



# PROTEOMICS LECTURE 3

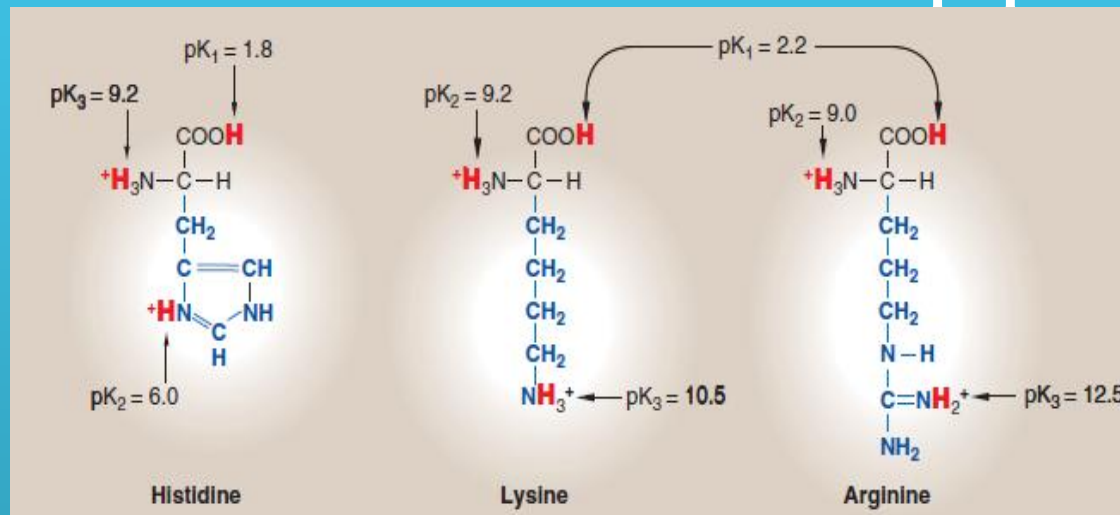
إعداد

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# Chemical classification of amino acids

## 2. Amino acids with basic side chains:

The side chains of the basic amino acids accept protons.



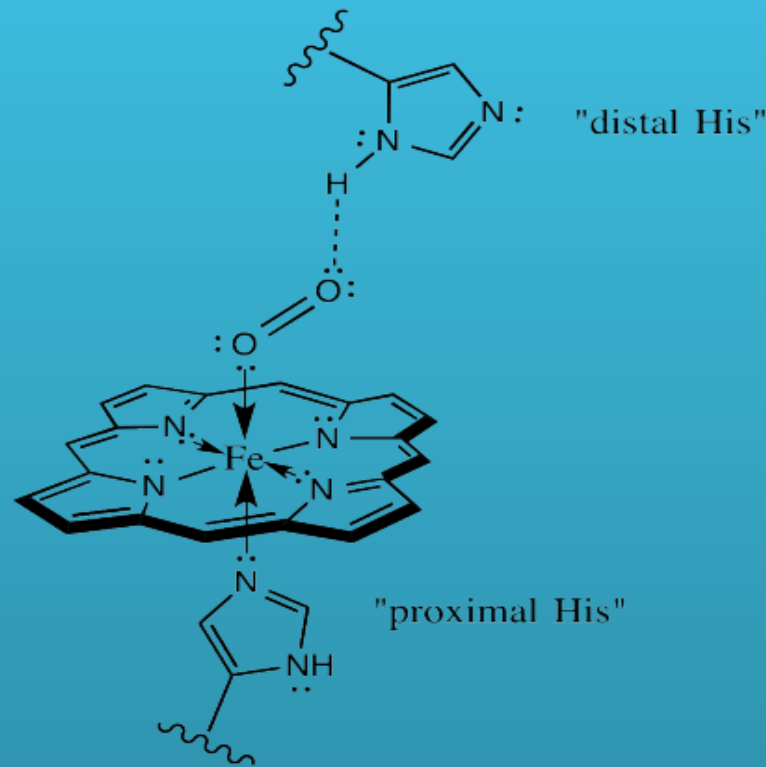
At physiologic pH:

- Lysine and arginine are positively charged.
- Histidine is weakly basic, and the free amino acid is largely uncharged.

# Chemical classification of amino acids

## Histidine:

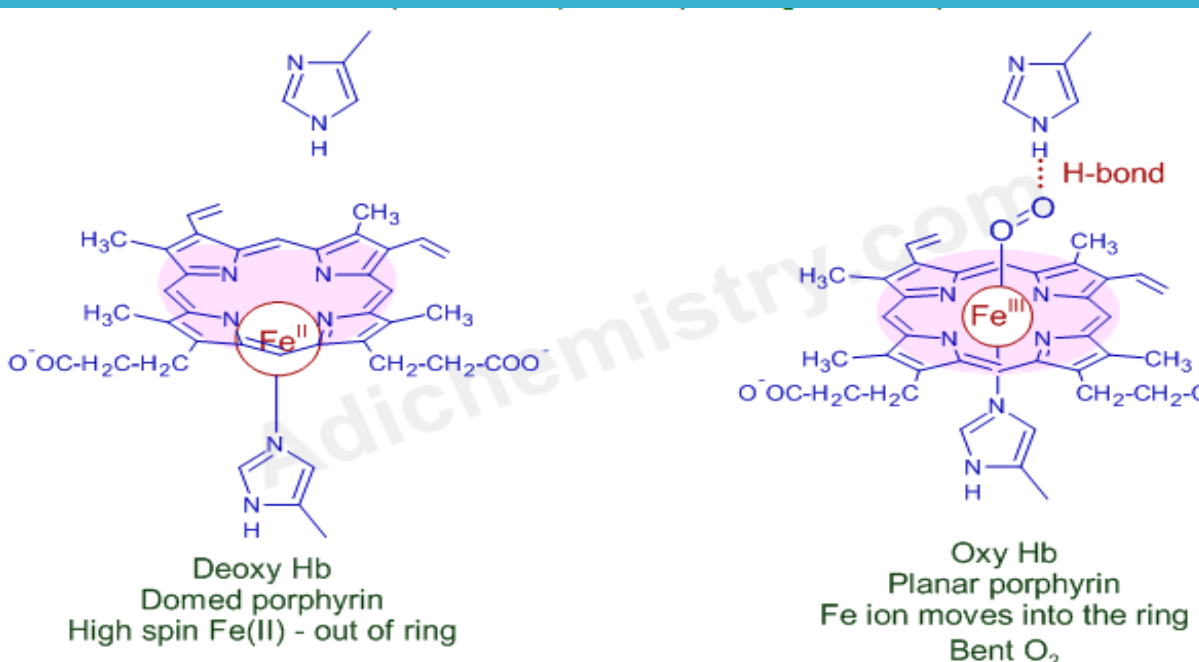
- There are two types of histidine in each heme proximal histidine distal histidine.



# Chemical classification of amino acids

## Histidine:

- **In deoxygenated hemoglobin:** the proximal histidine pulls the iron in heme out of the plane of the heme molecule.
- **In oxygenated hemoglobin:** the distal histidine prevents oxidizing molecules from oxidizing the heme iron.



# Nutritional classification of amino acids

## 1. Essential amino acids:

These amino acids can't be formed in the body and so, it is essential to be taken in diet. Their deficiency affects growth, health and protein synthesis.

## 2. Semiessential amino acids:

Semi-essential amino acids are arginine and histidine. These are formed in the body in sufficient amounts for adults, but not in sufficient amounts for body requirements in children.

## 3. Nonessential amino acids:

These are the rest of the amino acids that are formed in the body in amounts enough for adults and children. They are the remaining 10 amino acids.

# Metabolic classification of amino acids

## 1. Glucogenic amino acids:

They are amino acids that can be converted into glucose via gluconeogenesis. In amino acid catabolism, Glucogenic amino acids form pyruvate or other glucose precursors as an intermediate

## 2. Ketogenic amino acids:

They are amino acids that form acetyl CoA or acetoacetylCoA. These are precursors for ketone Lysine and Leucine are the only pure ketogenic amino acids.

## 3. Mixed ketogenic and glucogenic amino acids:

They give both ketone bodies and glucose. They include phenylalanine, isoleucine, threonine, tryptophan, and tyrosine.

# Biomedical importance of amino acids:

## 1. Amino acids enter in the structure of:

- Body peptides and proteins e g plasma proteins, tissue proteins, enzymes.
- Hormones Some hormones are AA derivatives e g thyroxine, catecholamines.
- Amines Some amino acids give amines by decarboxylation e g histidine gives histamine which is vasodilator.

## 2. Some amino acids as glycine and glutamate act as neurotransmitter

## 3. Some amino acids are used in detoxication reactions as glycine.

## 4. Essential amino acids support growth in infants and maintain health in adults.

# Properties of amino Acids:

## A. Solubility:

All amino acids soluble in water, dilute acid, dilute alkalies and ethanol.

## B. Melting point:

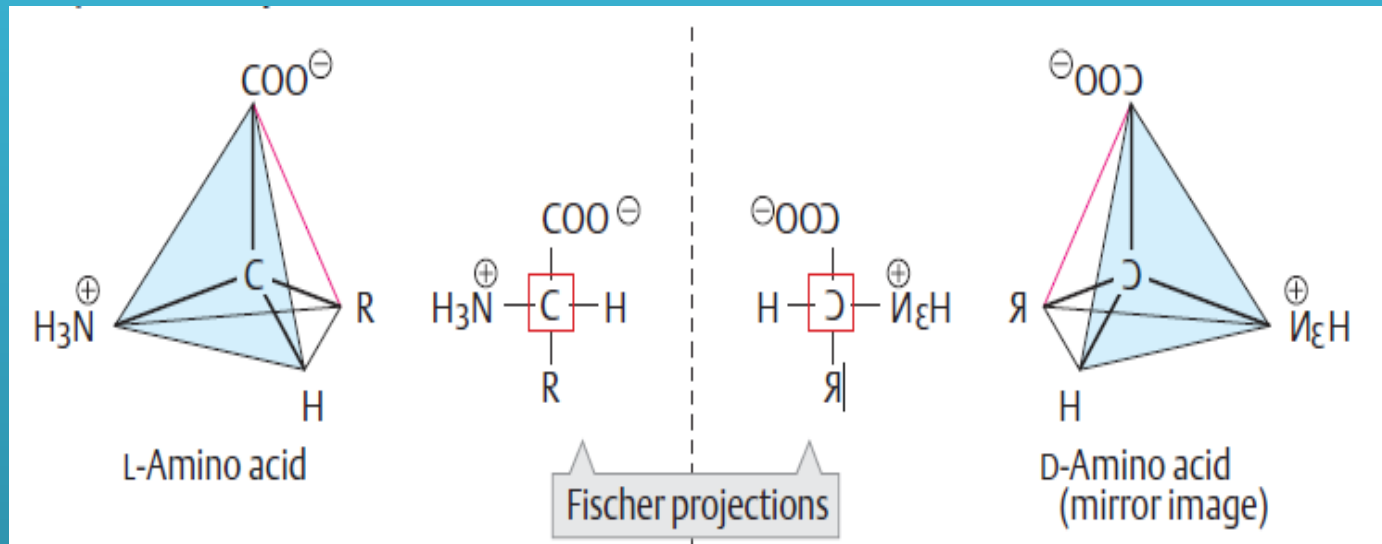
Amino acids have a high melting points above 200 0 C They are very stable molecules.



# Properties of amino Acids:

## C. Optical activity:

The  $\alpha$ -carbon of an amino acid is attached to four different chemical groups and is, therefore, a chiral or optically active carbon atom. Glycine is the exception.

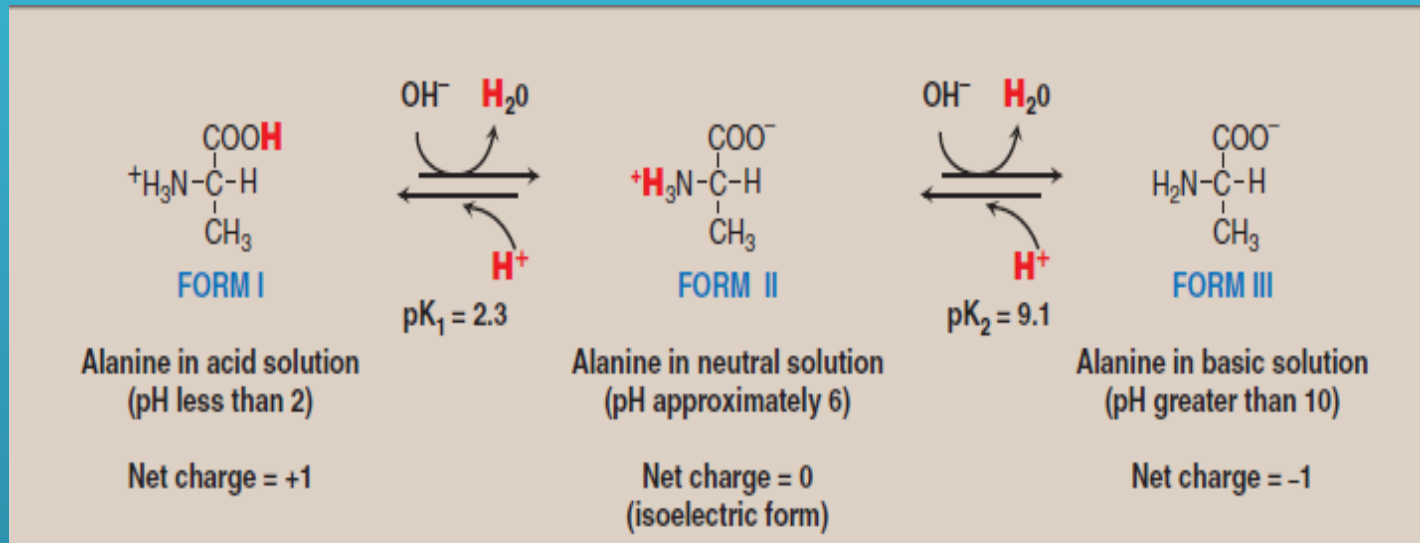


# Properties of amino Acids:

## D. Acidic and basic properties:

The presence of both an amino group and a carboxyl group in amino acids lead to:

1. Amino acids have amphoteric properties.

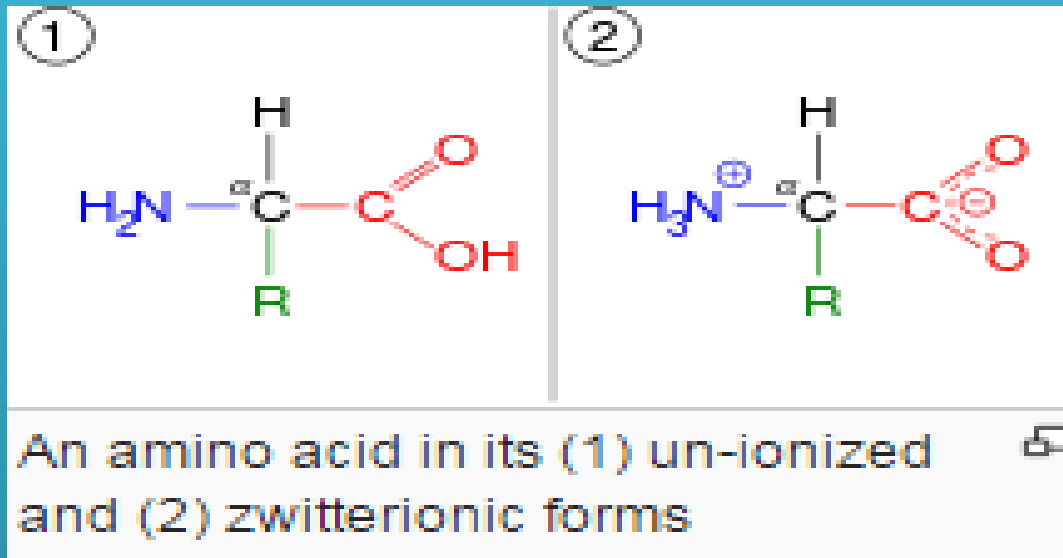


# Properties of amino Acids:

## D. Acidic and basic properties:

The presence of both an amino group and a carboxyl group in amino acids lead to:

**2. Amino acids can form zwitter ions or dipolar ions**



# Properties of amino Acids:

**The dipolar nature of amino acids gives them some unusual properties:**

- Amino acids have high melting points.
- Amino acids are more soluble in water than they are in ether, dichloromethane, and other common organic solvents.
- Amino acids are less acidic than most carboxylic acids and less basic than most amines.



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