FAQs

1. Write a note on proteins.

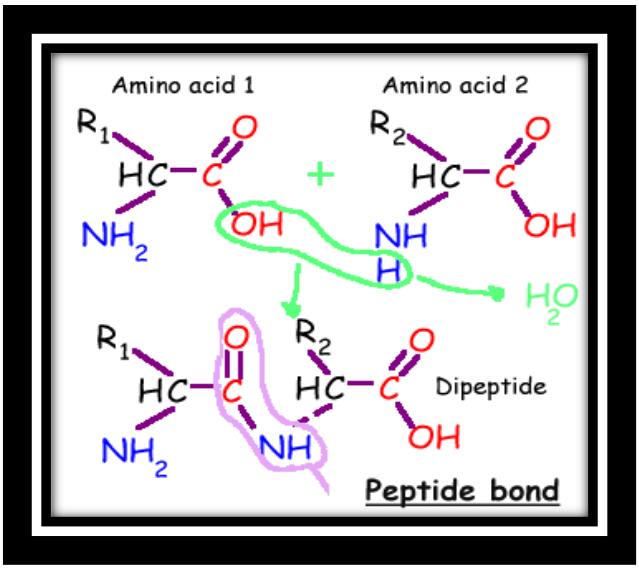
Ans: Proteins are the most abundant macromolecules in living cells and constitute 50% or more of their dry weight.About 50% of protein is present in muscle, 20% in bone, 10% in skin & the rest is present in other parts of the body.The term protein is derived from the Greek word ‘proteuo’ meaning first suggested by Mulder (1840) who recognized that without it no life is possible.Proteins are needed for growth, maintenance & repair of body tissue. They regulate key processes in the body & any excess proteins from the diet can be used as source of energy.

2. Explain the chemical composition of proteins.

Ans: Proteins are polymers & are made up of individual amino acids which are joined together by an amide linkage called a **‘peptide bond’**.In protein molecule the amino acid residues are covalently linked to form very long unbranched chains united in a head to tail arrangement. These macromolecules called polypeptides may contain hundreds of amino acid units. Some proteins contain one polypeptide & others contain two or more. Each polypeptide chain has a definite molecular weight, chemical composition, sequential order of its amino acids & three dimensional structures.

3. What is a peptide bond? Give its structure.

   Ans: A peptide bond is a bond which is formed between the amino group of one amino acid to carboxylic group of another amino acid releasing a molecule of water.



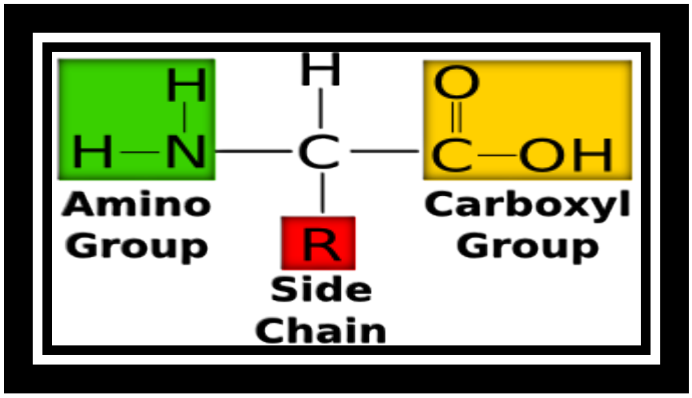
4. Structure of amino acids.

Ans: Amino acids are the basic units for proteins & exist as isomers. Most of the naturally occurring amino acids are of the L-form.

Typical amino acid has three features:

- ✓ Carbon skeleton
- ✓ free amino group (NH_2),
- ✓ a free carboxyl group (COOH), & a hydrogen atom (H) attached to central carbon.

  The amino group (N) of one amino acid is joined to the carboxyl (C) of another amino acid.



5. Write a note on physico-chemical properties of proteins.

Ans: The physico chemical properties of proteins are as follows:

- *Amphoteric behavior*: like amino acids proteins are ampholytes i.e., they act as both acids & bases. As electrolytes they migrate in an electric field.
- *Electrophoresis*: the movement of a charged particle in an electric field towards the oppositely charged electrode is called electrophoresis. Proteins migrate in an electric field except at the isoelectric point.
- *Solubility*: each homogenous protein has a definite & characteristic solubility in a solution of known salt concentration &pH. The solubility of protein is minimum at the isoelectric point & increases with acidity & alkalinity.
- *Colloidal nature*: proteins have large molecular weights & protein solutions are colloids & therefore, do not pass through semi permeable membranes.

6. Explain the classification of proteins.

Ans: Proteinsare classified into various types & are as follows:

1) Based on their functions; they are divided as essential & non-essential.
2) Based on nature; they are classified as acidic & basic proteins.
3) They are also grouped into simpler, conjugated & derived proteins based on their composition.
4) Based on conformation; they are divided as globular & fibrous proteins.

7. Give the nutritional classification of amino acids.

Ans: Amino acids can be divided nutritionally as essential & non-essential acids based on their body requirements. Essential amino acids are those which cannot be synthesized in the body & have to be taken through diet.

Essential amino acids include leucine, isoleucine, valine, histidine, lysine, methionine, phenyl alanine, tryptophan, and threonine. Non-essential amino acids are the ones which thehuman body can manufacture in required amounts & need not be taken through the diet. These include alanine, arginine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, proline, serine, glycine and tyrosine.

8. Discuss the functions of proteins.

Ans: Proteins are the important macromolecules which are essential for every biochemical reaction within the body. They play essential roles in many functions of the body. Theyact as enzymes, speeding up chemical reactions, as hormones, they are chemical messengers, maintain acid & base balance of body fluids by taking up or giving off hydrogen ions as needed by the body. They also transport many key substances such as oxygen, vitamins and minerals, to target cells throughout the body. They form basic skeleton of many structures like hair, skin, bone, nails, etc. Protein antibodies protect the body from infection & illness. If needed, they also can be used as a source of energy or glucose.

9. Write a note on sources of dietary proteins.

Ans: Although both animal & plant foods contain protein, the quality of protein in these foods differs. Dietary protein is found in meats, dairy products, legumes, nuts, seeds, grains, vegetables. In general, animal foods contain higher quality proteins than in plant foods. Good sources of protein are milk, meat, fish and egg among non-veg foods. Cereals, pulses, some vegetables are moderate sources of proteins.

10.Discuss on the digestion & absorption of proteins in human body.

Ans: Protein digestion begins in the stomach, where hydrochloric acid denatures protein & then the stomach acid unfolds proteins exposing them to digestive enzyme pepsin which breaks proteins to smaller peptides. Digestion then continues in small intestine, where proteases break

polypeptides into smaller peptide units, which are then absorbed into cells where additional enzymes complete digestion to amino acids. These amino acids are further absorbed into the capillaries of villi & travel in the bloodstream to tissues as needed. They are also stored in liver to manufacture a variety of important substances.

11. Explain Protein energy malnutrition (PEM).

Ans: Protein energymalnutrition is a condition resulting from long term inadequate intakes of protein & energy that can lead to wasting of body tissues & increased susceptibility to infection. Many situations contribute to PEM, such as poverty, decreased food intake, poor food quality, unsanitary living conditions & improper feeding. Although it can occur at all stages of life, it is most common during childhood, when protein requirement is needed to support rapid growth. Symptoms of PEM can be mild or severe & exist in either acute or chronic forms.

12.Give the classification of PEM.

Ans: PEM can occur either as calorie deficient or protein deficiency. Severe protein deficiency is called kwashiorkor, whereas severe calorie deficiency is called marasmus. Kwashiorkor is a type of malnutrition that occurs primarily in young children who have an infectious disease & whose diets supply marginal amounts of energy & very little protein. Marasmus is a type of malnutrition resulting from chronic inadequate consumption of protein & energy that is characterized by wasting of muscle, fat & other body tissue.

13. Discuss the differentiating factors leading to marasmus & kwashiorkor.

Characteristics	**Kwashiorkor**	**Marasmus**
Deficient nutrient invovled	Calories & protein but more protein	Calories & proteins but more calories
Signs & symptoms On set	1-3 years	Any age
Weight	60-80%	< 60%

Edema	Present	absent
Skin changes	Scaly pigmentation,	Wrinkled skin
Hair changes	Distorted	Not altered
Growth retardation	Not so severe	severe
Mental changes	More affected	Usually normal
Muscle wasting	Less	More
Diarhorrea	Present	Not common

14. What are the consequences of excess proteins on human health?

Ans: Proteins in adequate amounts are needed for the normal functioning of the body; any excess amount can lead to complications which may be fatal. In developed countries, excess protein & energy are a greater problem than protein deficiency. Diets rich in animal protein are often associated with high intakes of saturated fat & cholesterol which are known to cause obesity, heart diseases, osteoporosis, and certain types of cancers.