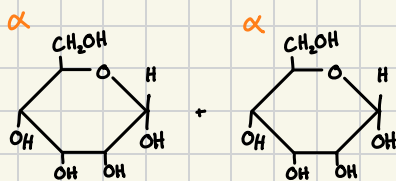


3.1.1 — Carbs & Lipids

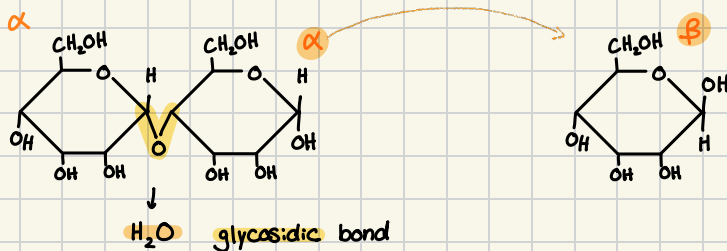
Polymer	monomer	Elements	Purpose	Type of bond
Carbohydrate	monosaccharide	CHO	Quick Energy Supply	glycosidic ^{covalent!}
Lipid	fatty acid / glycerol	CHO	Energy storage	Ester

Carbohydrates => composed of monosaccharides

- Ring structures
- Linked together via condensation reaction produces H_2O



$\alpha \Rightarrow$ H upwards on Carbon # 1
 $\beta \Rightarrow$ H downwards on Carbon # 1

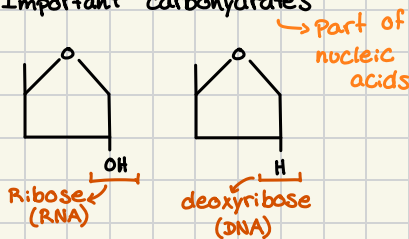


- 2 monosaccharides together = disaccharide
- >2 monosaccharides together = polysaccharide

Types of Carbs:

	Monosaccharides	Disaccharides	Polysaccharides
Subunits	one	Two	Many
Main function	Energy source	Transport form	storage form
Examples	- Glucose - Galactose - Fructose	- Lactose - Sucrose - Maltose	- Cellulose - Glycogen - starch
Mnemonic	"Gives Good Flavor"	"Length Supports Movement"	"Can Get Stored"

Important carbohydrates



a) cellulose

- Found in plant cell walls
- Linear molecule
- β -glucoses linked (1,4)
- No branching
- Indigestible for animals

b) Starch

- Energy storage in plants
- α -glucose (1,4)
- Found in 2 forms
 1. Amylose (no branching)
 2. Amylopectin (branching)

c) Glycogen

- Energy storage in animals
- α -glucose (1,4) & (1,6)
- stored in liver & muscles
- Branches (more than amylopectin)

More on polymers:

Type of polymer depends on monosaccharide subunits & bonding arrangement between them

From glucose

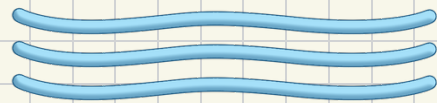
a) cellulose

b) starch (in plants)

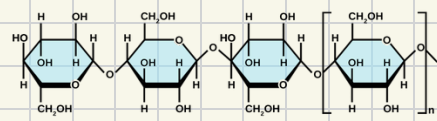
c) glycogen (in animals)

Cellulose:

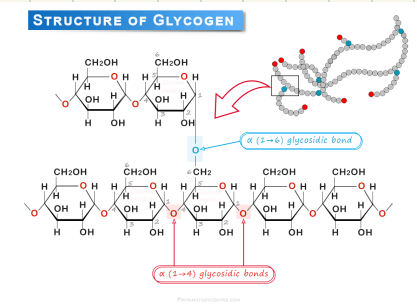
Cellulose Fibers



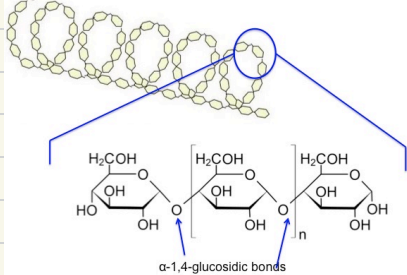
Cellulose Structure



Glycogen:

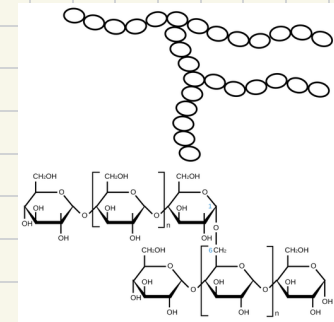


starch (amylose):



- Helical shaped
- water insoluble
- Not branched
- (1,4)

starch (amylopectin):



- Long chain
- Branched
- (1,6) / (1,4)
- 75% of starch
- More water soluble

Lipids

Monomer => fatty acid

long hydrocarbon chains found in certain types of lipids

i) length can change

1. Triglycerides

ii) number of double bonds

2. Phospholipids

between carbons can change

↳ Saturated fatty acid => no double bonds between carbons

• Max. number of hydrogens

↳ Unsaturated fatty acid => yes double bonds between carbons

a) Monosaturated => 1 double bond

b) Polysaturated => >1 double bond

- bent structure
- originate from plants
- Liquid at room temperature

1.

unsaturated-cis fatty acid

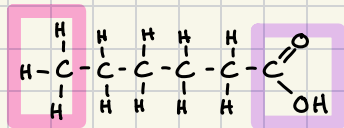
- Hydrogen atoms attached to either side of C=C are on the same side

Two possible structural configurations

2.

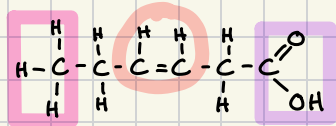
unsaturated-trans fatty acid

- Hydrogen atoms attached to either side of C=C are on different sides



Saturated fatty acid

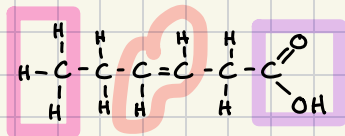
bad for health



unsaturated-cis fatty acid

Good for health

↳ bent configuration



unsaturated-trans fatty acid

]- usually produced by food industry

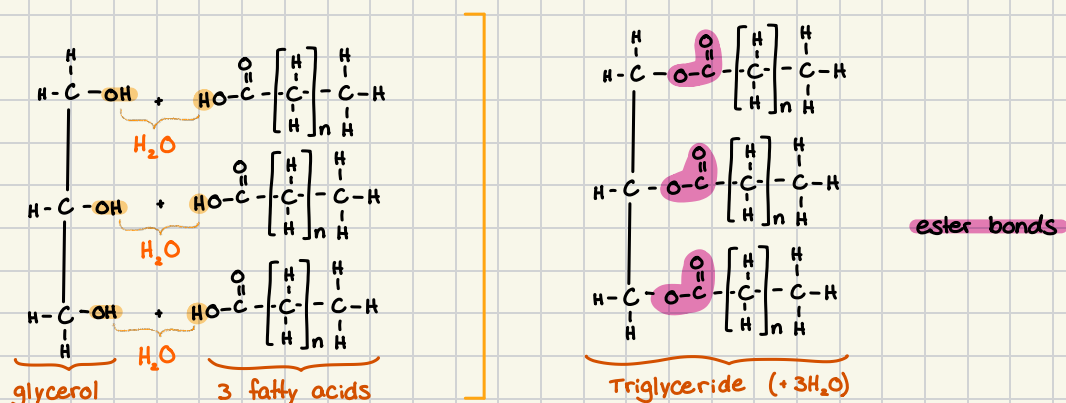
bad for health

Triglycerides

- ↳ Largest lipid
- ↳ Long-term E storage
 - a) Animals (as fats) - **Solid**
 - b) Plants (as oils) - **liquid**
- ↳ Formed via condensation reaction between:
 - i) 1 glycerol
 - ii) 3 fatty acids

Hydroxyl (OH) from glycerol + Carboxyl (COOH) from fatty acids } **ester bond**

 - formation of 3 H₂O molecules



Carbs vs. lipids - Both are storage molecules but in different ways:

Carbs	Lipids
glycogen Short-term More effect More easily digested ↳ aerobic & anaerobic respiration 4 energy units per gram water-soluble as mono/dimers ↳ easy transport	Triglycerides Long-term Less effect Less easily digested ↳ aerobic respiration 9 energy units per gram Not water-soluble ↳ hydrophobic
Storage Osmality Digestion ATP yield Solubility	Storage => Lipids are better for long-term Osmality => Lipids = less effect on cell's osmotic pressure Digestion => Carbs = easier to digest & use ATP yield => lipids store more energy per gram Solubility => Carbs = easier to transport in blood

SODAS