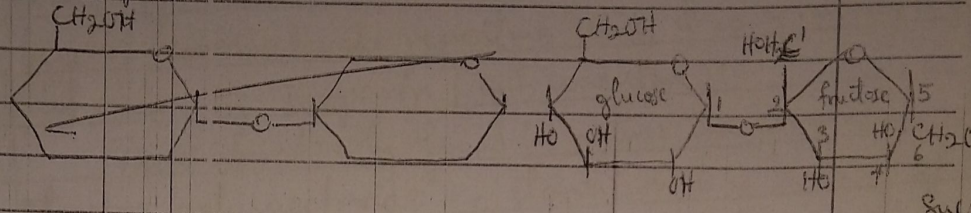
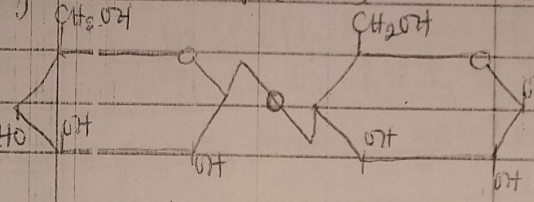
SUCROSE: It is a heterodisaccharide made up of fructose and glucose. The glycosidic bond is in the alpha (α) configuration. The bond occurs between carbon number 1 of glucose and carbon number 2 of fructose. Sucrose is not a reducing sugar, because the two reducing ends are utilized in forming the glycosidic bond. It is the sweetest type of disaccharide used in making malt and also used as natural sweetners in food industries.



Sucrose

CELLOBIOSE: It is a homodisaccharide made up of 2 glucose molecules. The glycosidic bond lies between carbon 1 of one glucose and carbon 4 of another. It has a Beta (β) configuration. [i.e. β (1-4) linkage]. It is a repeating unit in cellulose found in plant. It is a reducing sugar. The difference between cellulose and maltose is their configuration i.e. β (1-4) and α (1-4).



Cellobiose

RAFFINOSE: found in legumes and classified as an oligosaccharide. It is made up of galactose, glucose and fructose.

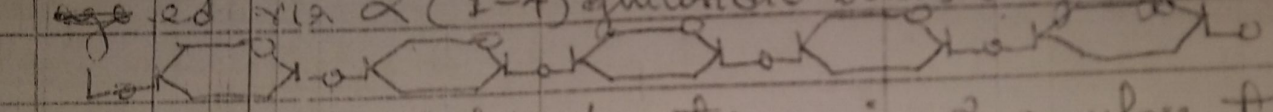
Galactose —α(1-6)— Glucose —α(1-2)— fructose

They are non-digestable by mammals and some monogastric animals but reverse is the case in the ruminant animals because of some microorganisms in their alimentary canal. It is found in beans.

POLYSACCHARIDES

They are polymers of monosaccharide units consisting of several hundreds to thousands of simple sugars. It is made of one unit of repeating monosaccharide (repeating unit of starch, glycogen, cellulose), but when it is a homopolysaccharide. But when it is made up of different type of monosaccharide repeating unit, it is a heteropolysaccharide; e.g. Heparin (anticoagulant).

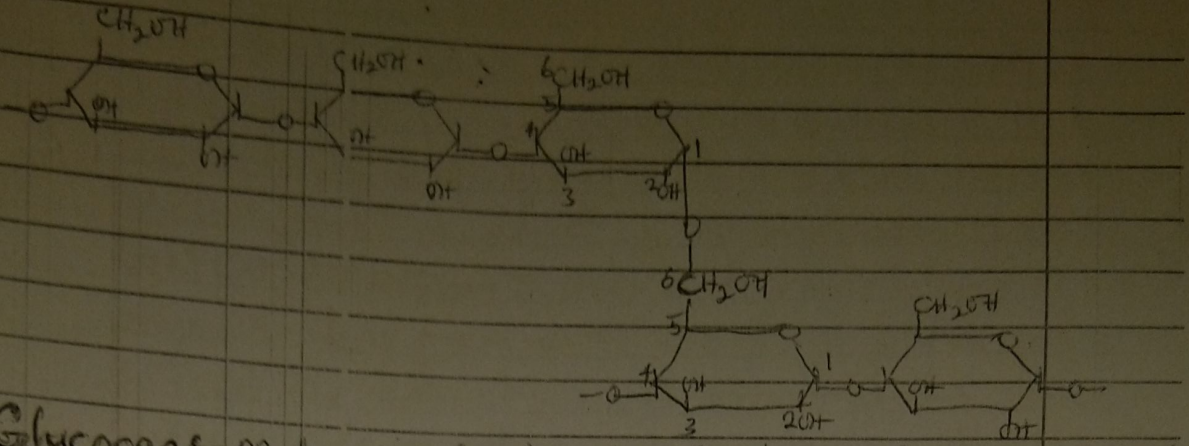
Those abundantly found in nature are grouped in two; **storage polysaccharide** e.g. starch which is made up of two types; **amylose** and **amylopectin**. Starch is a storage polysaccharide of plant origin. **Amylose**:- glycosidic linked via $\alpha(1-4)$ glucosidic bonds only e.g.



If it is subjected to digestion using α-amylose, the product is **maltose**. It is 25% of total starch in cereals. It is responsible for the blue black colour of starch when iodine is added to it. It has the ability to form gel (starch). It is due to a property known as **gelatinization** i.e. the ability to form gel.

Amylopectin:- It is about 75% of total starch in cereal grains. It is not responsible for the blue black colouration of iodine, therefore when iodine is added, the red colour of iodine remains. It has $\alpha(1-4)$ glycosidic bond and $\alpha(1-6)$ branched glycosidic bond.

When α- amylose and β- amylose is added to amylopectin, it produces **limit dextrin**; glucose and maltose. α- amylose can only hydrolyse $\alpha(1-4)$ glycosidic bond.



Glycogen:- Made of α(1-4) and α(1-6) bond. It is of animal origin. It is highly branched. It is stored in muscles and liver of animals. It can be degraded to yield α-amylose by α-amylase, β-amylase and α.(1-6) glycohydrolase. α-amylase and β-amylase can not completely hydrolyse glycogen. The branching is higher than that of amylopecting.

Cellulose:- It is only found in plant. It is found in cell walls of plant which helps to strengthen the plant. It has a β(1-4) glycosidic bond; α-amylase and β-amylase hydrolyse glycogen.

Chitin:- It is a linear homopolysaccharide composed of N-acetylglucosamine residues in β linkage. The only chemical difference from cellulose is the replacement of the hydroxyl group at C-2 with an acetylated amino group. Chitin forms extended fibers similar to those of cellulose, and like cellulose cannot be digested by vertebrates. Chitin is the principal component of the hard exoskeletons of nearly a million species of arthropods – insects, lobsters, and crabs, for example – and is probably the second most abundant polysaccharide, next to cellulose, in nature.

Dextrans:- They are bacterial and yeast polysaccharides made up of α(1-6) linked poly-D-glucose; all have α(1→3) branches, and some also have α(1→2) or α(1→4) branches. Dental plaque, formed by bacteria growing on the surface of teeth, is rich in dextrans. Synthetic dextrans are used in several commercial products (for example

Sephadex) that serve in the fractionation of proteins by size-exclusion chromatography. The dextrans in these products are chemically cross-linked to form insoluble materials of various porosities, admitting macromolecules of various sizes.

GLYCOSAMINOGLYCANS:- A different kind of repeating polysaccharide is present on the animal cell surface and in the extracellular matrix. Many glycosaminoglycans are made of **disaccharide repeating units** containing a derivative of an amino sugar, either glucosamine or galactosamine. At least one of the sugars in the repeating unit has a negatively charged carboxylate or sulfate group. Chondroitin sulfate, Keratan sulfate, heparin, heparan sulfate, dermatan sulfate, and hyaluronate are the major glycosaminoglycans. Glycosaminoglycans are usually attached to proteins to form **proteoglycans**. Heparin is synthesized in a non-sulfated form, which is then de-acetylated and sulfated. Incomplete modification leads to a mixture of variously sulfated sequences. Some of them act as anticoagulants by binding specifically to antithrombin, which accelerates the sequestration of thrombin. Heparan sulfate is like heparin except that it has fewer N- and O-sulfate groups and more acetyl groups.