MODULE 3: Carbohydrates: Structure and Biological Functions

Q.1. Specify the glycosidic linkages in Amylose, amylopectin, glycogen, dextran, cellulose, pectin?
Ans:
Amylose: $\alpha(1 \rightarrow 4)$
Amylopectin: $\alpha(1 \rightarrow 6)$
Glycogen: $\alpha(1 \rightarrow 4)$ or $\alpha(1 \rightarrow 6)$
Dextran: $\alpha(1 \rightarrow 6)$, $\alpha(1 \rightarrow 3)$, $\alpha(1 \rightarrow 4)$
Cellulose : $\beta(1 \rightarrow 4)$
Pectin: galacturonic acid units joined with $\alpha(1 \rightarrow 4)$ linkages

Q.2. Define the terms anomer, epimer, enetiomer and diastereomers using carbohydrates as examples?
Ans: **Anomer:** Isomers, such as these, which differ only in their configuration about their carbonyl carbon atom are called *anomers*.
Epimer: D- Glucose and D- Mannose have different configuration only at C-2 carbon. Such carbohydrates which differ in configuration only at one carbon atom are designated as epimers of each other.
Enantiomer: Two forms of carbohydrates which reflect mirror image of each other are called enantiomers.
Diastereomers: The stereoisomers which are not enantiomers are termed as distereoisomers.

Q.3. Three forms of active transport mechanisms are ----------, ---------- and ----------?
Ans: Protein pumps, Exocytosis and Endocytosis.

Q.4. Name a chemical test to detect presence of carbohydrates?
Ans: Molisch test or Benedict's test.

Q.5. Name the corresponding carbohydrate which can be hydrolysed by the following enzyme amylase, cellulase, pectinase, invertase, chitinase, lactase?

Ans:

Amylase: starch

Cellulase: cellulose

Pectinase: pectin

Invertase: sucrose

Chitinase: chitin

Lactase: lactose

Q.6. How many optical isomers are possible for a carbohydrate with (a) 3 (b) 4 carbon chains?
Ans: (a) 2 and (b) 4.

Q.7. Which among maltose and sucrose is a “reducing sugar” and why?
Ans: Maltose is a reducing sugar because of the presence of a free carbonyl group which may be oxidized to the free acid.

Q.8 What do abbreviations HFCS and HGS stand for?
Ans: HFCS: High fructose corn syrup.
HGS: Hydrogenated glucose syrup.