

Q.1 Define biochemistry. Explain scope & Importance of biochemistry :-



Biochemistry :-

Biochemistry can be defined as the science concerned with the chemical nature & chemical behaviour of living matter.

Importance of Biochemistry :-

- 1) To evaluate nutritive value of cereals & pulses.
- 2) Development & exploitation of better genotype.
- 3) Removal or inactivation of toxic and anti-nutritional factors present in the food grains in general and the grain legumes in particular.
e.g. BOAA (Boxyalyl) & amino oxalane)
- 4) Removal or inactivation of toxic and anti-nutritional factors present in the food grains in general and the grain legumes in particular.
- 5) Evaluation of nutritive value of cattle & poultry feed.

5) Biochemistry of disease & pest resistance in plants.

6) Biochemistry of drought resistance varieties

7) Use of non-conventional source of food

8) Synthesis & degradation of constituents of living tissue.

Scope of Biochemistry:-

1) The nature of chemical constituents of the living matter & the chemical substance produced by living things

2) The functions & transformation of chemical entities in biological system.

3) The chemical & energetic changes associated with the transformation in the activity of living matter

4) Modern Biochemistry has two branches describe & dynamic biochemistry.

Q. 2 Define carbohydrate. Give the classification of carbohydrates & function of carbohydrates.

⇒ * Carbohydrate :-

Carbohydrate are defined as the aldehyde or ketone derivatives of polyhydroxy alcohols.
Hence each carbohydrate contains aldehyde ($-CHO$) or ketone ($C=O$) group in its structure.

* Classification of carbohydrates :-

1) Monosaccharides :-

Simple sugars that cannot be split further by hydrolysis.

a) Aldoses :- Monosaccharides containing $-CHO$ group
e.g. glucose, galactose.

b) Ketoses :- Monosaccharides containing $C=O$ group
e.g. fructose.

2) Oligosaccharides :-

Sugars that yield 2-10 molecules of monosaccharides on hydrolysis.

a) Disaccharides :-

Sugars made up of two monosaccharides
e.g. sucrose, lactose, maltose

i) Reducing sugar :-

Sugars having free or potentially free $-CHO$ or $C=O$ groups. e.g. lactose, maltose

ii) Non-reducing sugars :-

Sugars having no free or potentially free $-CHO$ or $C=O$ groups i.e. sucrose

4] Trisaccharides :- Sugars made up of three monosaccharides
e.g. Raffinose.

5] Tetrasaccharides :-

Sugars made up to four monosaccharides
e.g. Stachyose.

6] Polysaccharides :-

Carbohydrates made up of ~~large but~~ ^{more than 10} molecules than monosaccharides on hydrolysis known as polysaccharides.

Classification of polysaccharides :-

- 1) on the basis of function
- 2) on the basis of composition

1) on the basis of function :-

- 1) storage polysaccharide :- e.g. starch, glycogen
- 2) structural polysaccharides :-
e.g. cellulose, pectin

2) on the basis of composition

- a) Homopolysaccharides
- b) Heteropolysaccharides

a) Homopolysaccharides :-

The polysaccharide yield the same type of monosaccharides is known as Homopolysaccharide
e.g. Glycogen, pectin, starch

b) Heteropolysaccharides :-

Polysaccharides yield the different type of monosaccharides
e.g. Hyaluronic acid

Define carbohydrates & its importance & classification with examples.

Carbohydrates :-

Carbohydrates are defined as polyhydroxy aldehydes or polyhydroxy ketones & the substance which yield these derivatives on hydrolysis.

Importance :-

- 1) Supply energy
- 2) Stored energy for future use
- 3) Structural constituents
- 4) Proteins sparing actions
- 5) Necessary for oxidation of proteins & fat.
- 6) Necessary for synthesis of non essential amino acids.
- 7) Conserve water & electrolyte
- 8) Beneficial effect on microflora.

Q.3 Properties of water, pH & buffer.

⇒ Properties of Buffer :-

- 1) Good buffers have a high solubility in water. Since most biological system naturally use water as their solvent.
- 2) It not pass through all membrane.
- 3) Buffer has minimal ionic solvent content to reduce this complications.
- 4) When amount of strong acids or base is added the pH doesn't change.
- 5) Buffers are often used in research involving living cells.
- 6) Buffers form a small number of complex that are soluble to prevent any accumulation that can affect the research.
- 7) It is resistance to non-enzymatic degradation & other component of setup.

Properties of water :-

- 1) Water is colourless & tasteless liquid.
- 2) Water is an excellent solvent.
- 3) Water has a high latent heat of vaporization.
- 4) Water can act as both acid & base.
- 5) Water has no odour.
- 6) ~~vis~~ Viscosity of water is 0.89 cP.
- 7) The crystal structure of water is hexagonal.
- 8) Molecular shape is bent.
- 9) Water has very strong hydrating tendency.

Properties of pH :-

- 1) The pH is measure of how acidity/basic water is.
- 2) The range goes from 0-14.
- 3) With 7 being neutral.
- 4) pH of less than 7 indicates acidic ~~bases~~ in nature.
- 5) pH of greater than 7 indicates the basic in nature.
- 6) pH is indicate the power of hydrogen.
- 7) pH is really a measure of relative amount of three hydrogen & hydroxyl ion in the water.

Q 4 Define nucleic acid & write down importance, classification & structure of nucleic acid.

⇒ Nucleic acid :-

Nucleic acids are the polynucleotides having high molecular weight. The monomeric unit of which is nucleotide.

Types of nucleic acid :-

1) Ribonucleic acid (RNA)

RNA may be found in nucleus but mainly occurs in cytoplasm carry out protein synthesis work.

~~2) Deoxyribonucleic acid (DNA) :-~~

Types of RNA :-

- 1) Transfer RNA (t-RNA)
- 2) Messenger RNA (m-RNA)
- 3) Ribosomal RNA (r-RNA)

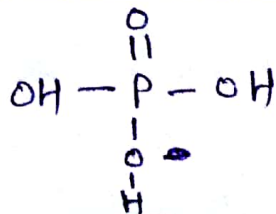
2) Deoxyribonucleic acid (DNA) :-

It occurs in nucleus as well as cell organelles like chloroplast & mitochondria.

Types of DNA :-

- 1) A-DNA
- 2) B-DNA
- 3) Z-DNA.

Structure of nucleic acid :-



Importance of nucleic acids :- / functions of nucleic acids

- 1) They carry genetic information (DNA)
- 2) Use in protein synthesis (RNA).
- 3) DNA store genetic information & control protein synthesis
- 4) Direct synthesis of specific protein (RNA)
- 5) m-RNA. To take genetic message from DNA.
- 6) (t-RNA) transfer attached amino acid (codon) to the site of protein synthesis.

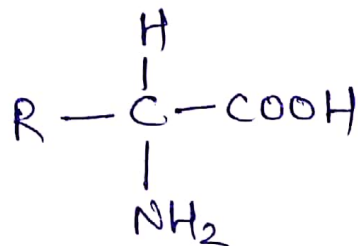
~~Functions of nucleic acids~~

3, 5 Define amino acids & give the classification of amino acid & properties of amino acids.

⇒ Amino acids :-

Amino acids are organic acids which contain both basic (amino $-NH_2$) & acidic (carboxyl $COOH$) groups.

The functional formula of amino acid is



amino acids

Classification of amino acids :-

1) Simple amino acids :-

In this amino acids instead of R-there is only H-atom in their side chain.

e.g. glycine, Alanine.

2) Hydroxy amino acids :-

In this group amino acid contain hydroxyl group hence is known as hydroxyl amino acid.

e.g. Serine, threonine.

3) Sulphur containing amino acids & amides :-

In these one carboxyl group is transform into amide group.

e.g. Asparagine & glutamine.

4] Basic amino acids :-

These amino acids possess the amino group in side chain is known as basic amino acid

e.g. Lysine, Arginine.

5] Sulphur containing amino acids :-

The amino acids possess sulphur atom

e.g. Cysteine, Methionine.

6] Aromatic Amino acids :-

They possess the benzene ring in side chain. e.g. Phenylalanine, Tyrosine.

7] Heterocyclic amino acids :-

Amino acids having ring in side chain which possess at least one atom other than carbon atom

e.g. Proline & Histidine

8] Acidic amino acids :-

They possess the carboxyl group in their side chain.

e.g. Aspartic acid & Glutamic acid.

* Properties of amino acids :-

A] Physical —

- 1) They are crystalline in nature
- 2) They are colourless compound
- 3) They are tasteless as thyrosin sweet as glycine & bitter as asanine.
- 4) All amino acids are possess the asymmetric carbon atom except glycine.
- 5) Amino acid are polar substance which are. Soluble in polar solvent like ethanol

B] Chemical properties :-

- 1) Solubility
- 2) Amphoteric nature
- 3) Esterification
- 4) Ninhydrin reaction
- 5) Reaction of alpha amino acids with HCl
- 6) Reaction of carboxyl group with NaOH
- 7) Zwitter ion.
- 8) Electrochemical properties.

* Functions of amino acids :-

- i) formation of proteins
- ii) Maintenance of tissue
- iii) formation of enzymes, hormones & antibodies.

6. Define protein, write down importance & classification

Proteins :- Proteins are polymers which is made up of hundreds ~~of~~ thousands of smaller units called amino acids, which are attached to one another in long chain.

Classification of protein :-

A) Based on source of protein :-

a) Plant origin

e.g Lysin from sunflower seed

b) Animal origin

e.g egg Albumin from egg

B) Based on shape of protein :-

a) Globular

e.g Hormone & Blood transport protein

b) Fibillar

e.g. keratin from epithelial tissue

C) Based on composition & solubility

a) Simple protein :-

1) Albumin

e.g - Lactalbumin of milk mysin from muscle

2) Globulin e.g pseudoglobulin

3) Glutelins

4) protamines

5) Histones

6) Prolamines

7) Scleroprotein

b) Complex protein :-

1) Metaloprotein

- 2) Chromoprotein e.g. Haemoglobin
- 3) Glycoprotein e.g. Albumin
- 4) Phosphoprotein e.g. Casein
- 5) Lipoprotein e.g. Lipovitellin
- 6) Nucleoprotein e.g. Nucleoprotein from yeast.

c) Derived protein :- (Derivatives of protein due to action of heat, enzymes or chemical reagents)

i) Primary derived protein :-

proteins
metaprotein
coagulated protein

ii) Secondary derived protein :-

- Proteases
- Pepton
- Polypeptide

d) Base on biological function

- a) Enzymatic protein e.g. Amylase & urease
- b) Structural protein e.g. collagen & Elastin
- c) Transport protein e.g. Haemoglobin
- d) Nutrient & storage protein e.g. Casein
- e) Contractile protein e.g. Actin
- f) Defence protein e.g. Antibodies
- g) Regulatory protein e.g. Insulin
- h) Toxic protein e.g. Ricin

Structural organization of proteins :-

The structural & functional features of protein & protein complexes are addressed at four level of hierarchical organization this are:-

- 1) Primary structure
- 2) Secondary structure.

Importance of protein / functions of protein

- 1) Storage of energy
- 2) Transport of energy
- 3) Important structural unit of body
- 4) It helps metabolic growth regulators
- 5) Control of biological reactions
- 6) Hormonal secretion
- 7) Catalytic activity
- 8) Toxicity by foreign proteins
- 9)

