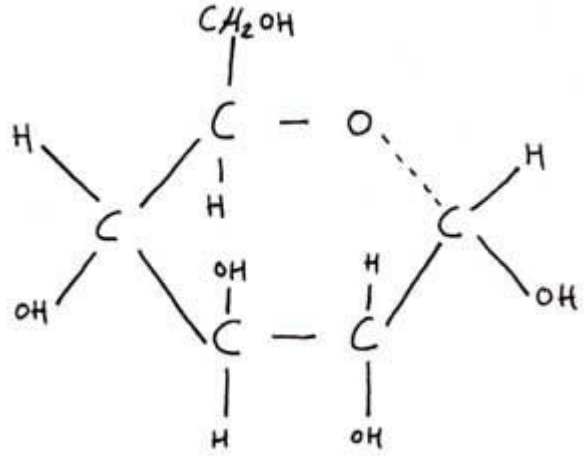
Biological Compounds

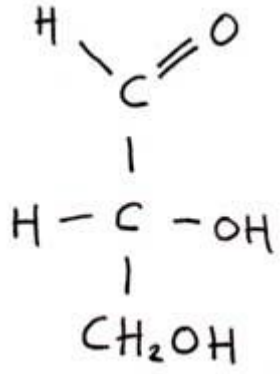
Monosaccharides

Monosaccharides are carbohydrates with relatively small molecules, they play quite a key part in life with glucose being the most well known monosaccharide sugar. The diagram below shows α-glucose (alpha glucose) which differs structurally to β-glucose (beta glucose) with the right-hand side hydrogen being trapped 'up' for α-glucose and 'down' for β-glucose.



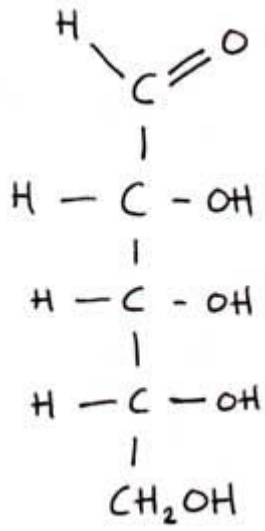
Triose

Many sugars are produced and used within chemical reactions within cells. An example of this would be glyceraldehyde, a triose three-carbon sugar used in early photosynthesis. It has the molecular formula $C_3H_6O_3$ and is shown below in a simplified version.



Pentose

As well as triose sugars there are also pentose sugars and, hence the name, contain five carbons. An example of a pentose sugar would be ribose ($C_5H_{10}O_5$ and shown in the diagram below) and deoxyribose ($C_5H_{10}O_4$) would be another example.

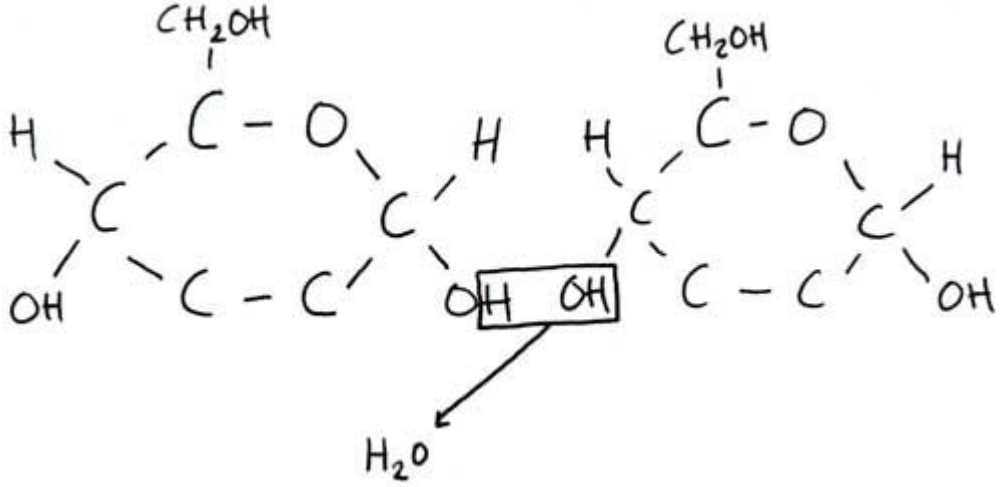


Hexose

Glucose ($C_6H_{12}O_6$) and fructose ($C_6H_{12}O_6$) are also sugars but contain six carbons and so are called hexose sugars.

Disaccharides

Disaccharides consist of two monosaccharide sugars linked together by a glycosidic bond with the elimination of water in a condensation reaction.



The diagram above shows two alpha glucose molecules which have bonded in a condensation reaction, releasing water. The resulting disaccharide formed is maltose (see table below).

Monosaccharides	Disaccaride	Where are they found?
Glucose + Glucose	= Maltose	In Malt sugar
Glucose + Fructose	= Sucrose	In Cane sugar
Glucose + Galactose	= Lactose	In Milk sugar

Polysaccharides

A polysaccharide is a large and complex molecules which are built from large numbers of monosaccharides linked by glycosidic bonds. An example of a polysaccaride would be starch (for plants) and glycogen (for

animals). They are both used for storage because they are very effective at what they do, glucose can be added or taken away from them very easily.

Starch

Starch is formed from many alpha glucose polymers and because of the type of bonds form a helix. It also contains many hydrogen bonds. It works well as an energy store within in plants because its molecules are compact and insoluble but are easily hydrolysed.

Lipids (Fats)

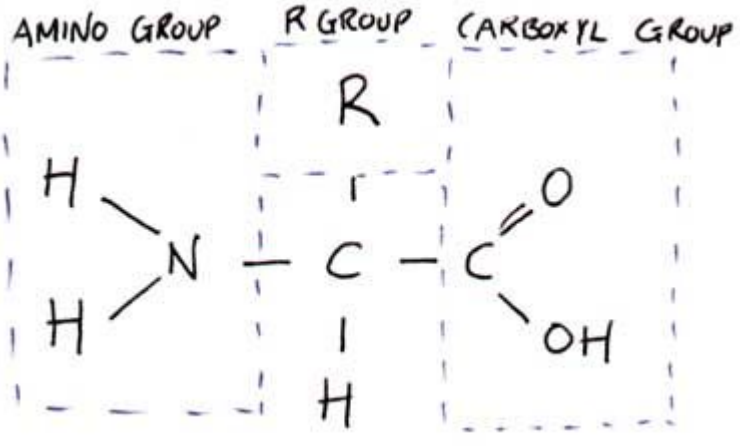
Glycerol is hydrophilic whereas fatty acids are hydrophobic

Lipids like carbohydrates contain carbon, hydrogen and oxygen but are different because they only contain a small amount of oxygen. They are formed by condensation reactions between glycerol and fatty acids, this is a similar reaction to the one shown in the diagram for disaccharides.

The chemical properties of lipids:

- Insoluble in water.
- May be solid or liquid at room temperature depending on their structure and composition.

Proteins



The diagram above shows the structure of a protein, they are different from carbohydrates and lipids by containing an amino group which contains nitrogen. Most proteins are very large molecules formed from long chains of amino acids. Other than the amino group they have a carboxyl group usually containing a carbon, two oxygen and a hydrogen (COOH).
As well as the amino and carboxyl group, proteins also have an R-group. This R-group is where each protein differs from one another.

Structure of a Protein

Proteins are made up of amino acids in a linear sequence, the amino group of one amino acid reacts with the carboxyl group of another amino acid in a condensation reaction releasing water. This reaction is called a peptide bond and the result of this reaction would be a dipeptide. If there are more than two amino acids bonded in this way it's called a polypeptide.