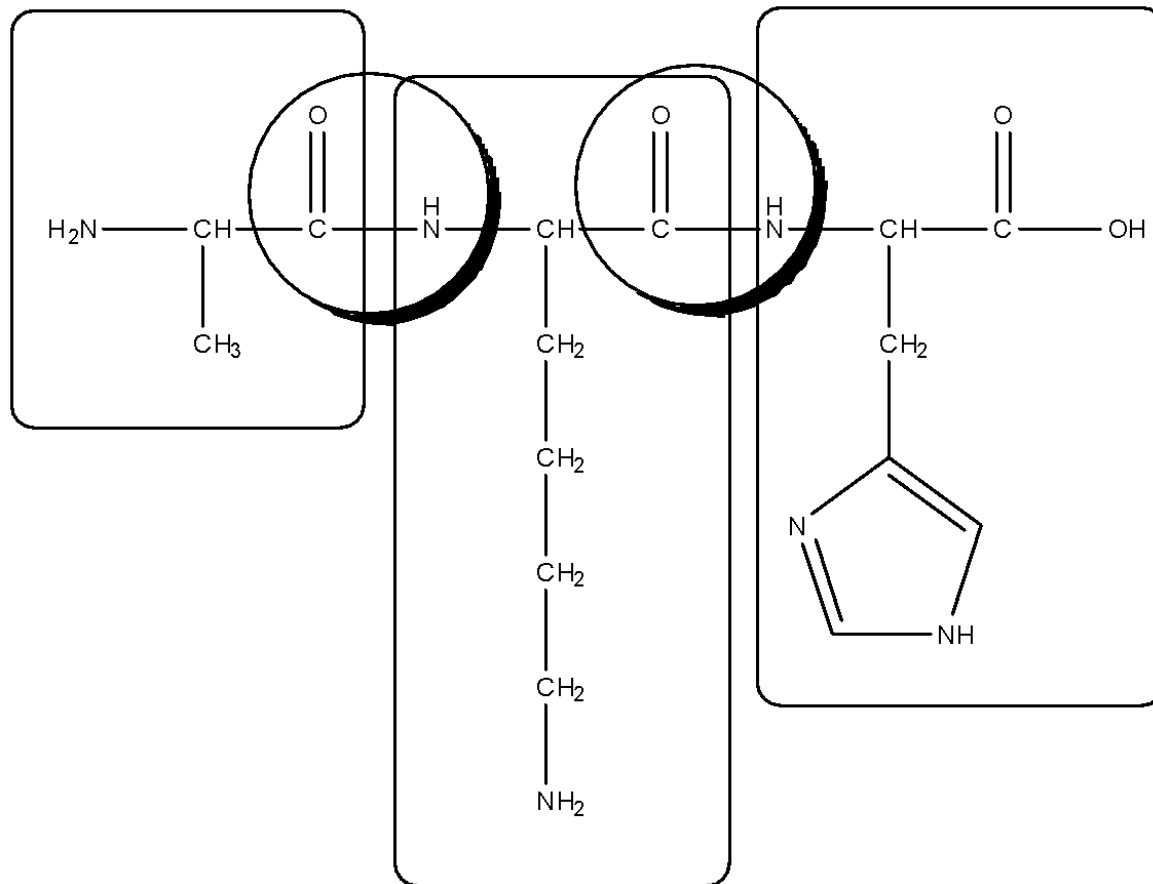
tryptophan

Biologically active compounds – derivatives of α -aminoacids.



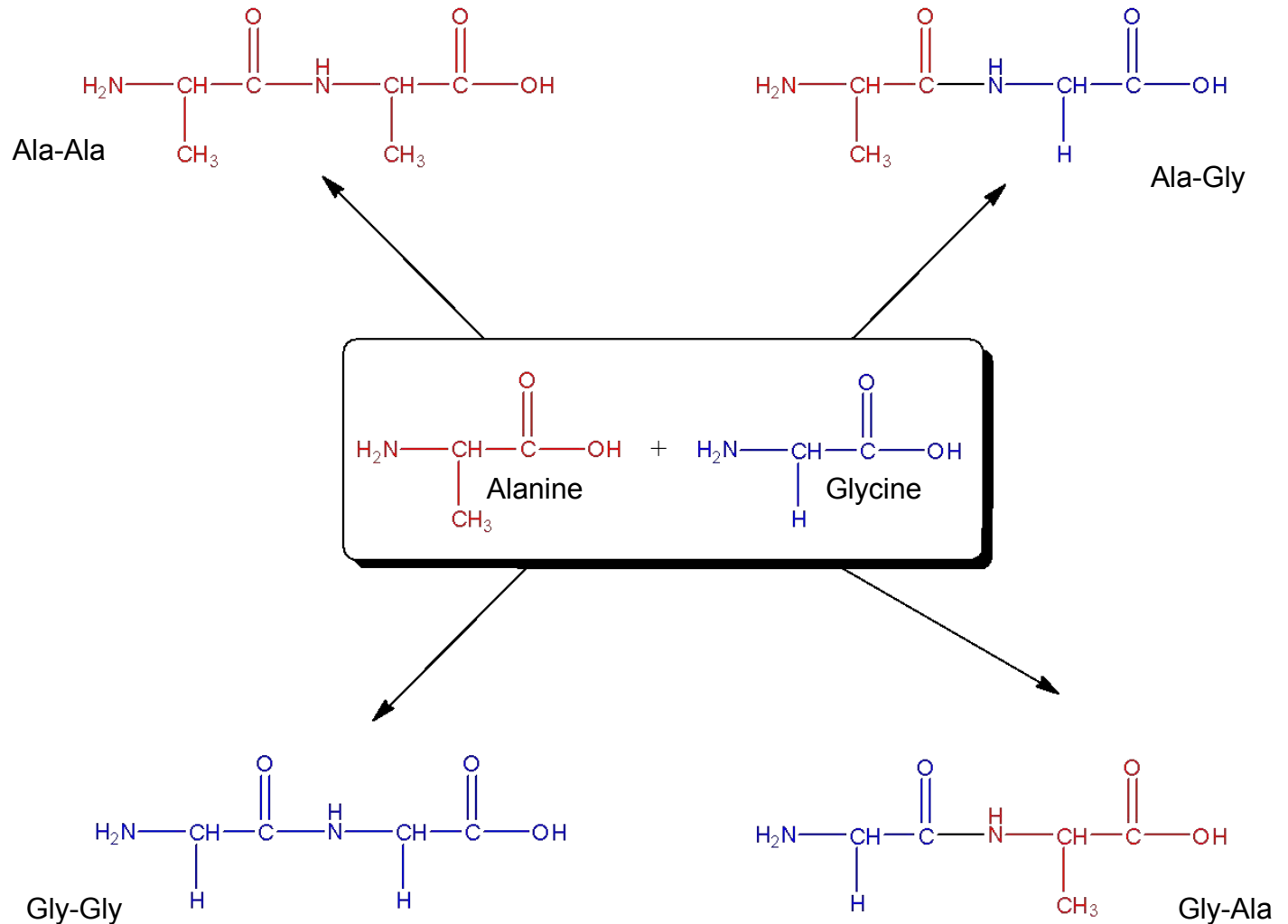
Peptides.

Peptides – polyamides formed by α -aminoacids.

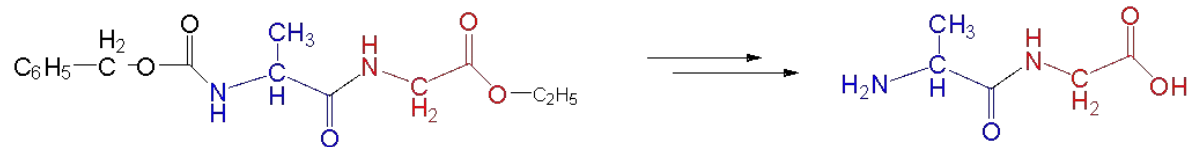
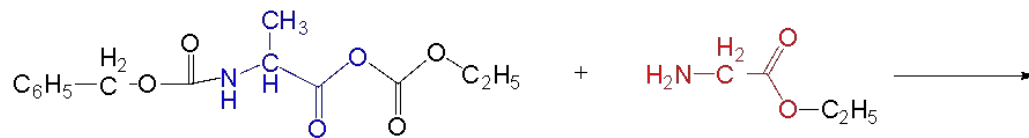
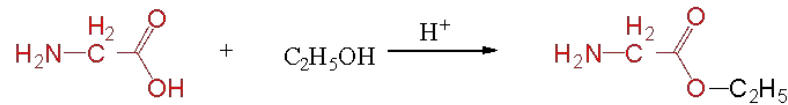
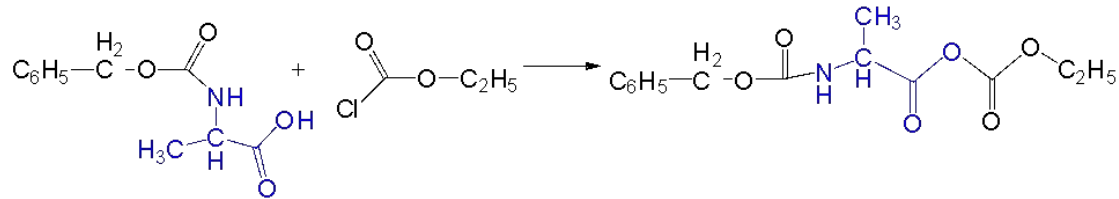
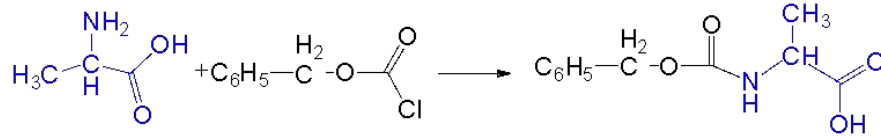


Synthesis of peptides.

Possible products of interaction between two α -aminoacids.



Synthesis of peptides.



Proteins.

Proteins – macromolecular compounds, polypeptides with molecular weight more than 10000.

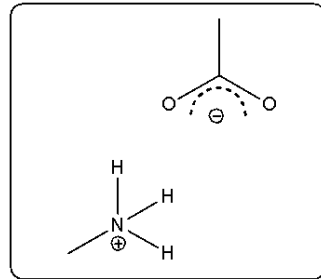
Primary structure – caused by amino acids sequence.

Secondary structure - regularly repeating local structures stabilized by hydrogen bonds.

Tertiary structure - the spatial relationship of the secondary structures to one another.

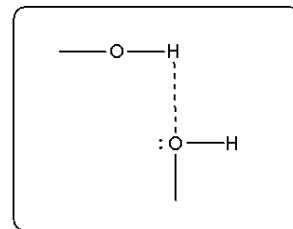
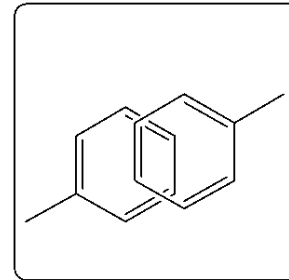
Quaternary structure - the structure formed by several protein molecules bonded by non-covalent bonds.

Interactions in protein molecules



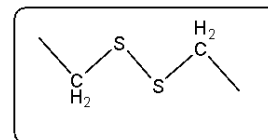
ionic interactions

hydrophobic interactions



hydrogen bonds

disulphide bonds





Thank You for Your attention!