Tests Of Carbohydrates, Fats & Proteins In Pure Samples & Detection Of Their Presence In Given Food Stuffs

Food is a necessary material which must be supplied to the body for its normal and proper functioning.

The main functions of the food are:
1. to provide energy
2. to promote growth
3. to replace worn out tissues
4. to sustain life
5. to regulate body processes like assimilation and digestion.

The essential constituents of food are:
1. Carbohydrates
2. Lipids (oils and fats)
3. Proteins
4. Minerals
5. Vitamins and
6. Water.

Carbohydrates

The name carbohydrate is used for the compounds having general formula, $C_x(H_2O)_y$. These are called carbohydrates because they can be treated as hydrates of carbon. For example, glucose ($C_6H_{12}O_6$), sucrose ($C_{12}H_{22}O_{11}$), etc. However, this definition of carbohydrates has lost significance because of the following two reasons:

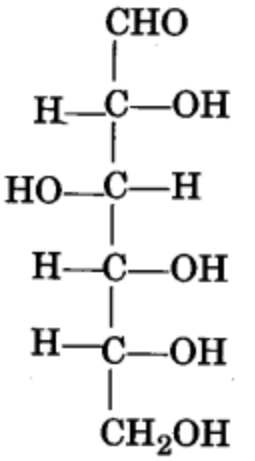
(i) There are many compounds which have general formula $C_x(H_2O)_y$ but do not behave as carbohydrates. For example, oxalic acid ($C_2H_2O_2$), formaldehyde (CH_2O), etc.

(ii) There are many compounds which do not conform to formula $C_x(H_2O)_y$ but possess characteristic properties of carbohydrates and are treated as carbohydrates. For example, rham-nose ($C_6H_{12}O_5$).

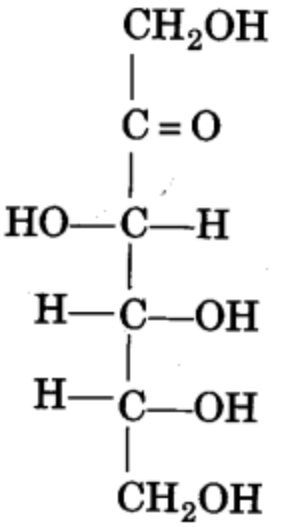
A more useful definition of carbohydrates is that Carbohydrates are polyhydroxy aldehydes, polyhydroxy ketones, their derivatives and the substances which yield them on hydrolysis.

The carbohydrates which are ketones are called ketoses and those that are aldehydes are called aldoses. The general term for all the carbohydrates is glycose.

The carbohydrates which cannot be hydrolysed to simple carbohydrates are called monosaccharides. For example, glucose, fructose ,etc.



D(+)—Glucose



D(–)—Fructose

The carbohydrates which contain two to ten monosaccharide units are called oligosaccharides. For example, sucrose ($C_{12}H_{22}O_{11}$), maltose ($C_{12}H_{22}O_{11}$), raffinose ($C_{18}H_{32}O_{16}$), etc.

The carbohydrates which contain more than ten monosaccharide units are called polysaccharides. For example, starch, cellulose, glycogen, etc. These may be represented by general formula $(C_6H_{10}O_5)n$.

A more general classification of carbohydrates is into sugars and non-sugars. The sugars like glucose, fructose and canesugar are crystalline, water soluble and sweet substances. Non-sugars which include starch, cellulose, etc., are amorphous, insoluble in water and taste¬less substances. ,

The carbohydrates which can reduce Tollen's reagent or Fehling solution are called reducing sugars. All monosaccharides are reducing sugars. Most of the disaccharides are also reducing sugars. Sucrose is a non-reducing sugar.

Carbohydrates are generally optically active because they contain chiral centres.

The carbohydrates perform two important functions in body:

(a) They act as biofuels to provide energy for functioning of living organisms.

In human system, all the carbohydrates except cellulose can serve as source of energy. Starch and various sugars which are taken as food are first hydrolysed to glucose by the enzymes present in the digestive system.

Glucose on slow oxidation to carbon dioxide and water in the presence of enzymes liberates large amount of energy which is used by the body for carrying out various functions.

$C_6H_{12}O_6 + 60_2 \longrightarrow 6C0_2 + 6H_20 + 2832\ kJ$

In order to fulfil the emergency requirements our body also stores some of the carbohydrates as glycogen in liver. Glycogen on hydrolysis gives glucose.

It may be noted that cellulose cannot be hydrolysed in our body because enzymes required for its hydrolysis are not present in our body. However, grazing animals are capable of hydrolysing cellulose to glucose.

(b) They act as constituents of cell membrane.