

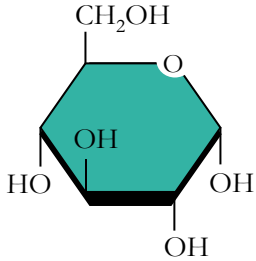
TOPIC 2.3: CARBOHYDRATES

Monosaccharides

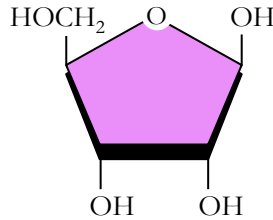
The monomer of a carbohydrate is called a monosaccharide

- Monosaccharides primarily function as an energy source

Examples of monosaccharides include glucose and ribose



Glucose



Ribose

Polysaccharides

Monosaccharides are covalently joined by glycosidic linkages to form polymers (requires condensation reactions)

Monosaccharides may be joined into disaccharides for ease of transport, or may form more complex polysaccharides

Polysaccharides may be used for a variety of cell functions:

- Short term energy storage (e.g. glycogen, starch)
- Structural components (e.g. cellulose)
- Recognition / receptors (e.g. glycoproteins)

The carbohydrate formed depends on the monosaccharide subunits used and the bonding arrangement between them

Types of Polysaccharides

Cellulose (*component of plant cell wall*)

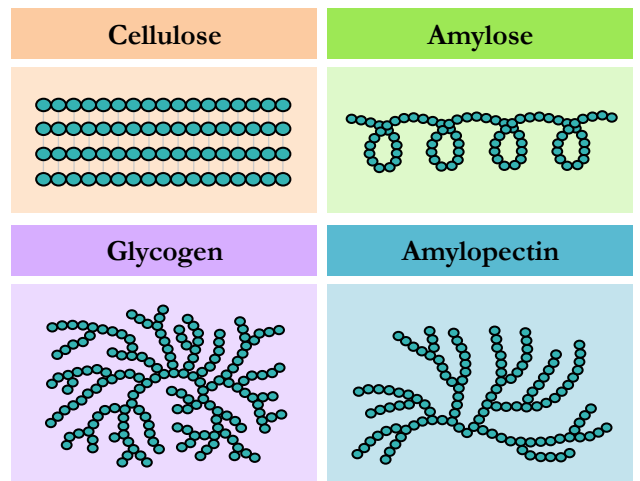
- Linear molecule made of β -glucose subunits
- Subunits bound in a 1-4 arrangement

Starch (*energy storage in plants*)

- Composed of α -glucose subunits and exists in two forms
- Amylose is linear (helical) and bound in 1-4 arrangements
- Amylopectin is branched (bound in 1-4 *and* 1-6 arrangements)

Glycogen (*energy storage in animals*)

- Branched molecule composed of α -glucose subunits
- Is like amylopectin but with more frequent 1-6 bonding



Energy Storage

Carbohydrates and lipids are both used as energy storage molecules, however they differ in certain key aspects:

- **S**torage (lipids used for long term storage)
- **O**smotic pressure (lipids easier to store)
- **D**igestion (carbohydrates easier to utilise)
- **A**TP yield (lipids store more energy per gram)
- **S**olubility (lipids insoluble / harder to transport)



	Carbohydrate	Lipid
Storage	Short term	Long term
Osmolality	More effect	Less effect
Digestion	Easier to digest	Harder to digest
ATP Yield	Smaller	Larger (~2x)
Solubility	Soluble (<i>mono-/ dimer</i>)	Insoluble in water

Body Mass Index

While carbohydrates (and lipids) are important components of a healthy diet, excess intake can affect body mass

The body mass index (BMI) can be calculated as follows:

- **BMI** = Mass in kg \div (Height in m)²

BMI can be calculated with an alignment chart (nomogram)

