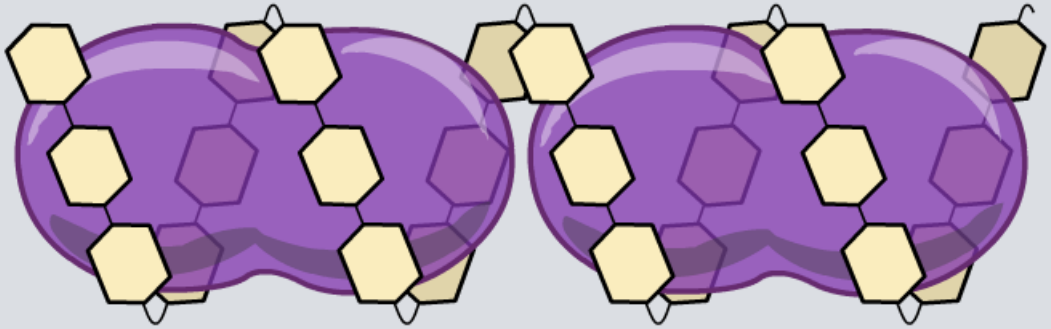
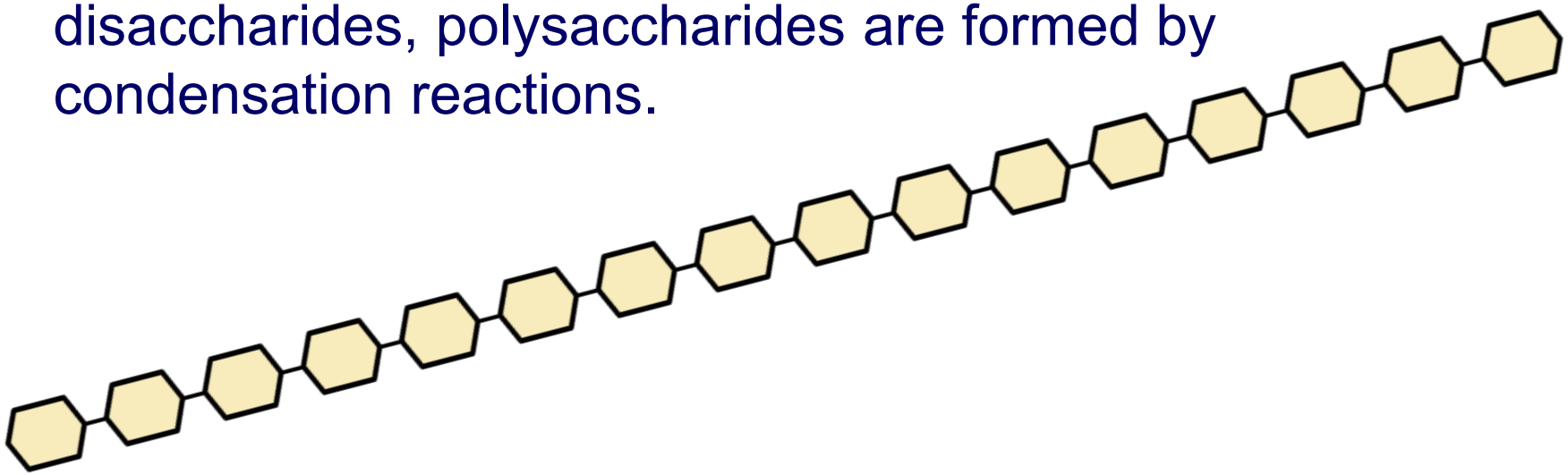
Polysaccharides



What are polysaccharides?

Polysaccharides are polymers containing many monosaccharides linked by glycosidic bonds. Like disaccharides, polysaccharides are formed by condensation reactions.



Polysaccharides are mainly used as an energy store and as structural components of cells.

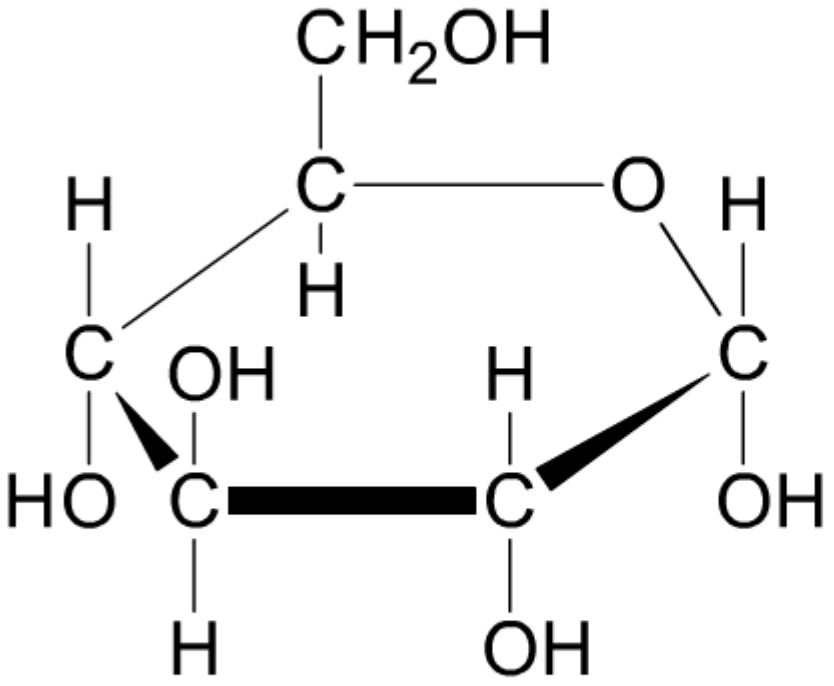
The major polysaccharides are **starch** and **cellulose** in plants, and **glycogen** in animals.

The structure of starch

What is the structure of starch?

Starch is a polysaccharide made of many alpha glucose molecules arranged into two different structural units: **amylose** and **amylopectin**.

Click "**play**" or the glucose molecule to find out more.



Properties and uses of starch

Starch is the major carbohydrate storage molecule in plants.

It is usually stored as intracellular **starch grains** in organelles called plastids.

Plastids include green **chloroplasts** (e.g. in leaves) and colorless **amyloplasts** (e.g. in potatoes).

Starch is produced from glucose made during photosynthesis. It is broken down during respiration to provide energy and is also a source of carbon for producing other molecules.

Iodine test for starch

What is cellulose?

Cellulose is another polysaccharide and is the main part of plant cell walls. It is the most abundant organic polymer.

Unlike starch, cellulose is very strong, and prevents cells from bursting when they take in excess water.

Cellulose consists of long chains of beta glucose molecules joined by beta 1–4 glycosidic bonds.

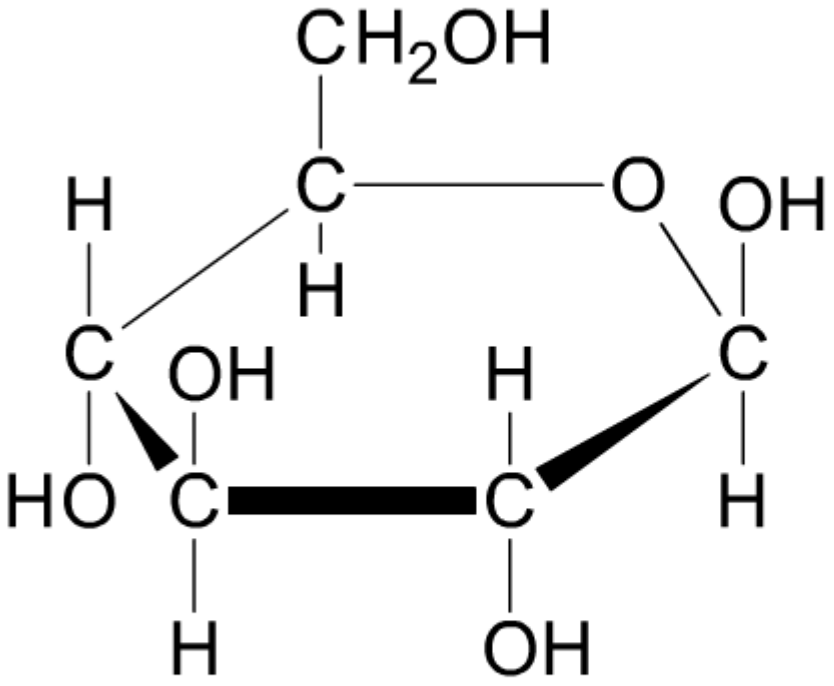
The glucose chains form rope-like microfibrils, which are layered to form a network.

The structure of cellulose

What is the structure of cellulose?

Cellulose is a polysaccharide made up of many **beta glucose** molecules. How are these linked?

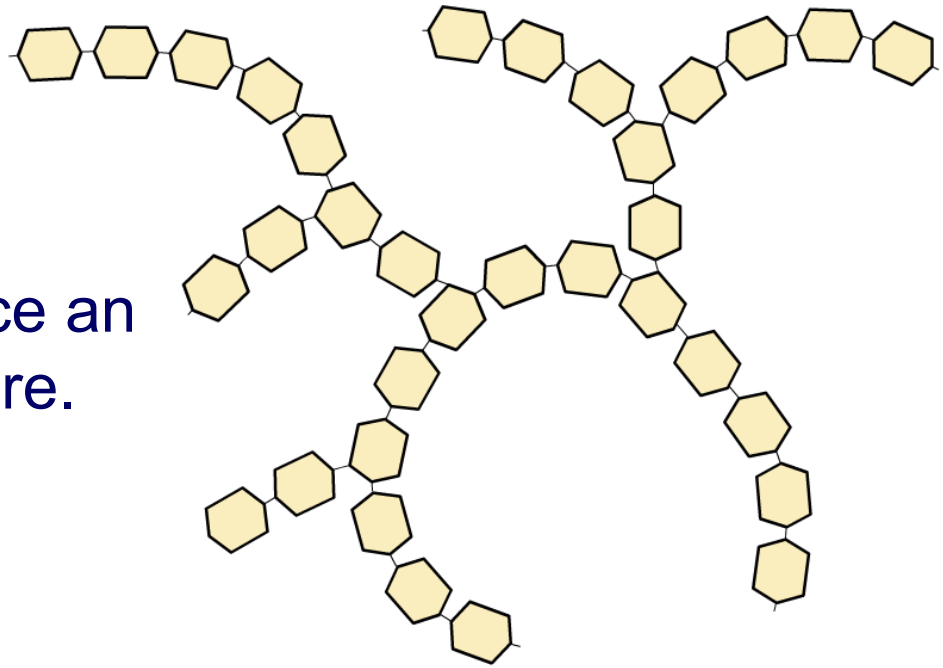
Click "**play**" or the glucose molecule to find out more.



What is glycogen?

Animals do not store carbohydrate as starch but as **glycogen**.

Glycogen has a similar structure to amylopectin, containing many alpha 1–6 glycosidic bonds that produce an even more branched structure.



Glycogen is stored as small granules, particularly in muscles and liver.

Glycogen is less dense and more soluble than starch, and is broken down more rapidly. This indicates that animals have higher metabolic requirements than plants.

Polysaccharides: true or false?

Are these statements about polysaccharides true or false?

1.	Starch and amylose are the same thing.	?
2.	Amylose contains glucose mainly joined by 1–4 glycosidic bonds and so has little branching.	?
3.	Amylopectin contains alpha and beta glucose.	?
4.	In cellulose, every other glucose molecule is rotated by 180°.	?
5.	Glycogen and amylopectin are structurally very similar.	?

true false