

**BIOMOLECULES**

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**1. What type of linkages hold together monomers of DNA?**

Monomer of DNA are held together by phosphodiester linkage.

**2. Give the differences between primary and secondary structure of proteins.****Primary structure of proteins:**

Proteins are polypeptide chains made up of amino acids connected through peptide bonds. The relative arrangement of the amino acids in the polypeptide chain is called the primary structure of the protein.

**Secondary structure of proteins:**

The amino acids in the polypeptide chain forms highly regular shapes (sub-structures) through the hydrogen bond between the carbonyl oxygen ( $-C=O$ ) and the neighbouring amine hydrogen ( $-NH$ ) of the main chain.  $\alpha$ -Helix and  $\beta$ -strands or sheets are two most common substructures formed by proteins.

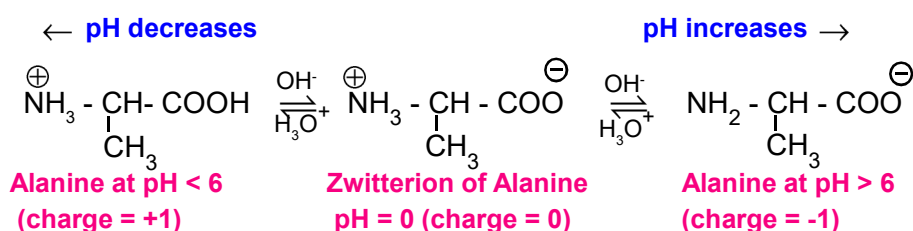
**3. Name the Vitamins whose deficiency cause i) rickets ii) scurvy**

i) rickets (children) - deficiency of vitamin D

ii) scurvy (bleeding gums) - deficiency of vitamin C

**4. Write the Zwitter ion structure of alanine**

It contains an amine group and a carboxylic acid group, both attached to the central carbon atom which also carries a methyl group side chain. Under biological conditions, it exists in its zwitterionic form with its amine group protonated (as  $-NH_3^+$ ) and its carboxyl group deprotonated (as  $-COO^-$ ).

**5. Give any three difference between DNA and RNA**

DNA	RNA
1. It is mainly present in nucleus, mitochondria and chloroplast	1. It is mainly present in cytoplasm, nucleolus and ribosomes
2. It contains deoxyribose sugar	2. It contains ribose sugar
3. Base pair A = T. G $\equiv$ C	3. Base pair A = U. C $\equiv$ G
4. Double stranded molecules	4. Single stranded molecules
5. It's life time is high	5. It is Short lived
6. It is stable and not hydrolysed easily by alkalis	6. It is unstable and hydrolyzed easily by alkalis
7. It can replicate itself	7. It cannot replicate itself. It is formed from DNA

**6. Write a short note on peptide bond**

The amino acids are linked covalently by peptide bonds. The carboxyl group of the first amino acid react with the amino group of the second amino acid to give an amide linkage between these amino acids. This amide linkage is called **peptide bond**.

**7. Give two difference between Hormones and vitamins****Vitamin:**

1. Vitamins are synthesized in plants and taken by animals chiefly through diet.
2. Chemically these are various compounds like esters, organic acids, etc.
3. Mostly these are coenzymes or a constituents of coenzymes.
4. Vitamins have catalytic action.
5. Their deficiency causes specific deficiency disease(symptom).

**Hormone:**

1. Hormones are secreted mostly by endocrine glands and some by neurosecretory cells of animals.
2. These are water soluble amino acids and polypeptides or fat soluble steroids.
3. Mostly these are excitatory, sometimes inhibitory but never act as coenzyme."
4. Hormones directly influence gene expressions.
5. Deficiency causes metabolic disorder.

**8. Write a note on denaturation of proteins**

Each protein has a unique three-dimensional structure formed by interactions such as disulphide bond, hydrogen bond, hydrophobic and electrostatic interactions. These interactions can be disturbed when the protein is exposed to a higher temperature, certain chemicals such as urea, alteration of pH, ionic strength etc., It leads to the loss of the three-dimensional structure partially or completely. The process of a protein losing its higher order structure without losing the primary structure, it called denaturation.

**9. What are reducing and non – reducing sugars?****Reducing Sugars-**

Reducing sugar is a saccharide that is capable of acting as a reducing agent because it has a free aldehyde or ketone group.

The Saccharide which reduces Fehling's solution, Benedict's solution & Tollen's reagent are called reducing sugars.

**Example-**

All Monosaccharide are reducing sugars like D-Glucose, D-Fructose, Disaccharides -Maltose & Lactose

**Non Reducing Sugars-**

The Saccharides which do not reduce Fehling's solution, Benedict's solution & Tollen's reagent are called Non reducing sugars.

- a) Non reducing sugars do not contain free -CHO group or  $>C=O$  group on the carbon adjacent to  $>C=O$  group.
- b) Cyclic form of non reducing sugars can not be opened into an open chain having free  $>C=O$  group.

**Example-**

All PolySaccharides are non reducing sugars (like starch, cellulose). Sucrose (disaccharide) is also non reducing sugar because anomeric carbon of both the mono saccharides are involved in glycoside or acetal formation.

Not all carbohydrates are optically active. Generally the monosaccharides are optically active. This is because they contain chiral carbon atoms, and chirality results in optical activity.

### 11. Classify the following into monosaccharides, oligosaccharides and polysaccharides.

i) Starch	ii) fructose	iii) sucrose	iv) lactose	iv) maltose
i) Starch	-	<b>polysaccharides.</b>		
ii) fructose	-	<b>monosaccharides,</b>		
iii) sucrose	-	<b>oligosaccharides(disaccharide)</b>		
iv) lactose	-	<b>oligosaccharides (disaccharide)</b>		
iv) maltose	-	<b>oligosaccharides(disaccharide)</b>		

### 12. How are vitamins classified

There are 13 universally recognized vitamins - A, B complex which contains B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>5</sub>, B<sub>6</sub>, B<sub>7</sub>, B<sub>9</sub> & B<sub>12</sub>, vitamin C, D, E & K.

All of these 13 universally recognized vitamins are categorized into **2 types** based on their solubility- fat soluble and water soluble.

**Fat-soluble vitamins** are- Vitamin A, Vitamin D, Vitamin E & Vitamin K. These vitamins are easily stored in fatty tissues & liver.

**Water-soluble** vitamins like Vitamin B complex & Vitamin C does not stay in the body for long. Because of their water solubility, they are easily excreted via urine.

### 13. What are hormones? Give examples

Hormone is an organic substance (e.g. a peptide or a steroid) that is secreted by one tissue. It limits the blood stream and induces a physiological response (e.g. growth and metabolism) in other tissues. It is an intercellular signalling molecule.

1. Chemically, hormones may be classified as

i) protein (e.g. insulin, epinephrine)                      ii) steroids (e.g. estrogen, androgen).

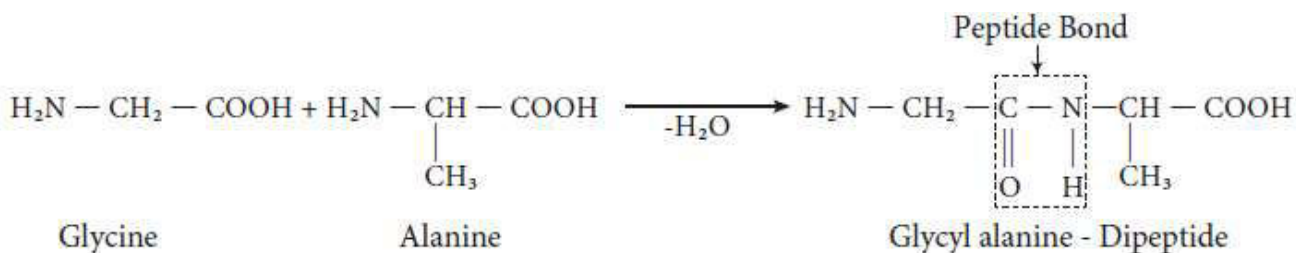
2. Hormones are classified according to the distance over which they act as,

Endocrine hormones - insulin

Paracrine hormones -interleukin-1 (IL-1)

Autocrine hormones -interleukin-2 (IL-2).

### 14. Write the structure of all possible dipeptides which can be obtained from glycine and alanine



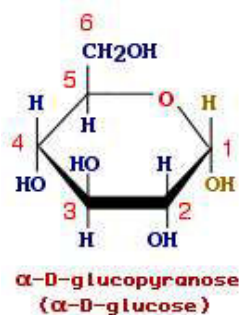
### 15. Define enzymes

There are many biochemical reactions that occur in our living cells. Digestion of food and harvesting the energy from them, and synthesis of necessary molecules required for various cellular functions are examples for such reactions. All these reactions are catalysed by special proteins called enzymes.

Enzymes are biocatalysts that catalyse a specific biochemical reaction.

### 16. Write the structure of $\alpha$ -D (+) glucopyranose

$\alpha$ -D (+) glucopyranose



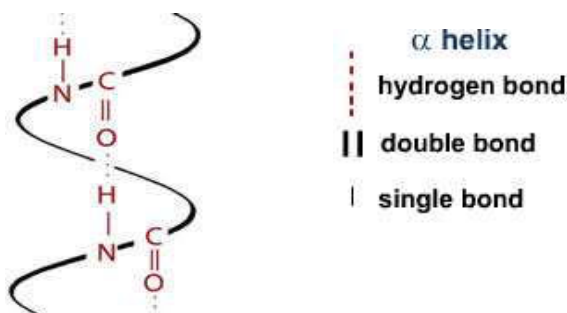
### 17. What are different types of RNA which are found

RNA molecules are classified according to their structure and function into three major types

- i. **Ribosomal RNA (rRNA)** : Ribosomes are the sites at which protein synthesis takes place .
- ii. **Messenger RNA (mRNA)**: The function of tRNA is to carry amino acids to the sites of protein synthesis on ribosomes.
- iii. **Transfer RNA (tRNA)** : mRNA carries genetic information from DNA to the ribosomes for protein synthesis.

### 18. Write a note on formation of $\alpha$ -helix .

An  $\alpha$ -helix is a right-handed coil of amino-acid residues on a polypeptide chain, typically ranging between 4 and 40 residues. This coil is held together by hydrogen bonds between the oxygen of C=O on top coil and the hydrogen of N-H on the bottom coil. Such a hydrogen bond is formed exactly every 4 amino acid residues, and every complete turn of the helix is only 3.6 amino acid residues.



### 19. What are the functions of lipids in living organism.

1. Lipids are the integral component of cell membrane. They are necessary of structural integrity of the cell.
2. The main function of triglycerides in animals is as an energy reserve. They yield more energy than carbohydrates and proteins.
3. They act as protective coating in aquatic organisms.
4. Lipids of connective tissue give protection to internal organs.
5. Lipids help in the absorption and transport of fat soluble vitamins.
6. They are essential for activation of enzymes such as lipases.
7. Lipids act as emulsifier in fat metabolism.

### 20. Is the following sugar, D – sugar or L – sugar?

Ans: L – sugar (L-Ribose)

