Cytoplasm Function

Functions of Cytoplasm are as follows:

- Cytoplasm is the site of many biochemical reactions that are vital and crucial for maintaining life.
- The Cytoplasm is the place where the cell expands and growth of the cell takes place.
- The Cytoplasm provided a medium for the organelles to remain suspended.
- The Cytoskeleton of the cytoplasm provides shape to the cell and it also facilitates movement.
- It also aids in the movement of the different cellular elements.
- The enzymes in the cytoplasm metabolize the macromolecules into small parts, so that it can be easily available for the other cellular organelles like mitochondria.
- The Cytoplasm is a means of transport for genetic material.
- It also transports the products of cellular respiration.
- The cytoplasm acts as a buffer and protects the genetic material of the cell and also the cellular organelles from damage caused due to movement and collision with other cells.
- The cytoplasmic organelles are specialized structures that haves its Own functions like cellular respiration, protein synthesis, etc.
- The cytoplasmic inclusions are non-soluble molecules, they are seen floating in the cytoplasm, they act as stored fats and sugars that are ready for cellular respiration.
- The cytoplasm and the proteins prevent the grouping of organelles in place due to gravity, that would impede their function.

Inorganic Compounds of Protoplasm:

The inorganic components of the protoplasm mostly occur in the form of water, minerals and salts which are as follows:

(i) **Water**: The most abundant inorganic constituent of the protoplasm is the water. Water constitutes about 65 to 80 per cent ¢ of the protoplasm.

In the protoplasm, the water occurs in two forms, VIZ., free water and bound water. The 95 per cent of the total cellular water is used by the Protoplasm as the solvent for various inorganic substances and organic Compounds and is Known as free water, The remaining 5 per cent of The total cellular water remains loosely linked with protein molecules byhydrogen bonds or other forced and is known as bound water, The water is the best biological solvent for inorganic substances such as mineral ions, salts, etc., and organic compounds such as carbohydrates and proteins. The water is used by the cell as a transporting media for the food, nitrogen wastes and other necessary substances. The water 1s immiscible with the non-polar liquids as the lipids, so its molecules remain stable and unmixed with the lipid contents of the plasma membrane and other intra-cellular membranes.

(ii) Minerals:

- The minerals are the inorganic chemical substances which occur in the crust of the earth. In the protoplasm the minerals usually occur in the form of salts and in combination with the organic compounds. ‘The mineral salts occur in the form of ions in the protoplasm. An ion is an atom or group of atoms which carries one or more positive or negative charge.
- The positively charged ions are known as cations and the negatively charged ions are known as anions. For example, when sodium chloride (NaCl) is dissolved in water, it

is ionized to form a sodium cation (Na+) and a chlorine anion (CI-). The inorganic compounds which by dissolving in water become ionized are known as electrolytes but those Which do not dissociate in the solvent but remain as such in the molecular stated are known as pot-electrolytes The, protoplasm contains both electrolytes and non- electrolytes.

a) Electrolytes:

- The electrolytes play a Vital role.in the maintenance of osmotic pressure and acid base equilibrium in the protoplasm. Certain ions such as the magnesium (Mg+), etc., are essential for many enzymatic, activities because these ions act as cofactor, The dot phosphate (PO4) ion is the important constituent of the adenosine triphosphate as (ATP) which is the chief supplier of energy for most of the life processes. Other important ions of the protoplasm are sodium (Na+), potassium (K+), calcium (Ca+), chlorine (Cl-), carbonate (CO,), sulphate (SQ,), and amino acids.

(b) Non-electrolytes:

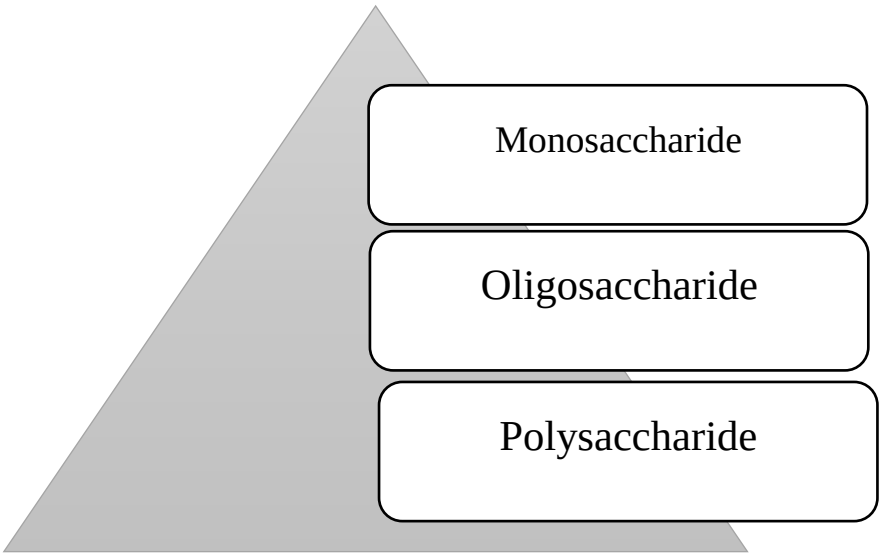
- Some of the minerals occur in protoplasm in non-ionising stale. The non- electrolytes of the protoplasm are Na, K, Ca, Mg, Cu, I, Fe, Mn, FI, Mo, CI, Zn, Co, Ni, etc. The iron (Fe) occurs in the haemoglobin, ferritin cytochromes and some enzymes as catalase and cytochrome oxidase.
- The calcium (Ca) occurs in the blood, protoplasm and the bones. The copper (Cu), manganese (Mn), molybdenum (Mo) and zinc (Zn) are useful as cofactors for enzymatic actions. The iodine and fluorine are essential for the thyroid and the enamel metabolism respectively.

Organic Compounds of Protoplasm:

- The chemical substances which contam carbon (C) in combination with one or more other elements as hydrogen (H), nitrogen (N), sulphur (S), ete., are called organic compounds, The organic compounds usually contain large molecules which are formed by the similar or dissimilar unit structures known as the monomers. ae the monomers.
- A monomer is a simplest unit of the organic molecule which can exist freely. Some organic compounds such as carbohydrates occur in the protoplasm as the monomers.
- The monomers usually link with other monomers to form oligomers and polymers. The oligomers contain small numbers of monomers, while the polymers contain large number of monomers. The oligomers at il polymers contain large-sized molecules or macromolecules.
- When a polymer contains similar kinds of monomers in its macromolecule, it is known as homo-polymer and when the polymer is composed of different kinds comonomers, it is known as the heteropolymer.
- The main organic compounds of the protoplasm are the carbohydrates, lipids, proteins and nucleotides.

i) Carbohydrates:

- The carbohydrates are the compounds containing the carbon, hydrogen and oxygen. The carbohydrates form the main source of the energy for. all living beings. Only green plants and certain microbes have the power of synthesizing the ca cryohydrates from the water and CO_2 in the presence of sunlight and chlorophyll by the process of photosynthesis...
- All the animals, non-green plants (e.g., fungi, bacteria and viruses) depend on green plants for the supply of carbohydrates.



Carbohydrates classification

1. Monosaccharide's:

- The monosaccharide's are the simple sugars with empirical formula C_n $(H_20)_n$.
- The monosaccharides are the monomers and cannot split further (or hydrolysed) into the simpler compounds.
- They are classified and named according to the m number of carbon atoms in their molecules as follows: (i) Trioses contain three carbon atoms in their molecules, e-g., Glyceraldehyde and Dihydroxy acetone.
- (ii) Tetrodes contain four carbon atoms in their molecules, e.g., Erythrose.
- (iii) Pentoses contain five carbon atoms in their molecules, e.g., Ribose, Deoxyribose, Arabinose a and Xylulose.
- (iv) Hexoses contain six carbon atoms in their molecules, e.g., Glucose, Fructose and Galactose.
- (v) Heptoses contain seven carbon atoms in their molecules, e.g., Sedoheptulose.

- The pentose s and hexoses are the most abundantly found monosaccharides in the protoplasm), The pentose sugar, ribose is the important compound of ribonucleic acid (RNA) and certain coenzymes as nicotinamide adenine dinucleotide (NAD), NAD, phosphate (NADP), adenosine triphosphate (ATP) and coenzyme A (CoA).
- Another pentose sugars, the deoxyribose is the important of the deoxyribonucleic acid (DNA). The ribulose is a pentose which is necessary for photosynthesis mechanism. The glucose, a hexose sugar is the primary source of the energy for the cell. The other important hexose sugars of the protoplasm are the fructose sand galactose.

2. Oligosaccharides:

- The oligosaccharides contain 2 to LO monosaccharide's (monomers) in their olecules. The monomers remain linked with each other by the glycosidic linkages.
- Certain important oligosacchandes are as follows:

(i)Disaccharides contain two monomers, e.g., Sucrose Maltose, Lactose. etc.

(ii)Trisaccharides contain three monomers, e.g, Raffinose, Rabinose, Rhaminose, Gentianose and Maltose.

(iii)Trisa Saccharides contain four monomers, e.g, Stachyose and Scordose.

(iv) Pali feieeckcr leer ener nacelel monomers, e.g., Verbascose.

- The most abundant oligosaccharides are the disaccharides, viz., sucrose, maltose and lactose. The sucrose and maltose and lactose, The sucrose and maltose occur mainly in the protoplasm of plant cells, while lactose occurs exclusively in the protoplasm of animal cells.

3. Polysaccharides: soya

- The polysaccharides are composed of ten to many thousands monosaccharide's as the monomers in their macromolecules. Their empirical formula is$(C_6H_{10}O_5)_n$. The molecules of the polysaccharides are of colloidal size having high molecular weights. The polysaccharides can be hydrolysed into simpler sugars. The protoplasm contains two kinds of polysaccharides, viz., homopolysaccharides and heteropolysaccharides.

(i) Homopolysaccharides:

The homopolysaccharides have similar kinds of monosacchande's in their molecules. 'The most important homopolysaccharides of the protoplasm are the Starch, glycogen and cellulose.

(a) Starch:

The-molecules of the starch are composed of several units of amyloses and amylopectin's. 'The starch 1s the storage food-material of the plant cells.

(b) Glycogen:

The glycogen is a polymer of glucose molecules. It is the important storage food material of animal cells. The glycogen though occurs in most animal cells in smaller amount but the cells of molluscs, liver and muscles are rich in glycogen contents.

(c) Cellulose:

The cellulose is the polymer of the cellobiose $(C_{21}H_{22}O_{11})$ which in turn contains many glucose molecules in its molecule.

(ii) Heteropolysaccharides:

The polysaccharides which are composed of different kinds of the monosaccharide's and amino nitrogen or sulphuric or phosphoric acids are known as heteropolysacchande: