Frequently Asked Questions (FAQ's)

Q1. What are carbohydrates?

Ans: The carbohydrates are defined as optically active polyhydroxy aldehydes or polyhydoxy ketones or the compounds which can be hydrolysed to them.

Q2. What are the major biochemical roles of carbohydrates?

Ans: The major biochemical roles of carbohydrates are: they act as a source of energy that can be released in a form usable by body tissues, and they serve as carbon skeletons that can be rearranged to form other molecules that are essential for biological structures and functions.

Q3. What are simple carbohydrates?

Ans: The simple carbohydrates consist of monosaccharides and disaccharides, and are often called sugars. The simple carbohydrates cannot be further hydrolyzed. They are the monomers out of which the larger carbohydrates are constructed.

Q4. What are the two types of monosaccharides based on the functional group? Give examples of each.

Ans: The two types of monosaccharides are aldoses and ketoses. When the functional group in monosaccharide is an aldehyde, they are known as aldoses, e.g. glyceraldehyde, glucose, ribose. When the functional group is a keto group, they are referred to as ketoses, e.g., dihydroxyacetone, fructose, ribulose.

Q5. What are reducing and non-reducing sugars?

Ans: Carbohydrates which reduce Tollen's reagent and Fehling solution are called reducing sugars. These sugars have a free aldehyde or ketone group. For example, glucose, fructose, maltose and lactose are reducing sugars.

Carbohydrates which do not reduce Tollen's reagent and Fehling solution are called non-reducing sugars. They do not have a free aldehyde or ketone group, e.g. sucrose.

Q6. What is the structural difference between amylose and cellulose?

Ans: In amylose, D-glucose units are joined together by α-glycosidic

linkages involving C-1 of one glucose molecule and C-4 of the next glucose molecule. In cellulose, D-glucose units are joined together by β-glycosidic linkages between C-1 of one molecule and C-4 of the next glucose molecule.

Q7. What are polysaccharides? What are its various types?

Ans: Polysaccharides (poly-many) consist of chains of monosaccharides containing more than 9 units and may extend to hundreds or thousands of units. They are usually tasteless (non-sugars) e.g., starch glycogen, inulin, cellulose.

The polysaccharides are of two types on the basis of composition. These are homopolysaccharides and heteropolysaccharides. Homopolysaccharides or homoglycans are those complex carbohydrates which are formed by polymerization of only one type of monosaccharide monomers. For example, starch, glycogen and cellulose. Heteropolysaccharides or heteroglycan are those complex carbohydrates which are produced by condensation of two or more types of monosaccharide derivatives, e.g., agar, peptidoglycan, arabanogalactans, arabanoxylans, etc.

Q8. What is modified starch?

Ans: Modified starch are normal natural starches that have been altered chemically or physically to assist in the food processing industry. They can be crossbonded, esterified or converted by acids or enzymes to have greater viscosity, clarity etc. They have used in canning, instant puddings, frozen foods etc.

Q9. What is mutarotation?

Ans: Mutatrotation is the term given to the change in the specific rotation of a cyclic monosaccharide as it reaches an equilibrium between its α and β anomeric forms. Though the cyclic forms are usually heavily favoured, liquid monosaccharides (or monosaccharaides in aqueous solution) are always in equilibrium with their straight-chain forms. This equilibrium is established as the hemiacetal bond between C1 (the only carbon bound to two oxygens) and C5 is cleaved (forming the straight-chain compound) and reformed (forming the

cyclic compound). When the hemiacetal bond is reformed, the OH group on C5 may attack either of the two stereochemically distinct sides of the aldehyde group that contains C1. Which side it actually does attack on decides whether the α or β anomer is formed.

Q10. Explain and differentiate caramelization and Maillard reaction?

Ans: Both the phenomena are a result of heating the carbohydrates at high temperature in presence of moisture the non-enzymatic browning in case of caramelization gives rise to brown colour and flavour to the food. In maillard reaction, the carbonyl group of the carbohydrates (especially the reducing sugars) in foods reacts with amino group of proteins and gives brown colour and flavour to the baked products.

Q11. What are dietary fibres?

Ans: Dietary fibers are the indigestible portion of plant foods that move food through the digestive system and absorb water. Dietary fiber consists of non-starch polysaccharides such as cellulose and many other plant components such as dextrins, inulin, lignin, waxes, chitins, pectins, beta-glucans and oligosaccharides.

Q12. How are the carbohydrates generally classified? Write the types and explain in brief.

Ans: Carbohydrates are generally classified on the basis of the complexity of their structure. They are classified into simple and complex types. The simple carbohydrates include mono-, di- and oligosaccharides while the complex ones have polysaccharide. The polysaccharides are further divided into starch and non-starch polysaccharides.

Q13. How do sugars help in extending the shelf-life of baked products?

Ans: Sugars are good in absorbing moisture. When put into the foods to be baked these absorb the moisture and do not allow microbes to grow. This increase the shelf life of that food.

Q14. What is optical activity? What are dextrorotatory and laevorotatory compounds?

Ans: Optical activity is the ability of the compound (in solution form) to rotate the plane of polarization of plane polarized light either to right or left of the original. A compound rotating the plane of polarized light to right is called as dextrorotatory and is designated as d or (+) type, and other type is called as laevorotatory and is designated as l or (-) type. If a solution contains equal amounts of both types of a particular type of optically active isomer then the net specific rotation of the solution is zero as the specific rotation of one isomer is cancelled by that of the other and this particular solution is called as racemic mixture or dl mixture or (+-) conglomerate, and process is called as racemisation.

Q15. What are anomers and epimers?

Ans: Anomers are stereoisomers of cyclized monosaccharide molecules differing only in the configuration of the newly created centre of chirality arising from the cyclization. The carbon of a newly created centre of chirality arising from the cyclization of a sugar is called an anomeric carbon. The epimers, on the other hand, are those isomers which differ from each other in the configuration around a single specific carbon other than anomeric carbon atom. Glucose differs from galactose with regard to carbon 4 in arrangement of –OH group; similarly glucose and mannose are C2-epimers.