

Proteins Classification

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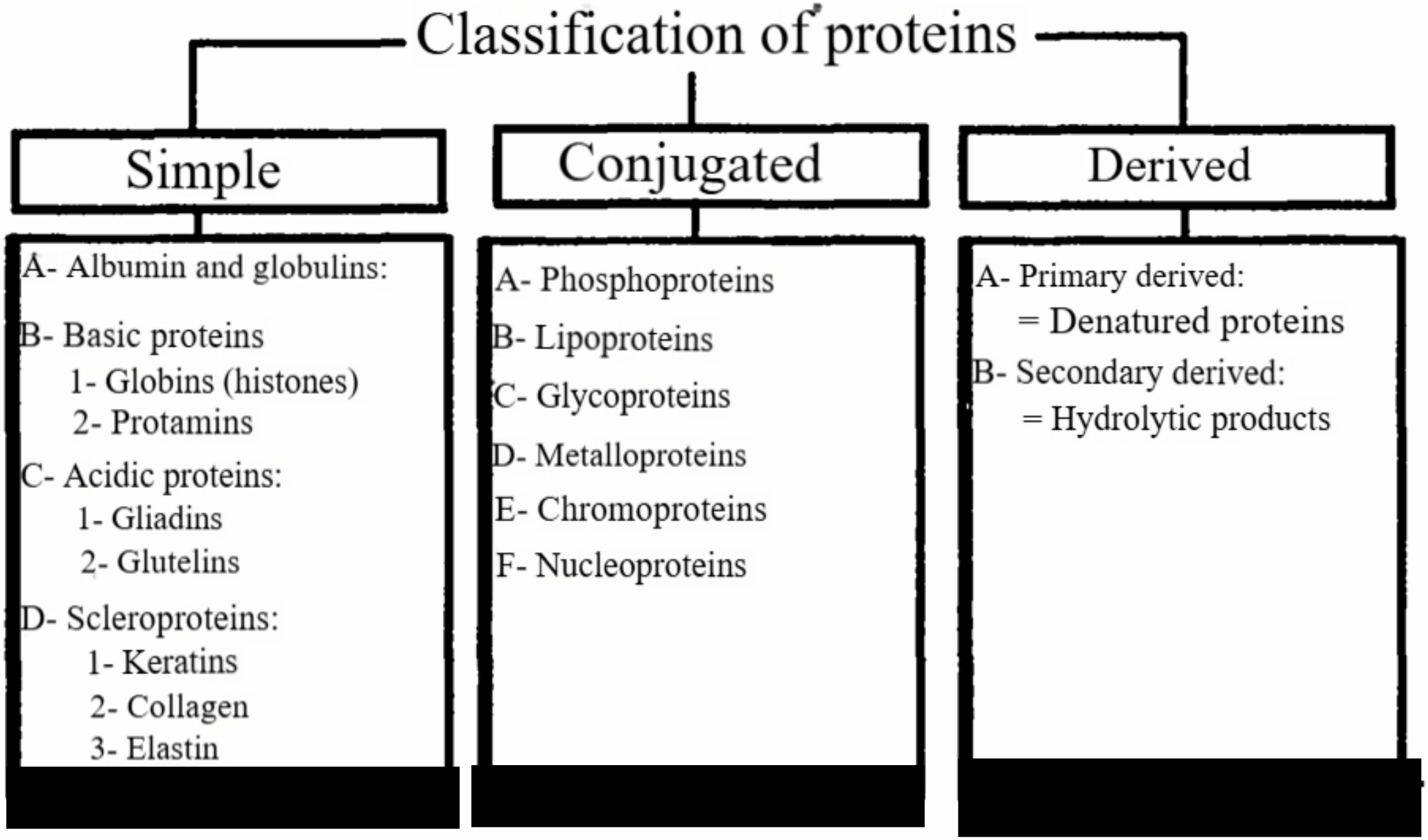
Amphoteric properties of proteins

- Proteins contain free amino group (N-terminal) and free carboxylic group (C-terminal)
- The presence of both free amino and carboxyl groups make the protein amphoteric compound and it can act as a buffer.
- Proteins are positively charged in acidic medium and negatively charged in alkaline medium.

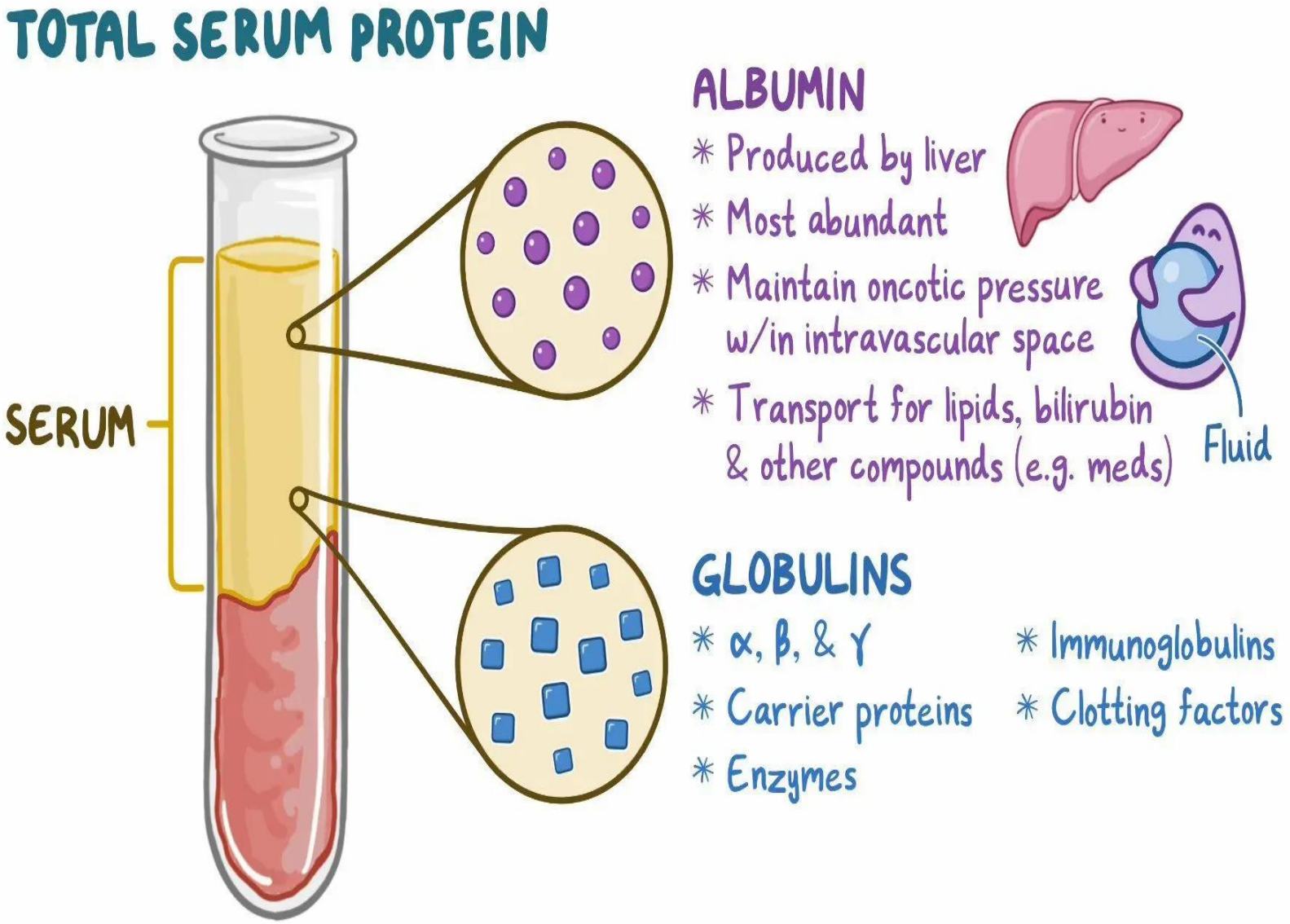
Isoelectric point of proteins

- **Isoelectric point (I.E.P.):** **It is the pH at which the protein molecule carries equal positive and negative charges → neutral**

Classification by Chemical Composition



Simple proteins



Simple proteins

- **By hydrolysis they give amino acids only**

- **Basic proteins**

	Histones	Protamine's
Type of basic amino acid	Histidine	Arginine
Functions	Combined with DNA to form nucleoproteins.	Sperms synthesis
Location	Somatic and germ cells	Only in sperm

Simple proteins

- **Acidic proteins**
- **Gliadins and glutelins**
- Both are acidic proteins, rich in acidic amino acids: glutamic acid.
- Both are present in cereals.



Simple proteins

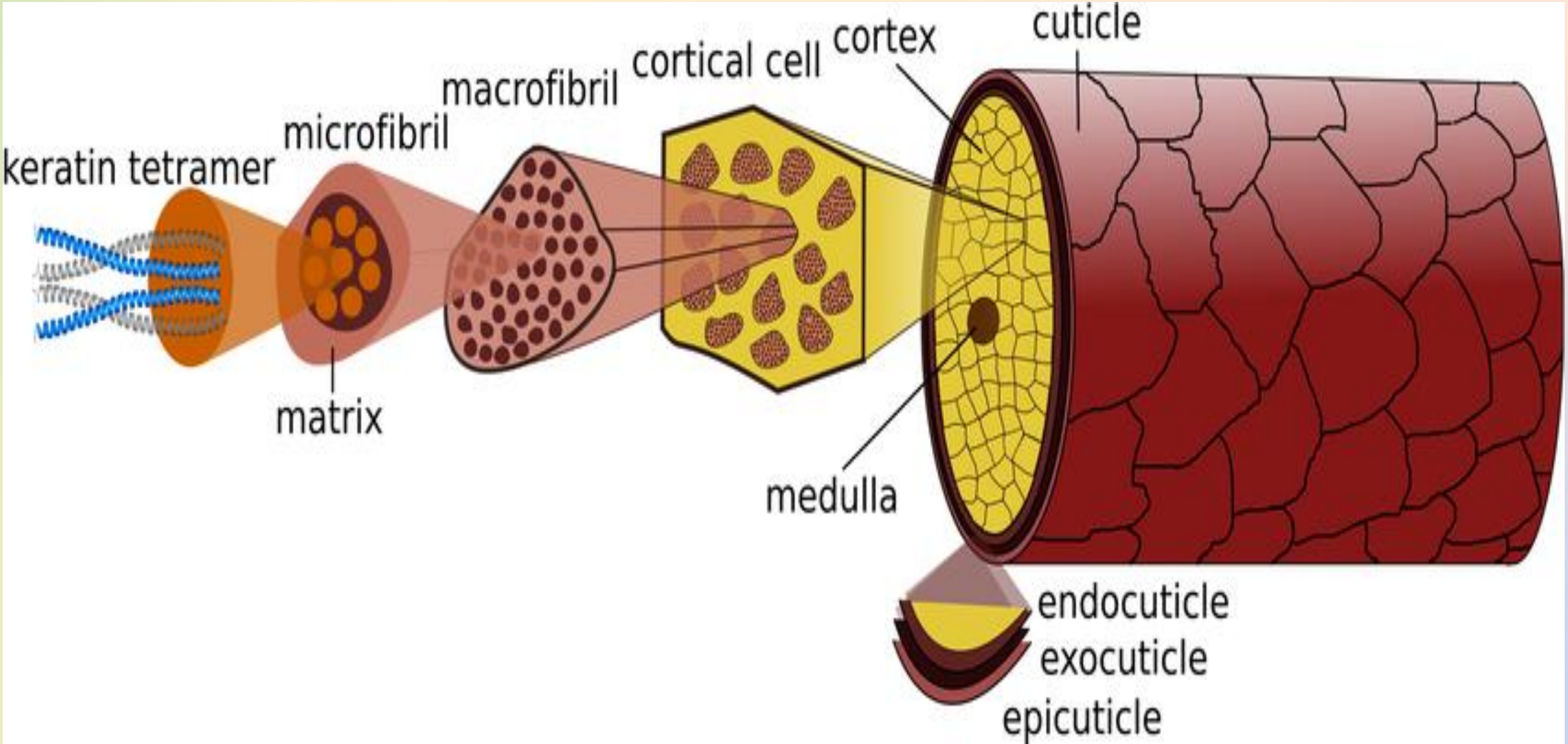
Scleroproteins (fibrous proteins)

- **keratin, collagen, elastin are Scleroproteins**

Keratins

Functions: strengthens skin, hair and nails

Keratin structure



Conjugated proteins

- On hydrolysis, they give protein part (apoprotein) and nonprotein part (prosthetic group). **they include:**
- **Phosphoprotein:** are proteins conjugated with phosphate group.

Examples:

- **Casein**: A milk protein
- **Phosphoenzymes**

Vitellin :Present In egg yolk.

Conjugated proteins

- **Lipoproteins**
- **Are proteins conjugated with lipids.**

Example:

- **Plasma lipoproteins.**

Conjugated proteins

Glycoproteins and proteoglycans

Are proteins conjugated with carbohydrates.

- **Glycoproteins (2-15 sugar units).**
- **Proteoglycans (more than 50 sugar units).**

Examples:

- **Glycoproteins:** Immunoglobulins, transferrin**.**
- **Proteoglycans:** heparan sulfate proteoglycan**.**

Conjugated proteins

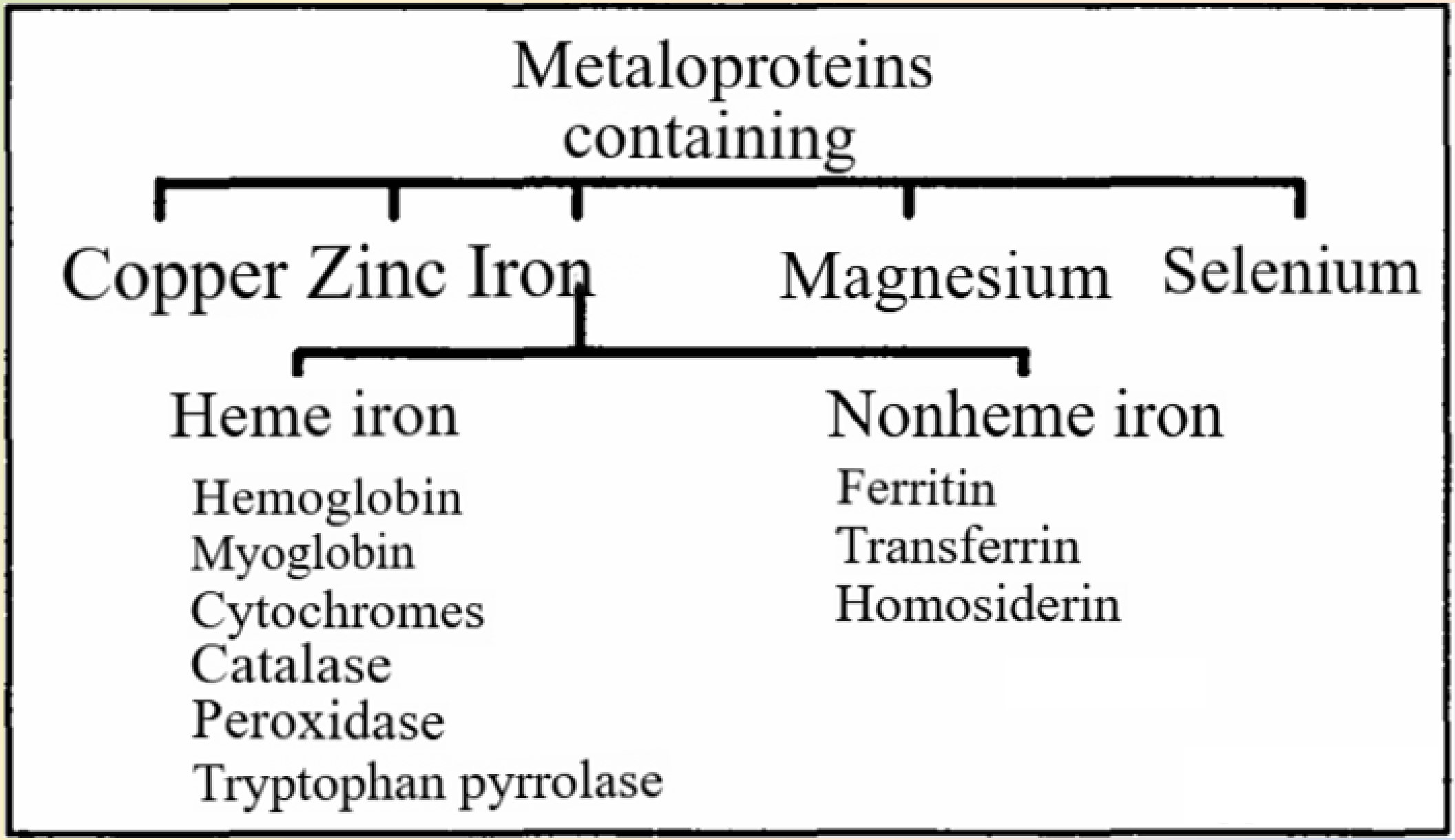
Nucleoproteins

- **Are proteins (protamine's or histones) conjugated with nucleic acids (DNA or RNA).**

Examples:

- **Chromosomes:** (**histone** + DNA).
- **Ribosomes:** (**proteins** + RNA).

Metalloproteins



Metalloproteins

1. Metalloproteins containing Iron:

The iron may be in the form of heme or nonheme iron

A. Heme Iron:

Hemoglobin

Myoglobin

Metalloproteins

B. Nonheme Iron:

Ferritin: Is the storage form of iron, present in liver, spleen, bone marrow and intestinal cells.

Transferrin: the iron carrier protein in the plasma.

Metalloproteins

2. Metalloproteins containing copper

Ceruloplasmin: Is plasma protein, responsible for the oxidation of ferrous ions (Fe^{+2}) into ferric ions (Fe^{+3}).

3. Metalloproteins containing zinc

Insulin hormone.

Metalloproteins

4. Metalloproteins containing magnesium:

kinase and phosphatase enzymes.

5. Metalloproteins containing selenium:

Glutathione peroxidase.

Chromoproteins

- They are proteins conjugated with colored elements.

Divided into:

- **Metalochromoproteins** (contain colored metal)
- **Non- metalochromoproteins** (contain colored pigment).

Denaturation of proteins

- Loss of all protein structures (secondary, tertiary and quaternary) except the primary structure.
- Break of all bonds except the peptide bond .
- Loss of protein function.

Factors that cause denaturation of proteins

1. PH change by: strong acids & bases

2. Heavy Metals

3. Temperature

4. Heat

5. Radiation

6. Enzymes



THANK YOU