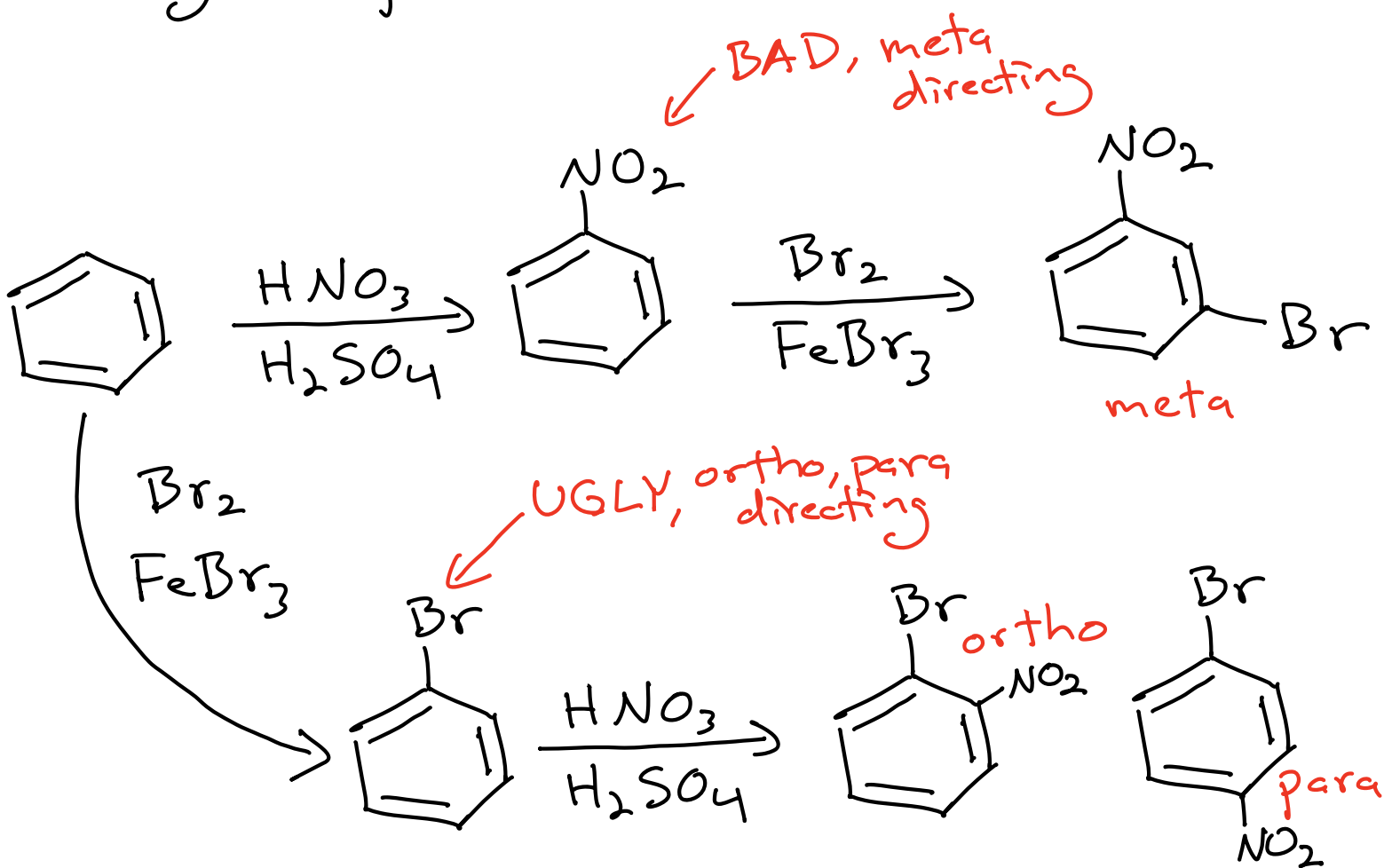
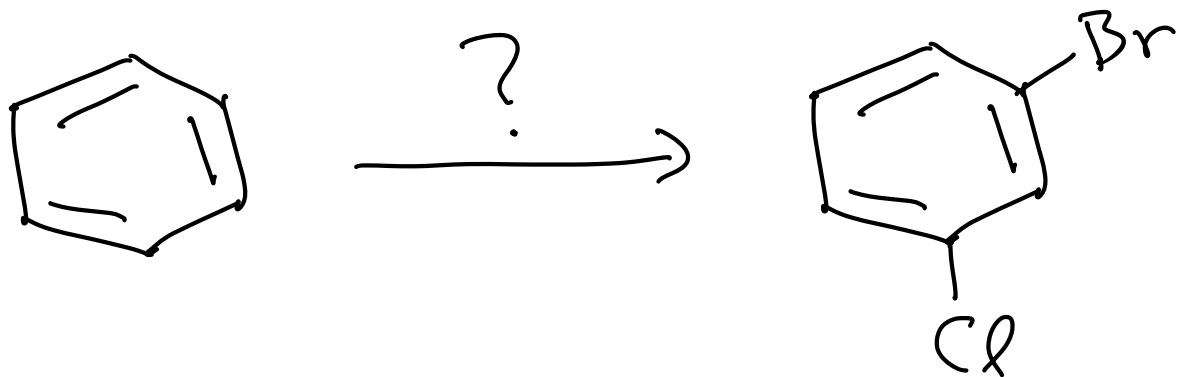


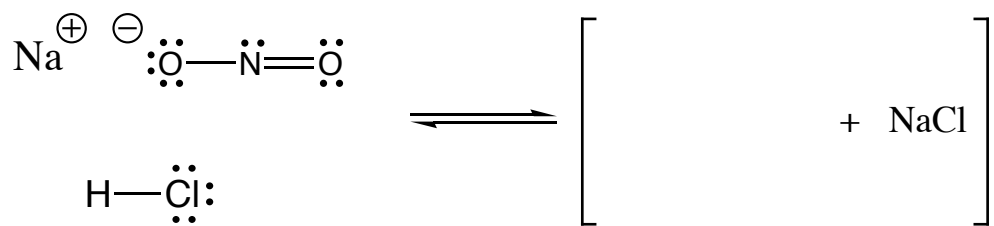
The order in which you add groups matters!



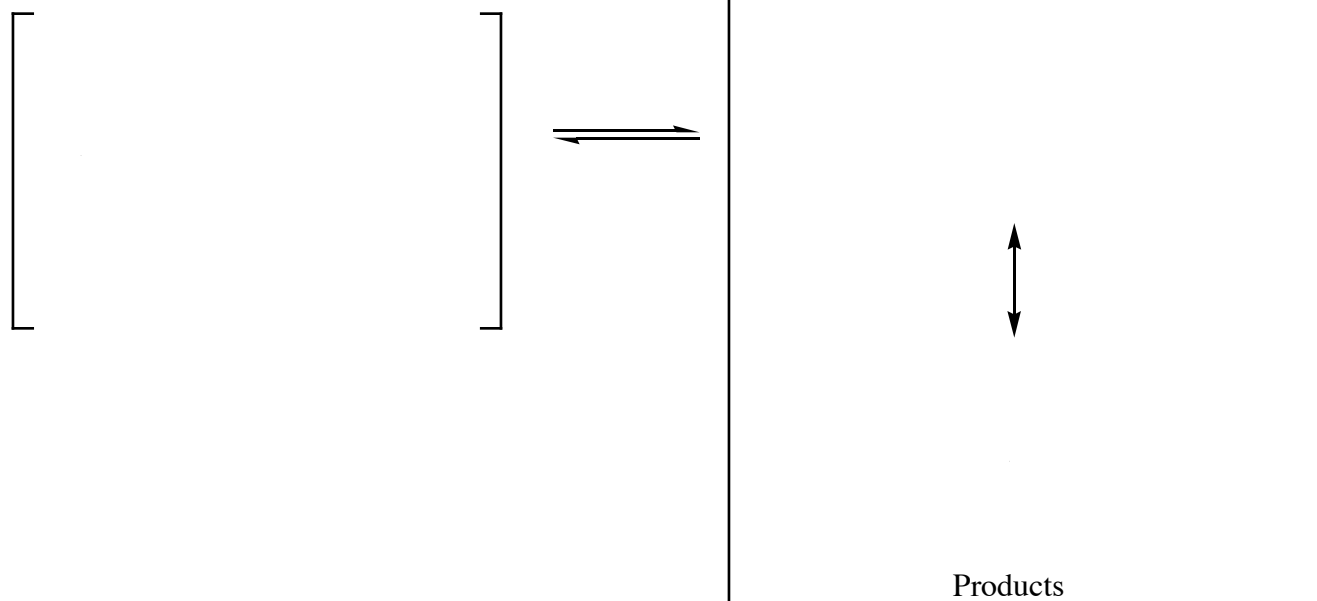
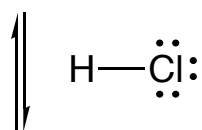
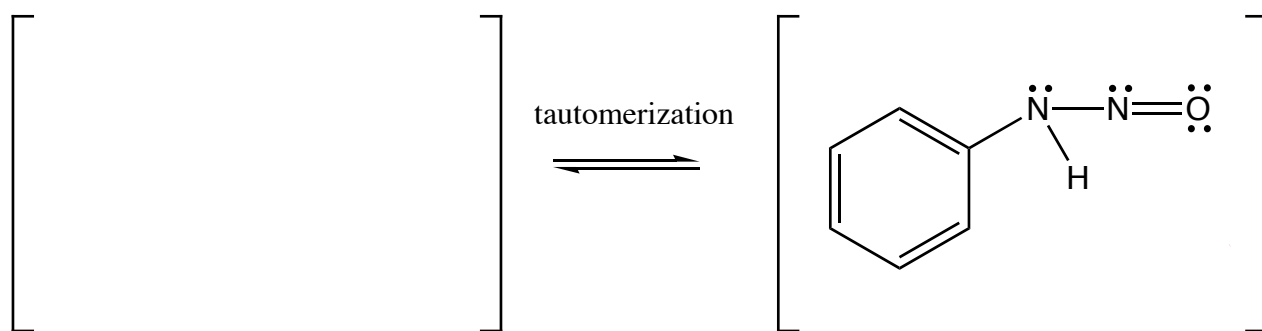
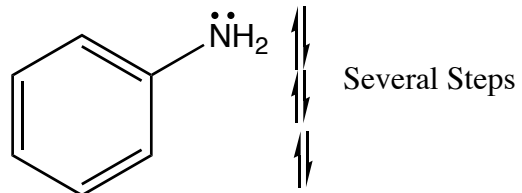
How do we carry out the following synthesis?

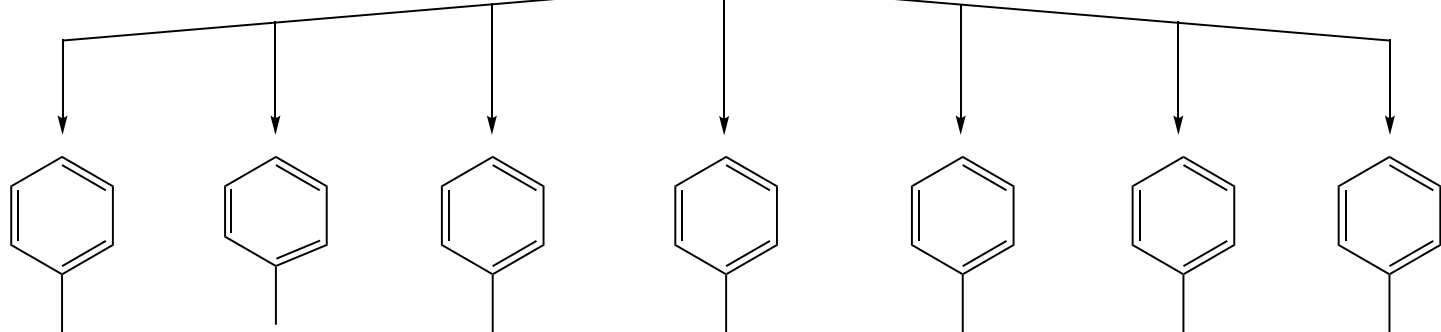
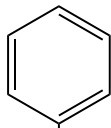
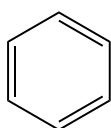
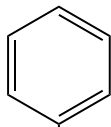
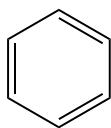


Preparation of Diazoniums, The "Mr. Bill" Reaction



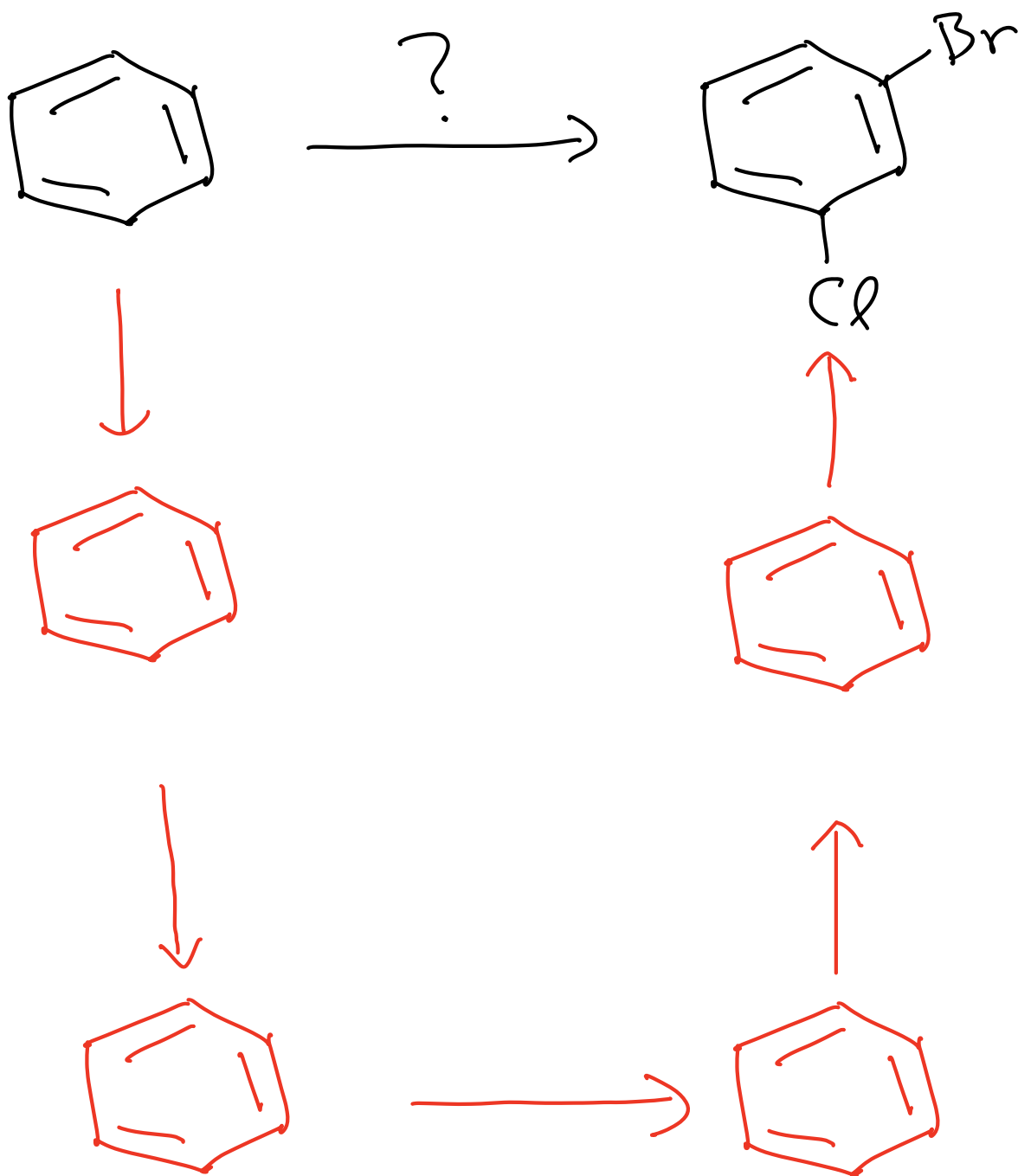
The Mr. Bill reagent



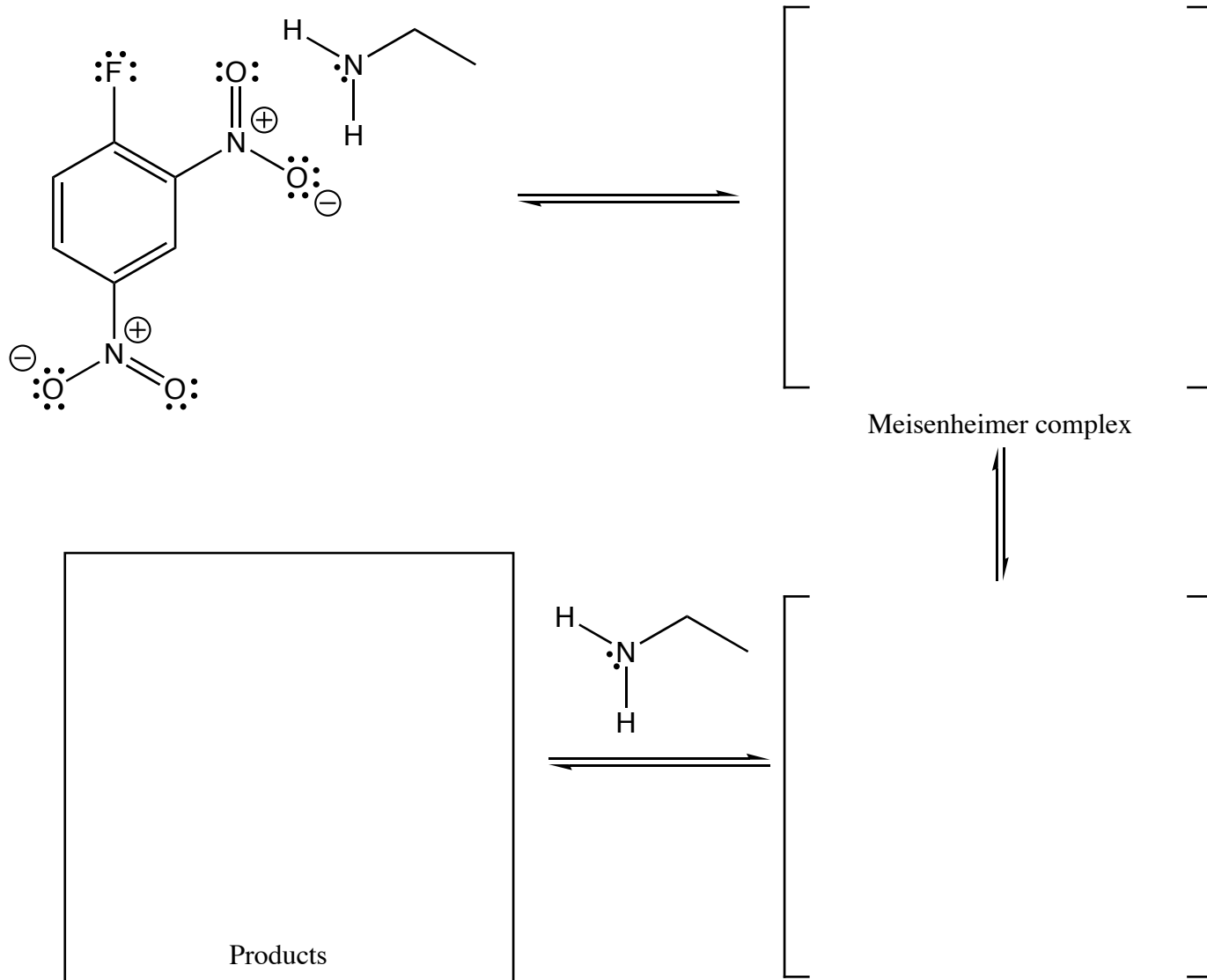


Sandmeyer Reaction

How do we carry out the following synthesis?

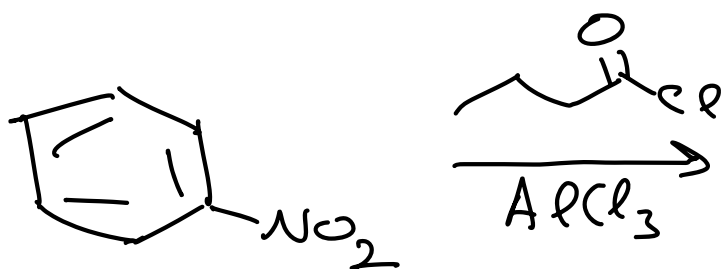


Nucleophilic Aromatic Substitution

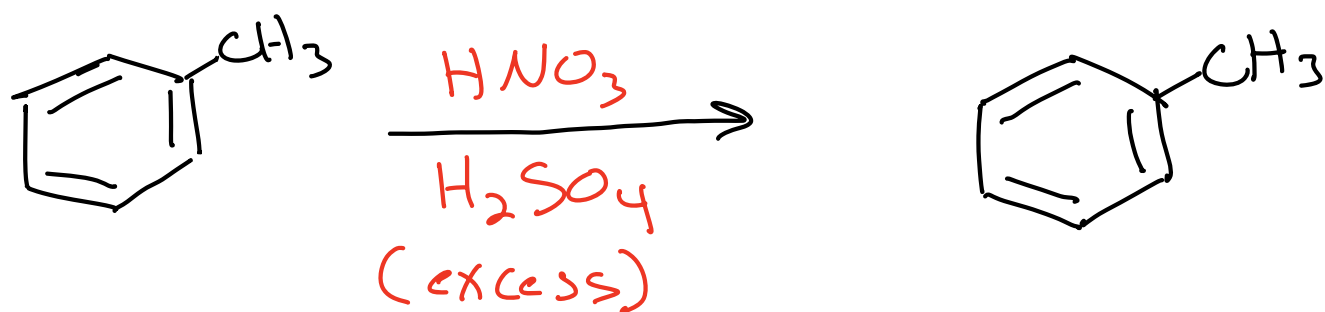


What you need to know about electrophilic aromatic substitution reactions:

1) Friedel-Crafts alkylation and acylation



However → Some reactions with harsh conditions will work:



Toluene



Solvent used
in model glue

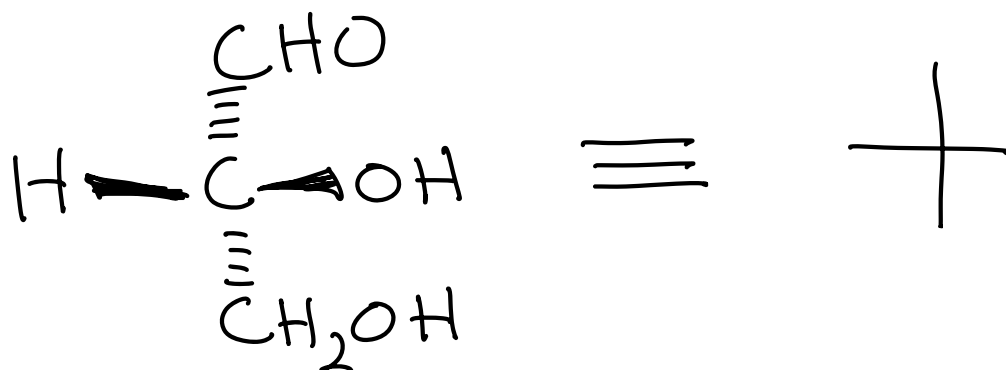
Carbohydrates

Monosaccharides \rightarrow 5 or 6 carbons
and are aldehydes and ketones

Ex.

Glucose is an

Stereochemistry



(R)-D-Glyceraldehyde

Called
Fischer
projection

Can I have
a hug please?

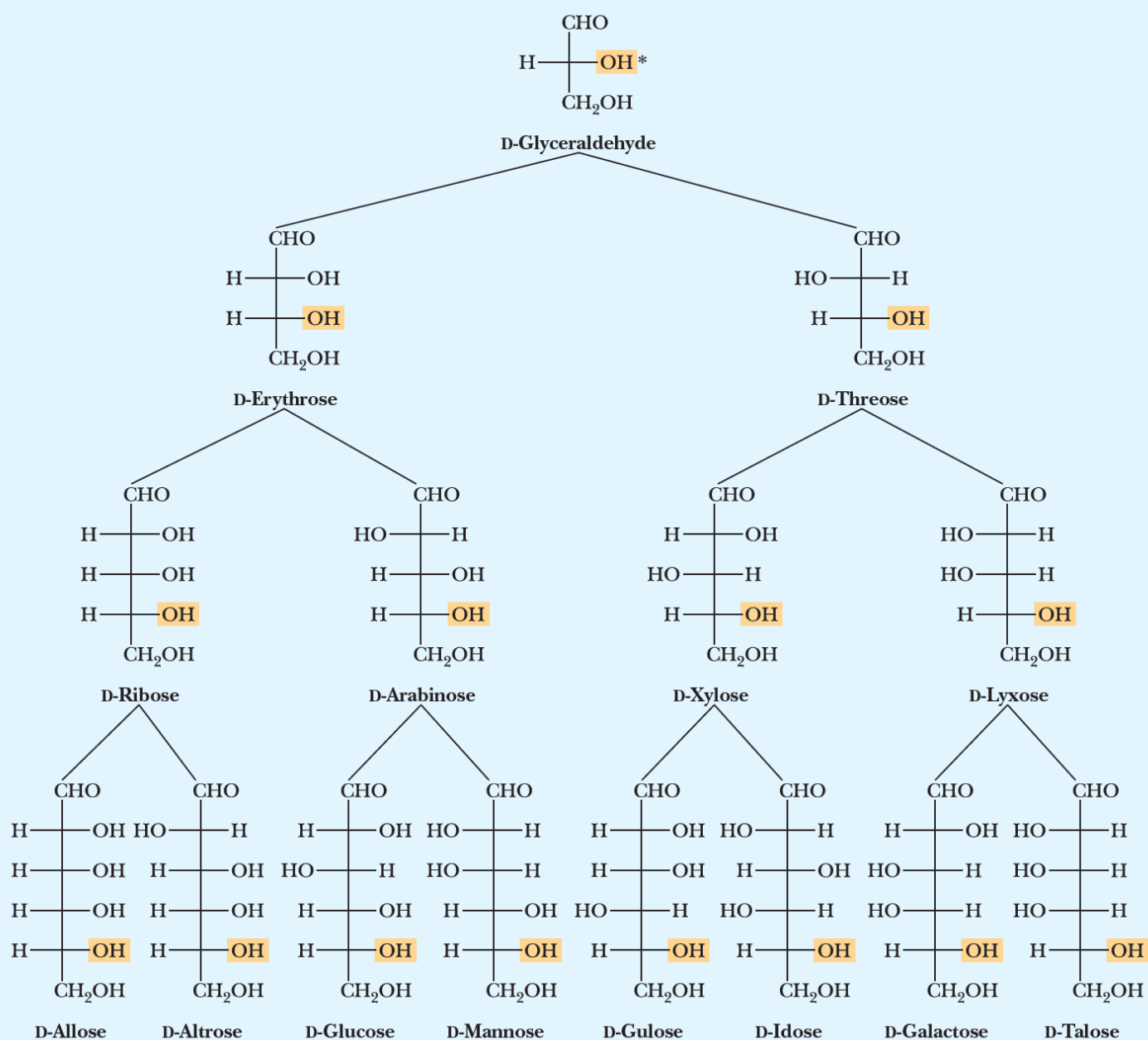


Stereochemistry defines the different carbohydrates

→ Due to the way carbohydrates are synthesized in cells → the common carbohydrates all have the same stereochemistry as D-glyceraldehyde at the carbon farthest from the carbonyl (aldehyde or ketone)

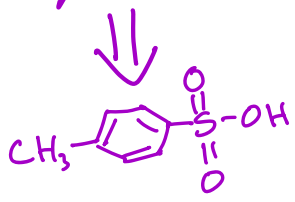
That is why they are called "D" carbohydrates

Table 25.1 Configurational Relationships Among the Isomeric D-Aldotetroses, D-Aldopentoses, and D-Aldohexoses

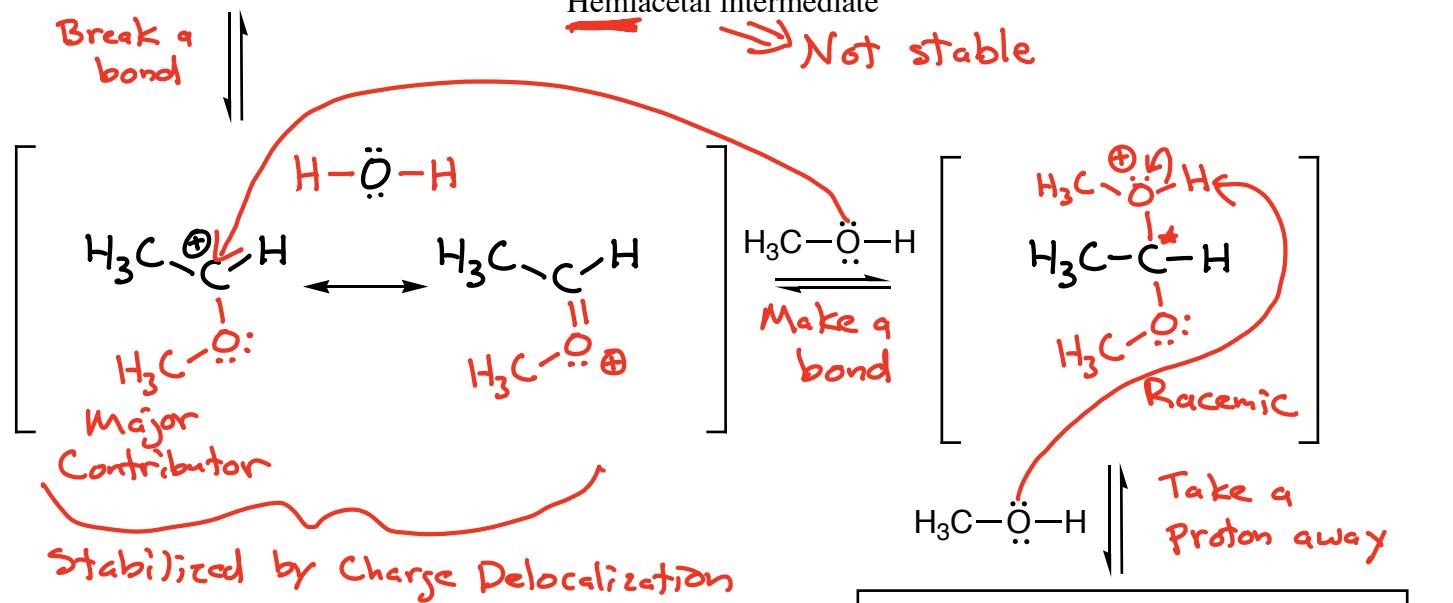
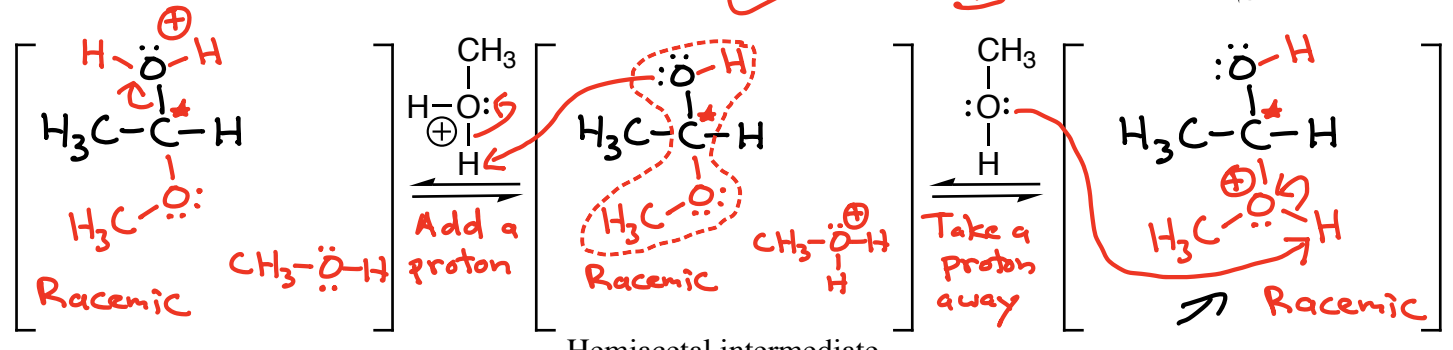
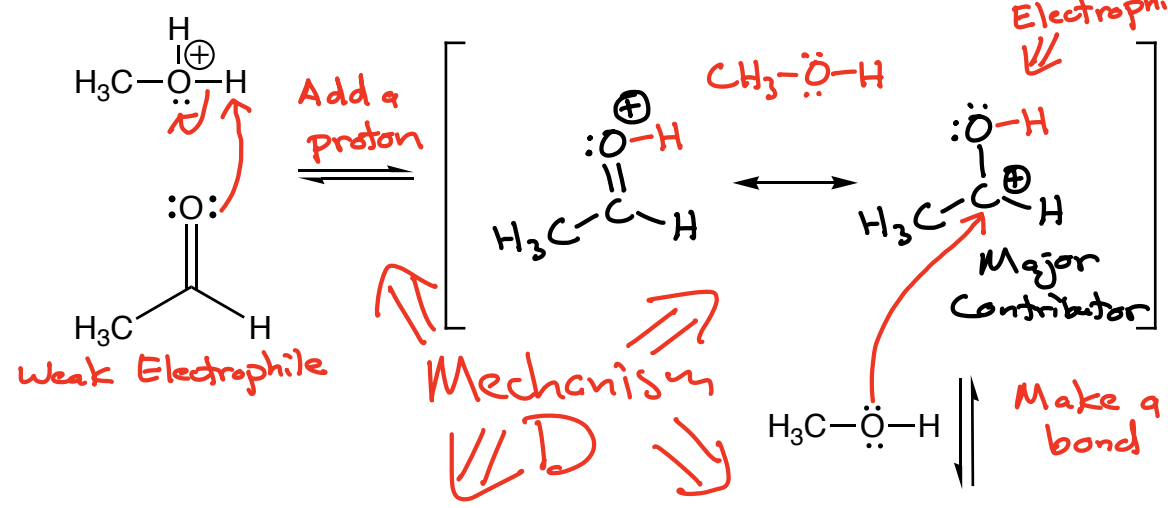




TsOH or H₂SO₄
Tosylic Acid
 Acid Catalyzed Hemiacetal and Acetal Formation From an Aldehyde or Ketone

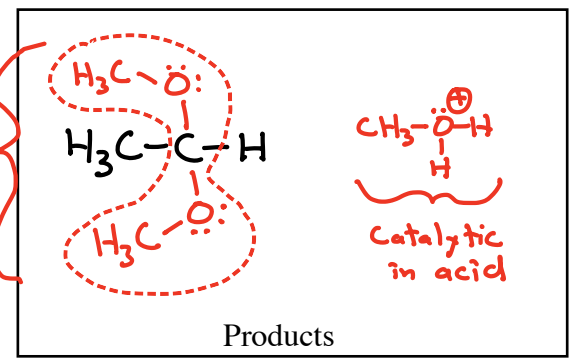


"Hey, does that thing have a hemi in it?" "SWEET!"

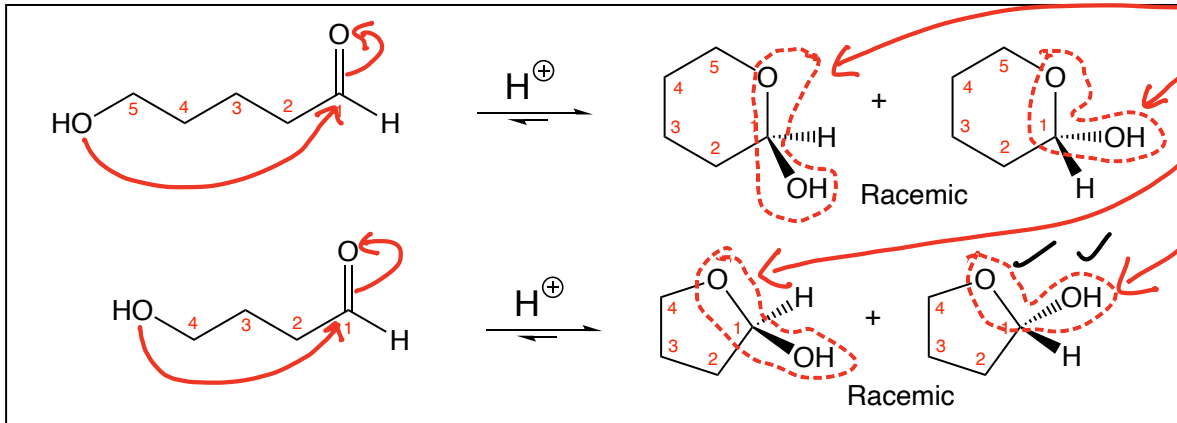


Key Recognition Element (KRE):
 Two bonds to O atoms from an sp³ C atom

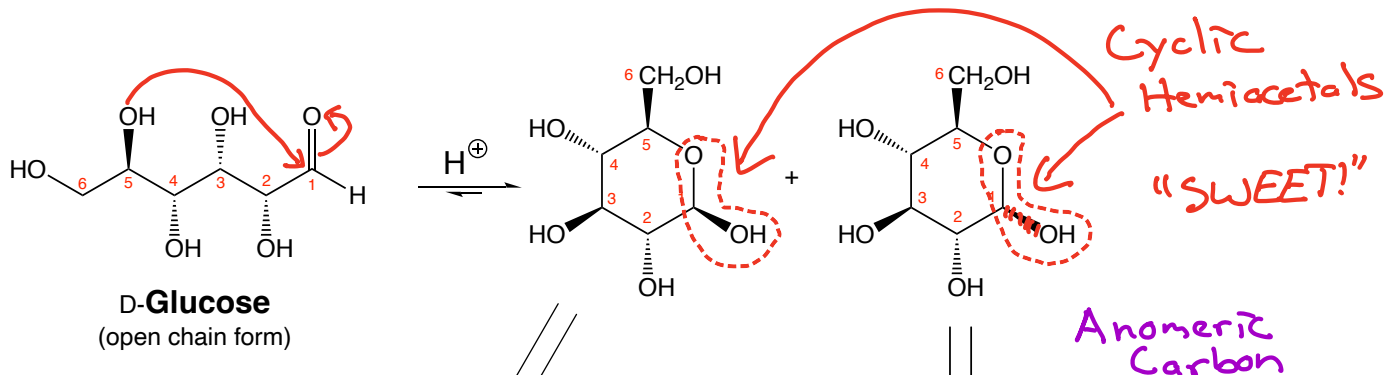
Definition of an acetal



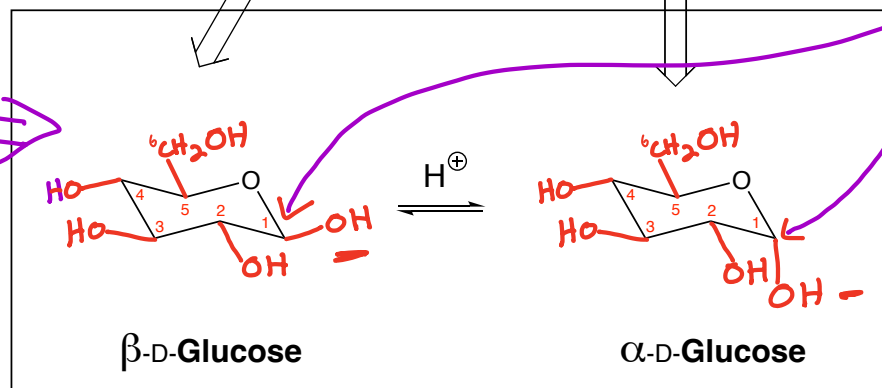
Cyclic Hemiacetals and Carbohydrates



The cyclic form of hemiacetals are stable - "SWEET!"
 → The chelate effect



This interconversion is called "mutarotation"



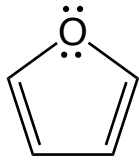
Biochemists call these two forms "anomers"

β -D-Glucopyranose
 means "6-membered ring"

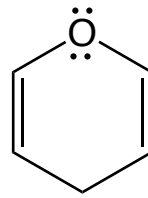
More stable → every group is equatorial!

α -D-Glucopyranose
 Less stable → one -OH is axial

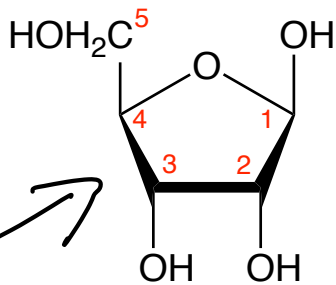
For Glucose:
 "α is axial!"



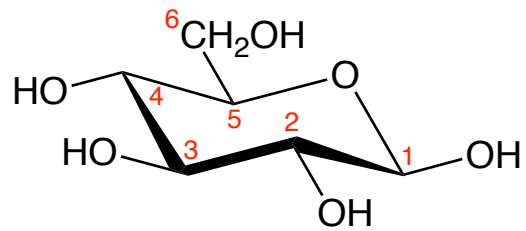
Furan



Pyran

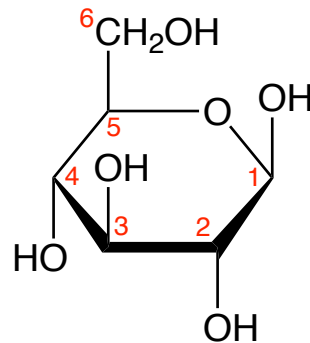


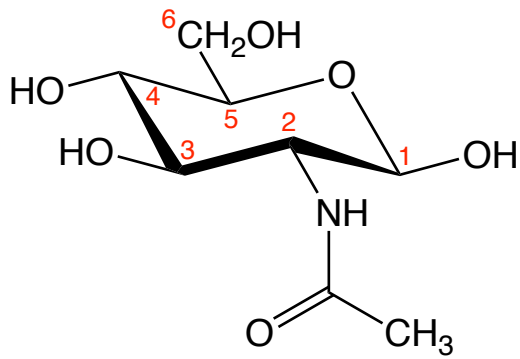
A furanose
 β -D-Ribose
or β -D-Ribofuranose



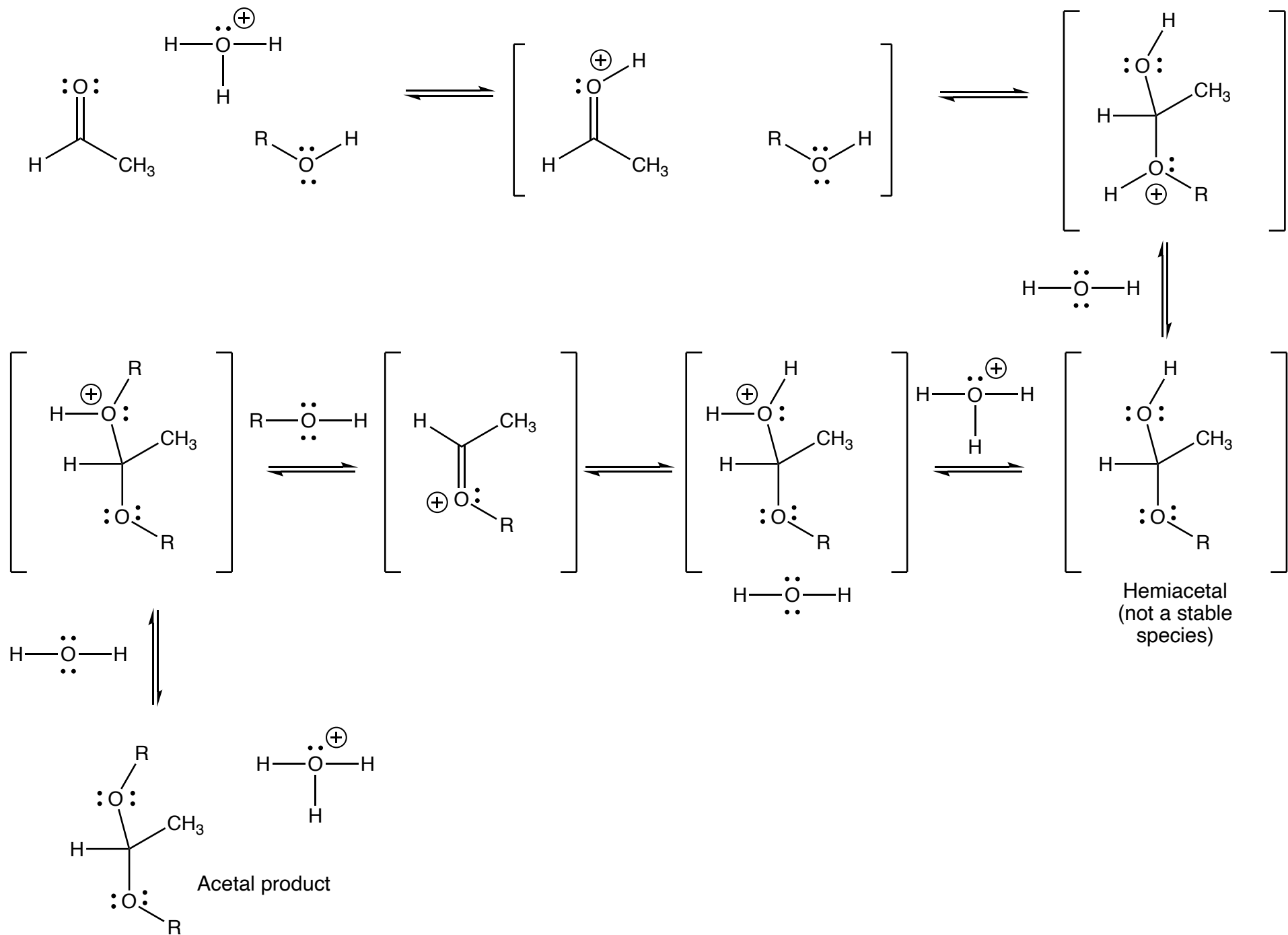
A pyranose
 β -D-Glucose
or β -D-Glucopyranose

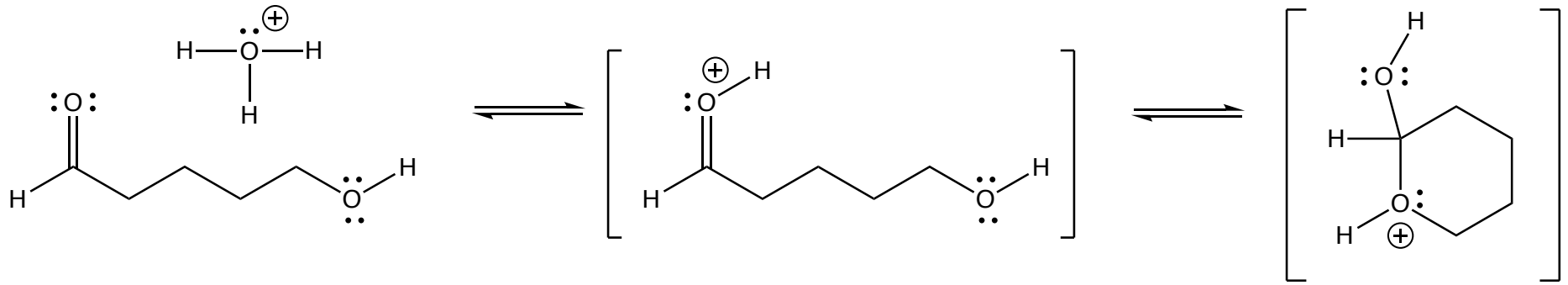
This is called a
Haworth projection



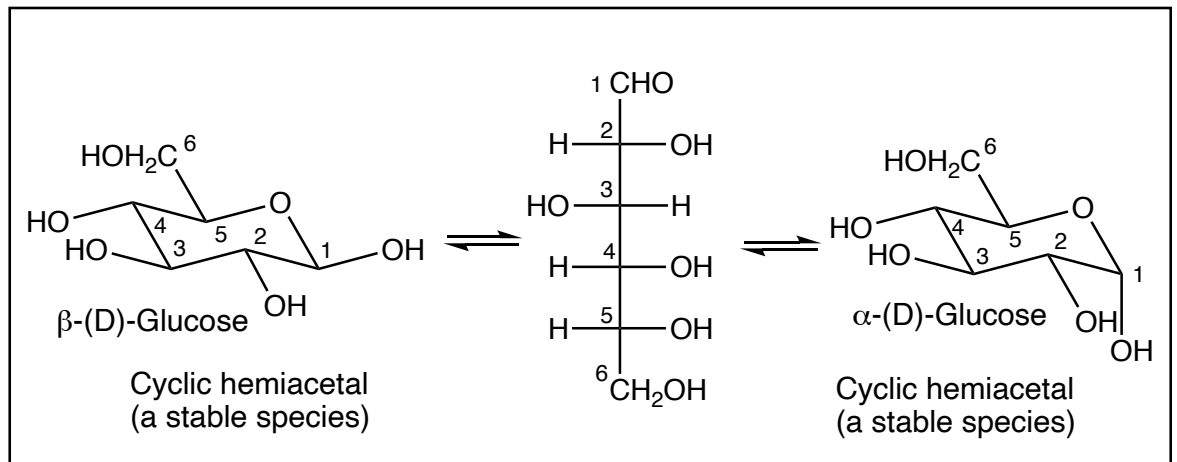
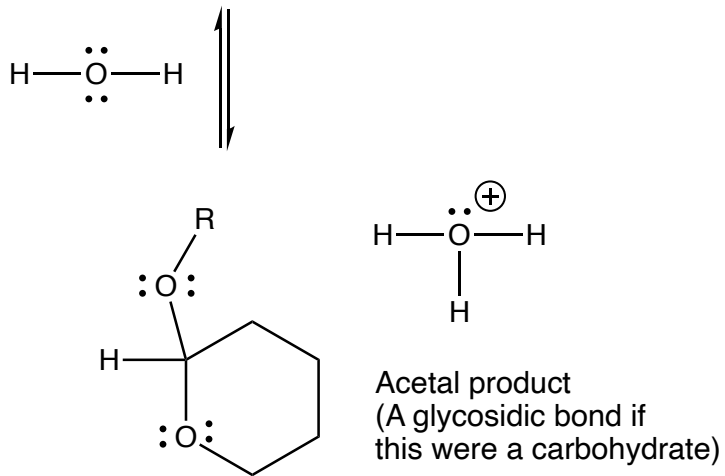
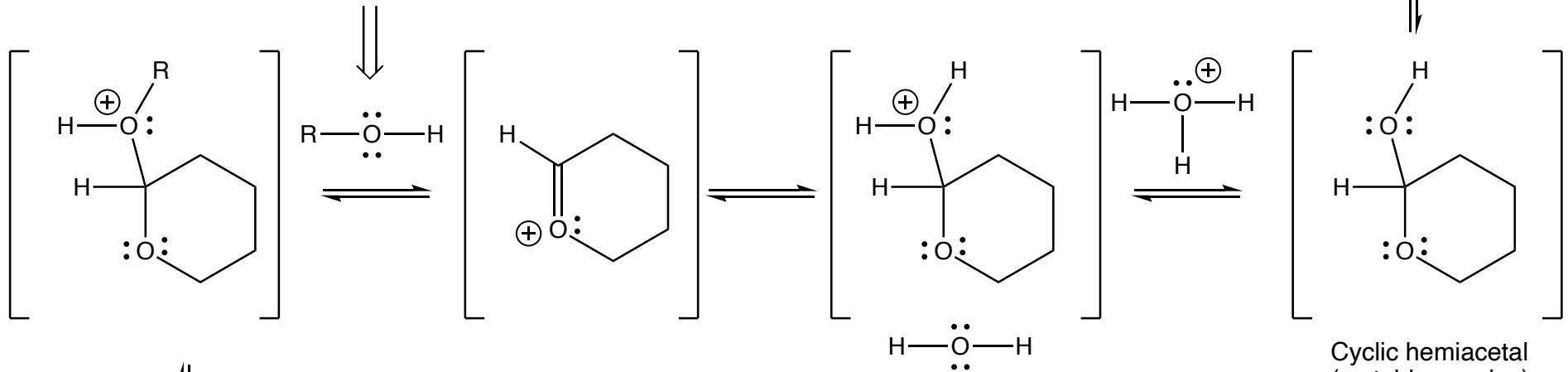


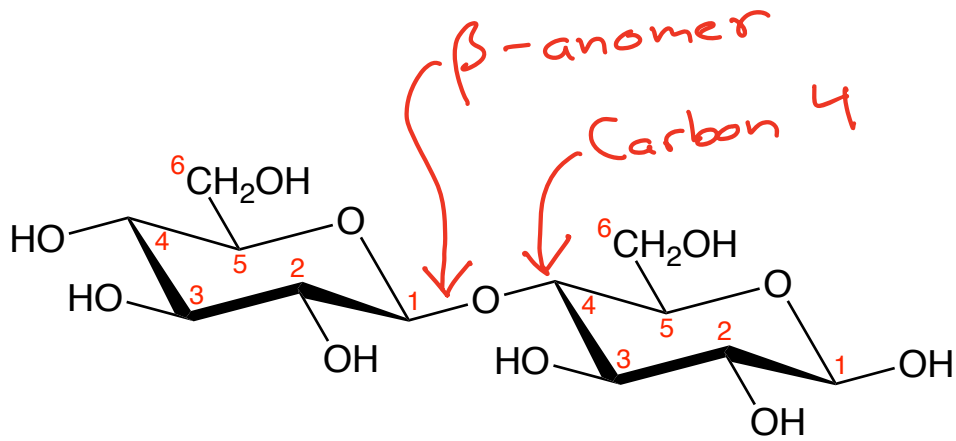
N-Acetyl-D-Glucosamine
(GlcNAC)



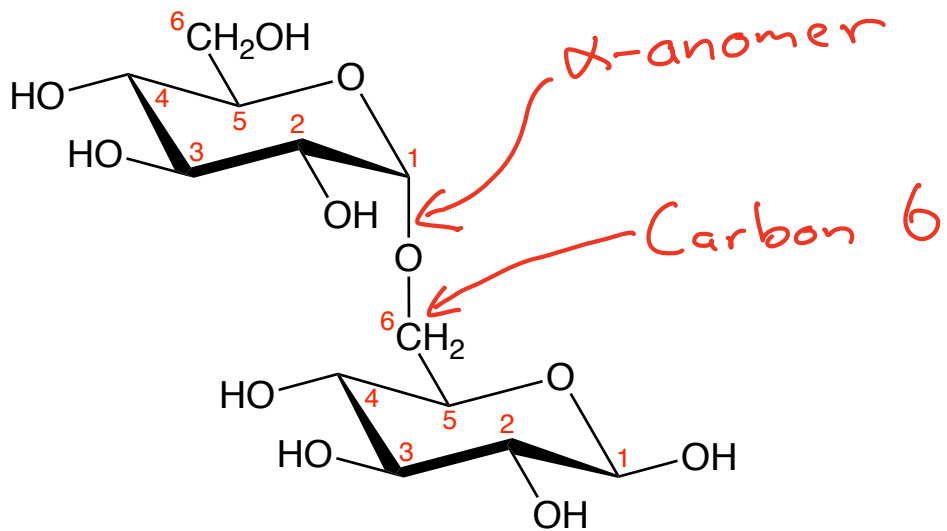


This can be another sugar!



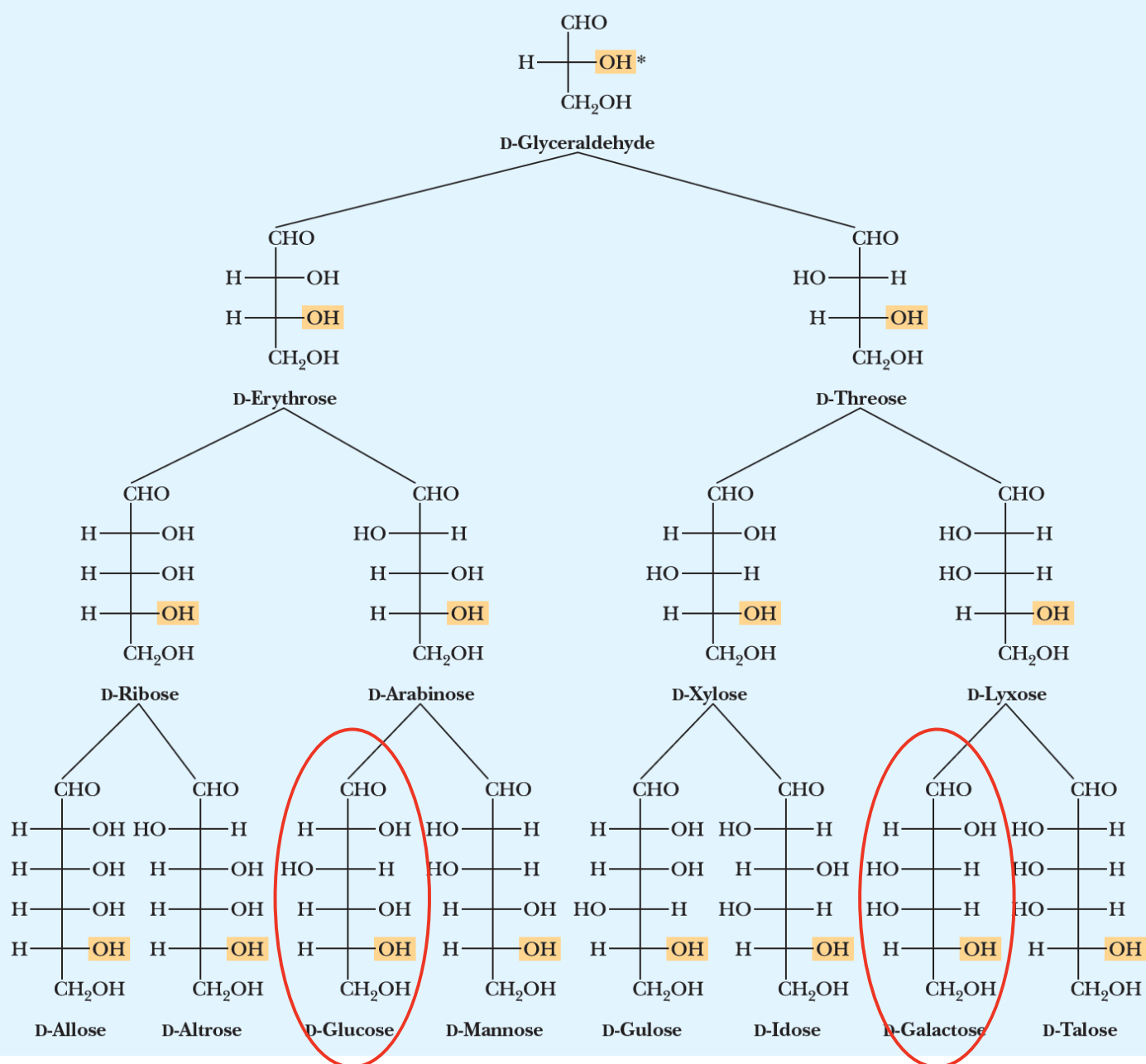


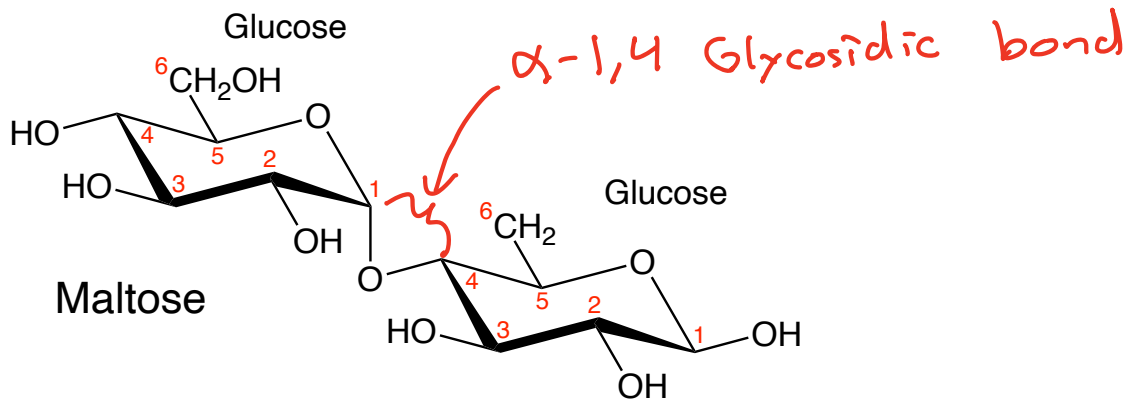
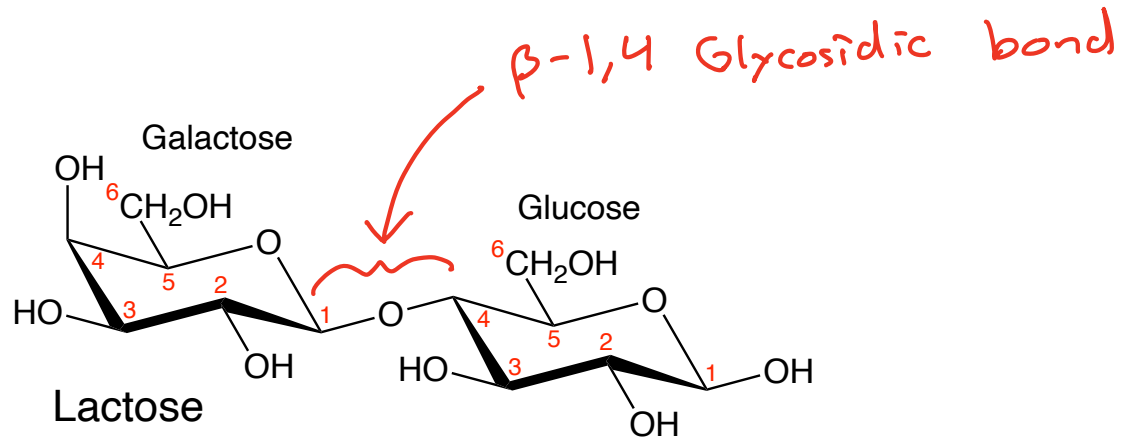
This is a β -1,4-Glycosidic Bond



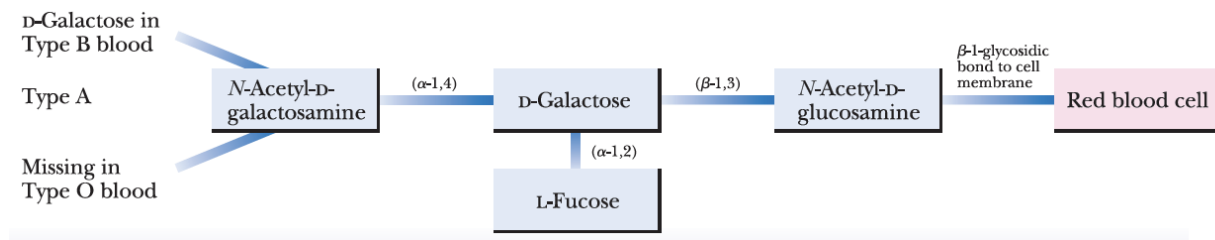
This is an α -1,6-Glycosidic Bond

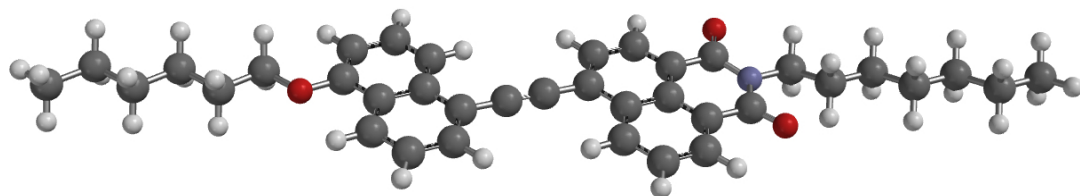
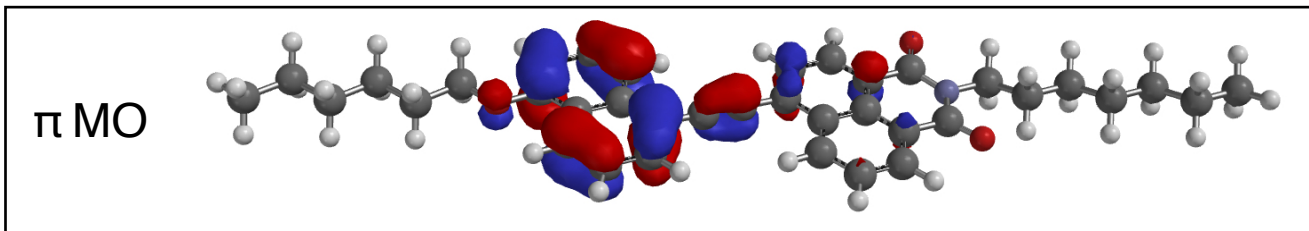
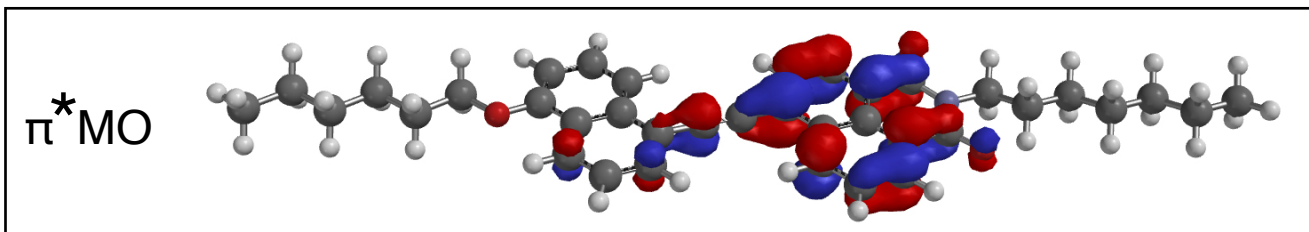
Table 25.1 Configurational Relationships Among the Isomeric D-Aldotetroses, D-Aldopentoses, and D-Aldohexoses



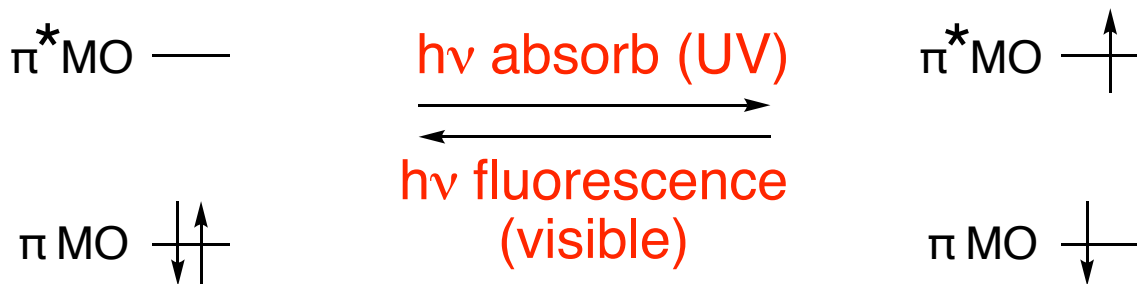
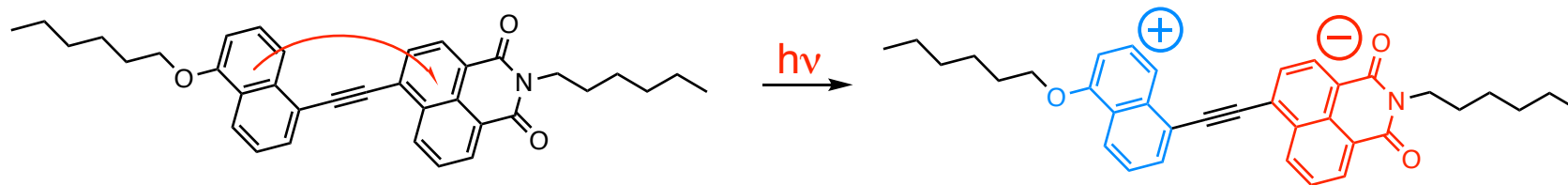


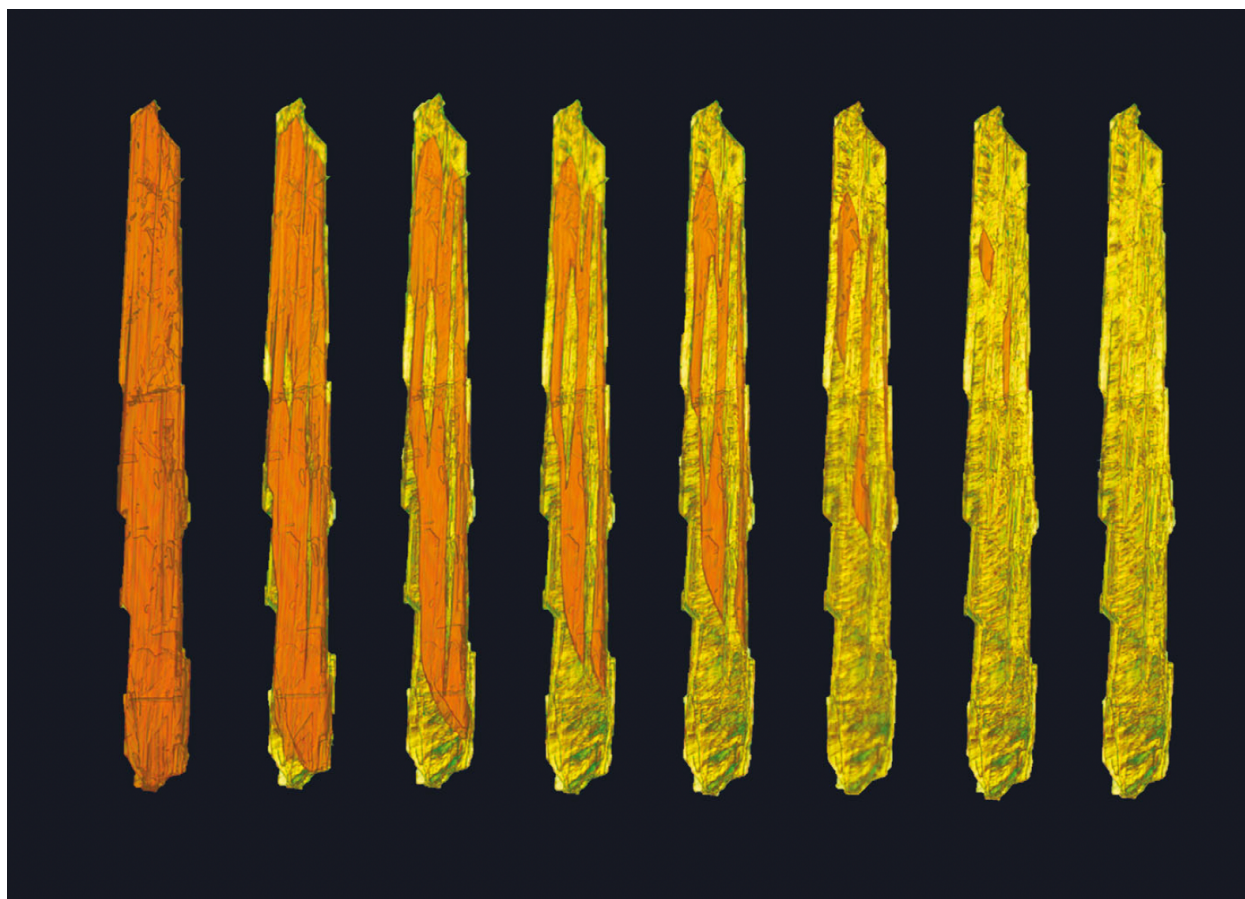
We can link more carbohydrates together, always at Carbon 1, with α or β linkages at carbons 2, 3, 4 or 6





Blue Light = higher energy
Orange light = lower energy





Cite this: *J. Mater. Chem. C*, 2015,
3, 12156

Solution- and solid-state photophysical and stimuli-responsive behavior in conjugated monoalkoxynaphthalene–naphthalimide donor–acceptor dyads†

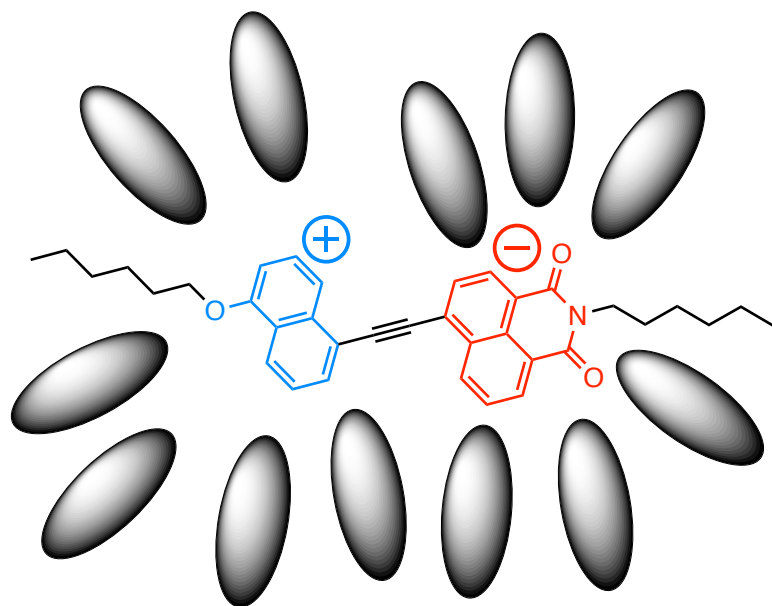
Cameron Peebles, Christopher D. Wight and Brent L. Iverson*

The stimuli-responsive properties of a series of aromatic conjugated monoalkoxynaphthalene–naphthalimide donor–acceptor dyads were studied. Two of the dyads, dyads **1** and **4**, showed a difference in solid-state color between relatively faster (yellow) and slower (yellow-orange or orange) evaporation from solution, while the other dyads, dyad **2** and **3**, only showed one color (yellow-green) for both evaporation rates. Importantly, highly solvatochromic dyad **4** displayed thermochromic (orange to yellow), mechanochromic (orange to yellow) and vapochromic (yellow to orange) stimuli-responsive behavior in the solid-state with repeatable cycles of color changing. Structural and spectroscopic studies indicated that the stimuli-responsive behavior of dyad **4** is the result of a 180° molecular rotation wherein the thermodynamically more stable head-to-head stacked orange crystalline solid interconverts with a head-to-tail stacked soft-crystalline yellow mesophase. The thermochromic transition of **4** from a presumably more stable crystalline state (orange) to a metastable soft crystalline mesophase state (yellow) that persists at room temperature unless exposed to solvent vapor is particularly noteworthy.

Received 3rd August 2015,
Accepted 30th September 2015

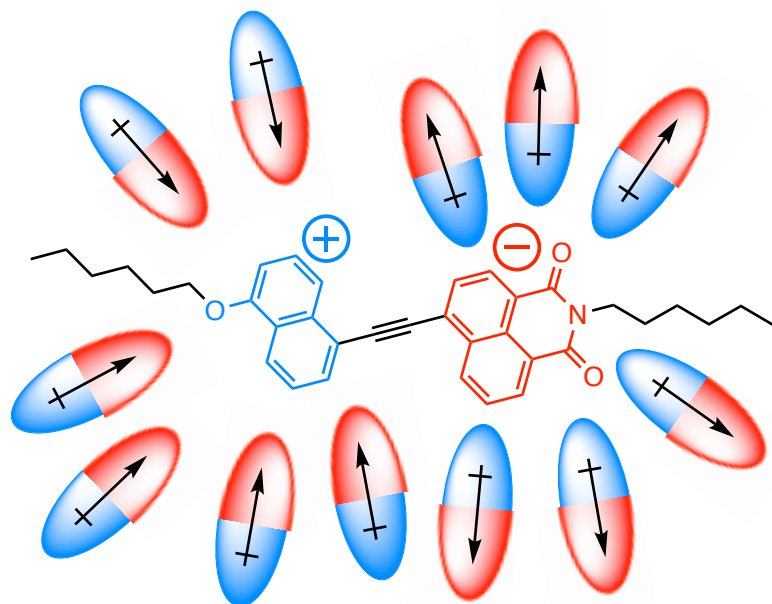
DOI: 10.1039/c5tc02397a

www.rsc.org/MaterialsC



Non-polar Solvent Molecule

No stabilization of the
charged excited state



Polar Solvent Molecule

Stabilization of the
charged excited state

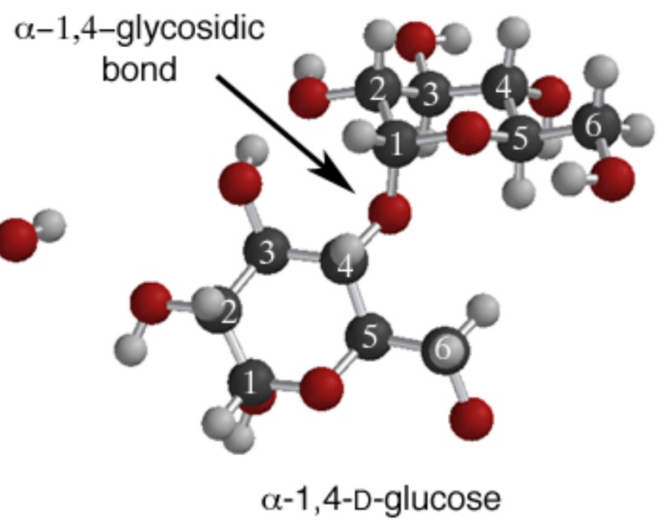
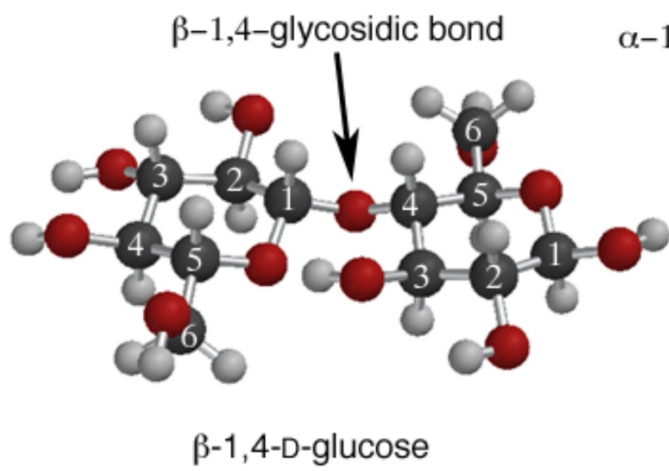
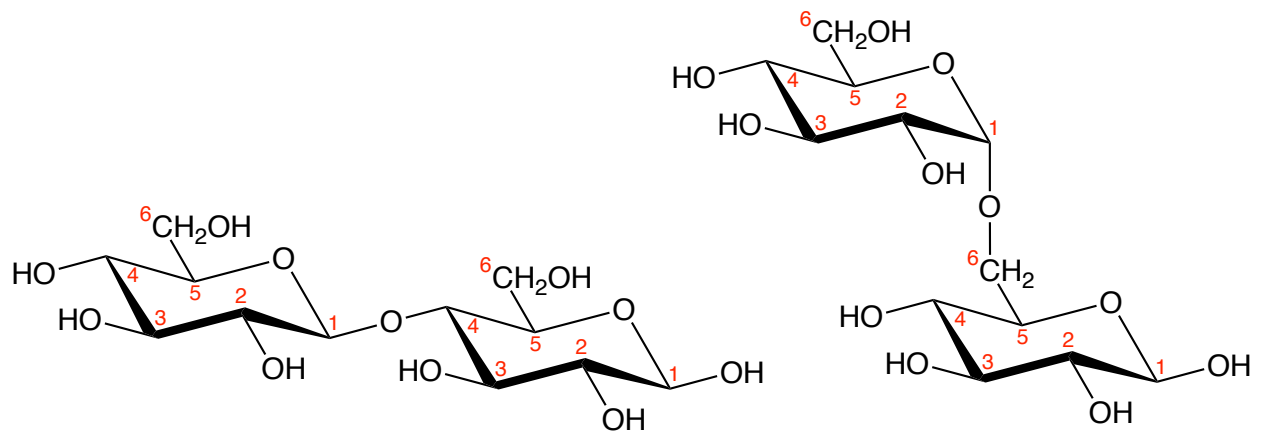




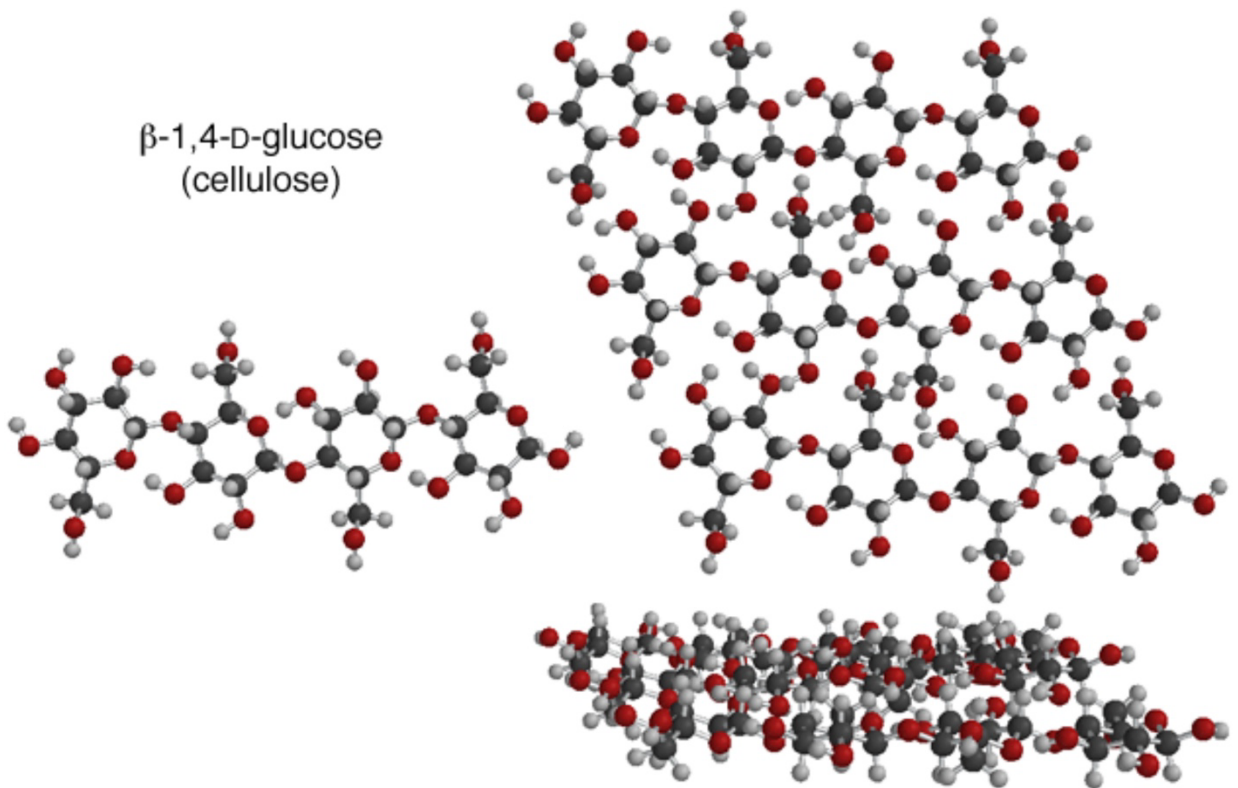
VS.



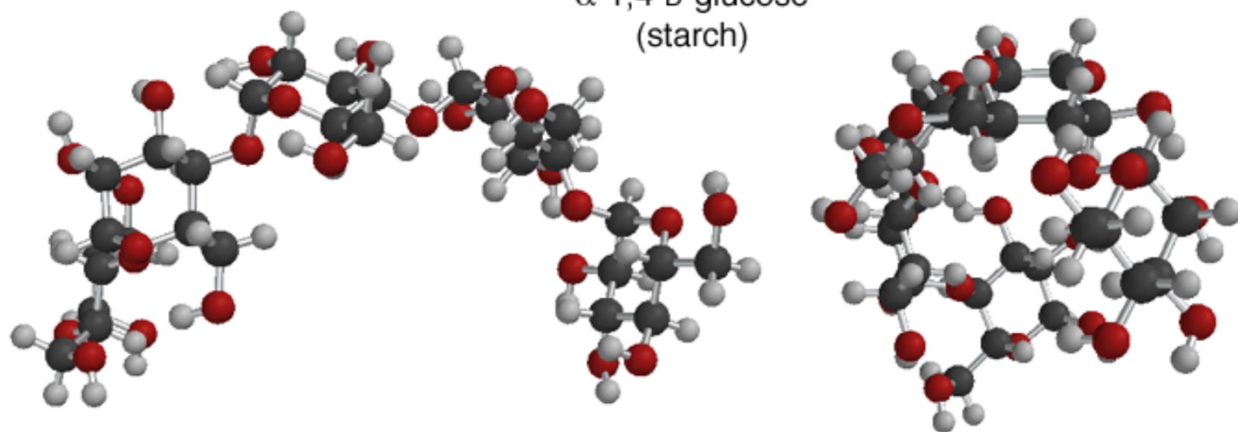
What is the difference —
They are both polymers
of D-Glucose



β -1,4-D-glucose
(cellulose)



α -1,4-D-glucose
(starch)

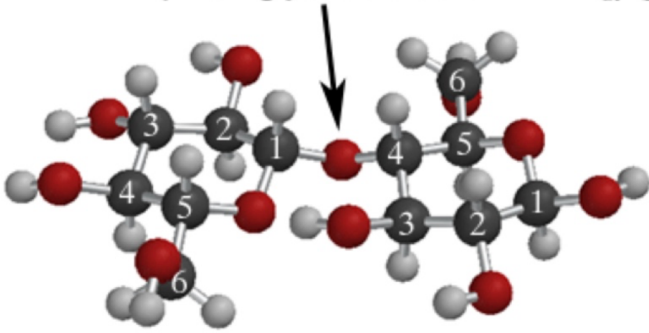




vs.

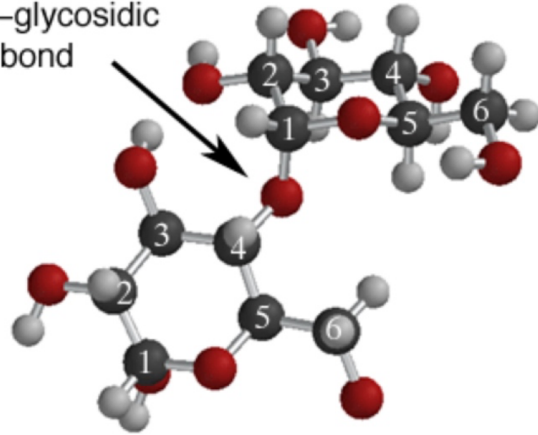


β -1,4-glycosidic bond

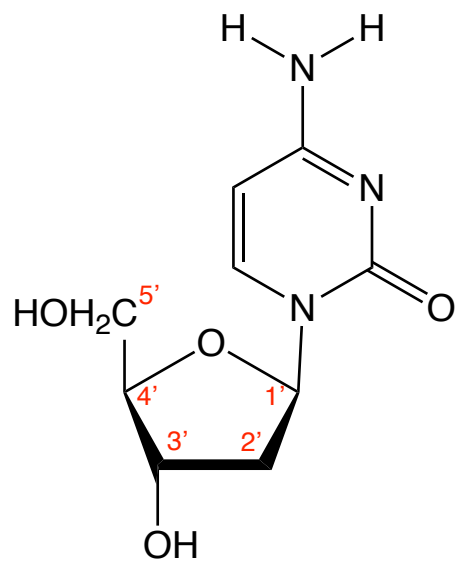
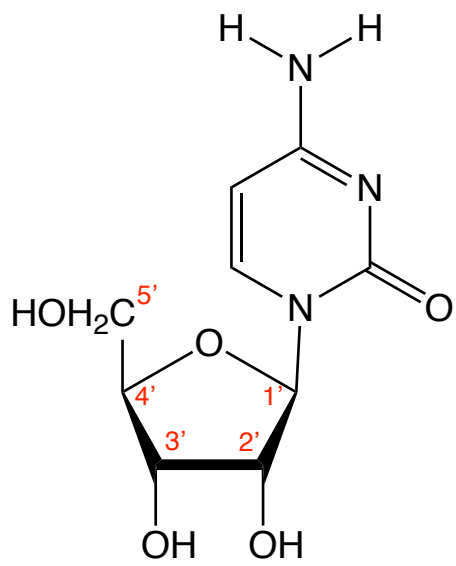


β -1,4-D-glucose

α -1,4-glycosidic bond



α -1,4-D-glucose

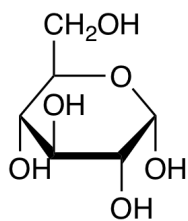


Corn starch \rightarrow cheap polymer
of α -D-Glucose
 \rightarrow Converted to α -D-Glucose
monomers using 2 enzymes:

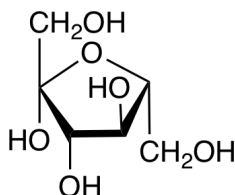
1) α -Amylase \rightarrow

2) Glucoamylase \rightarrow

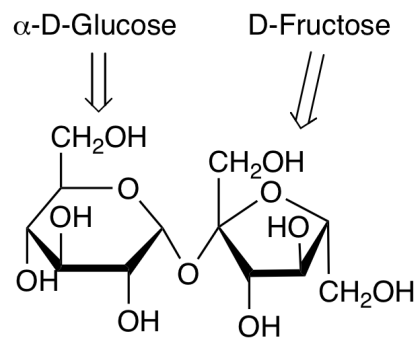
3) Some of the D-Glucose is converted
to D-Fructose



α -D-Glucose



D-Fructose



Sucrose (Table Sugar)

Final high fructose corn
syrup:

90 D-Fructose

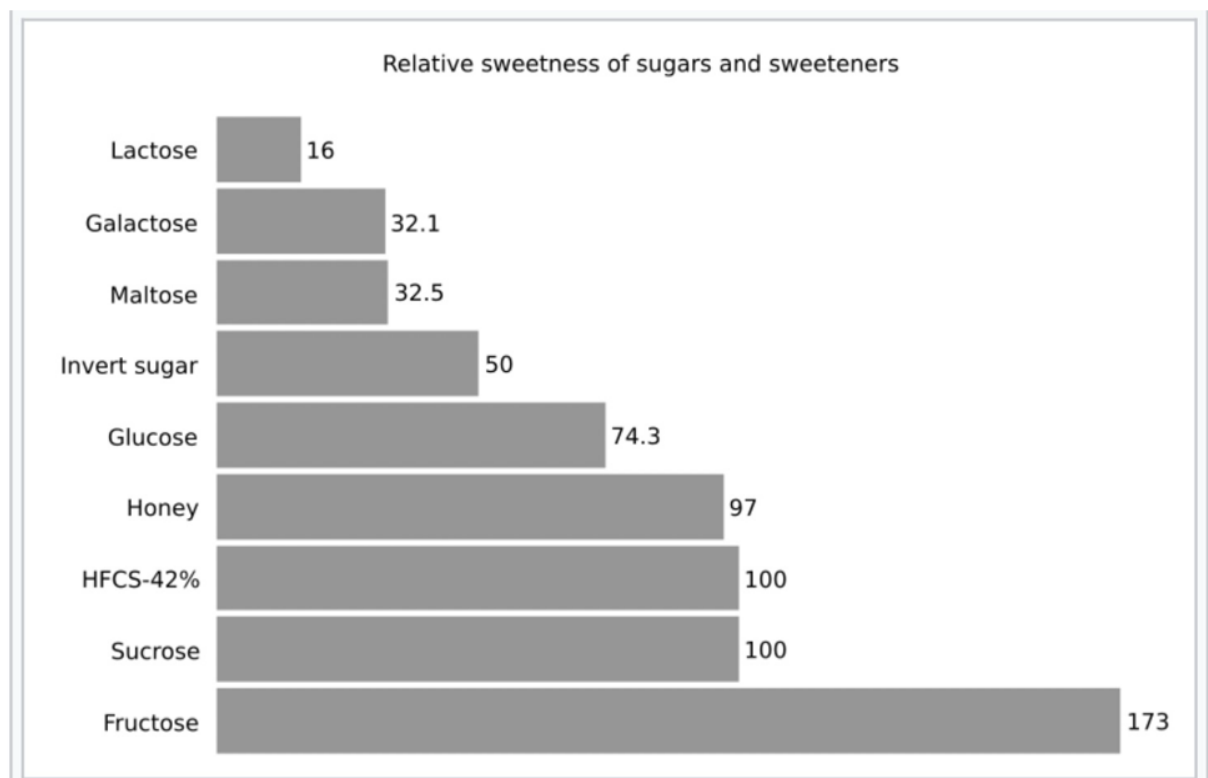
90 D-Glucose

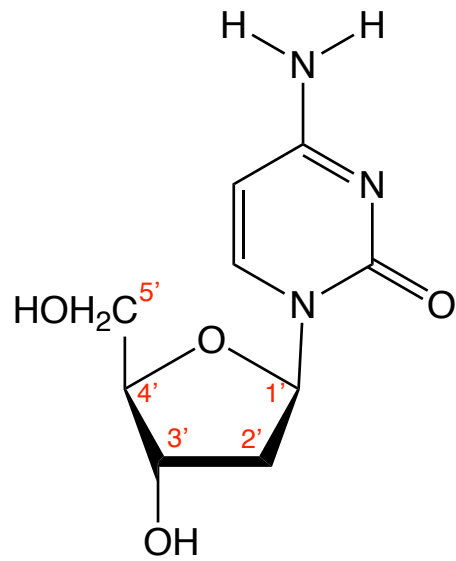
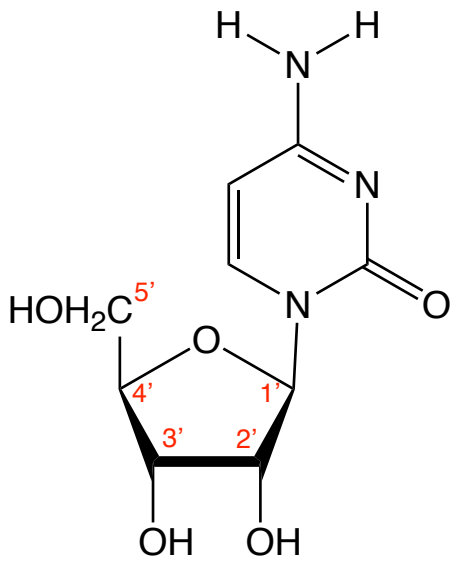
This is intended to mimic bee honey

90 D-Fructose

90 D-Glucose

90 Sucrose

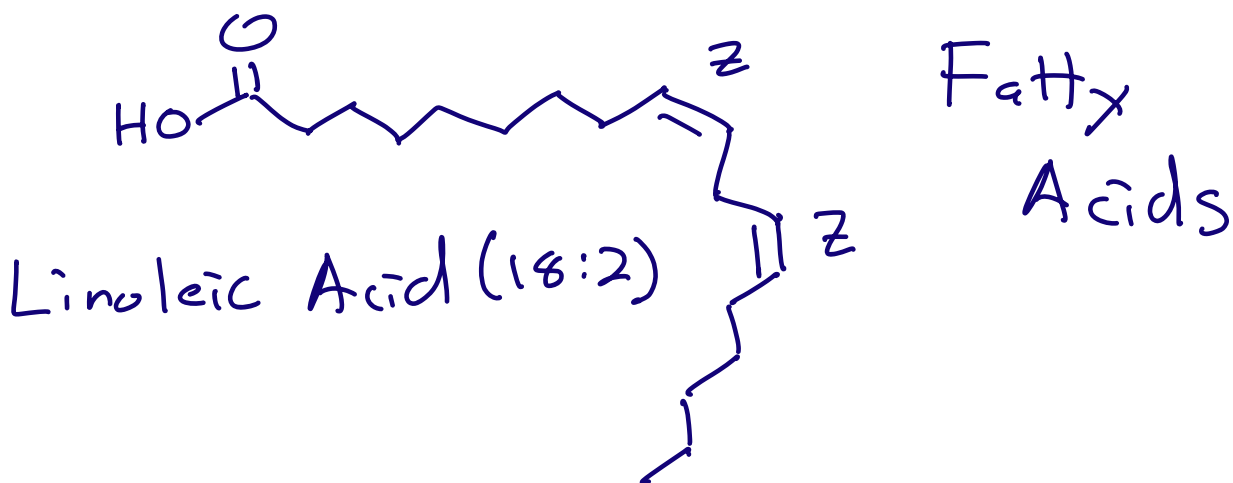
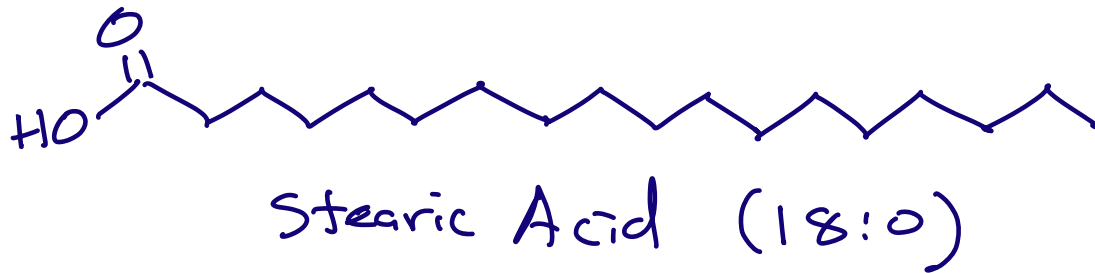
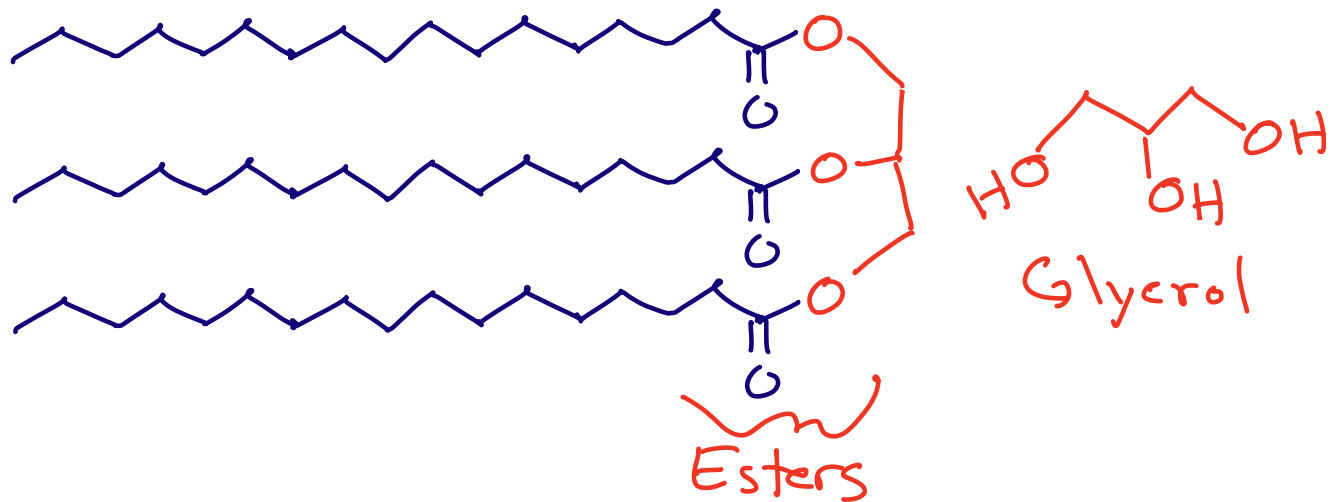




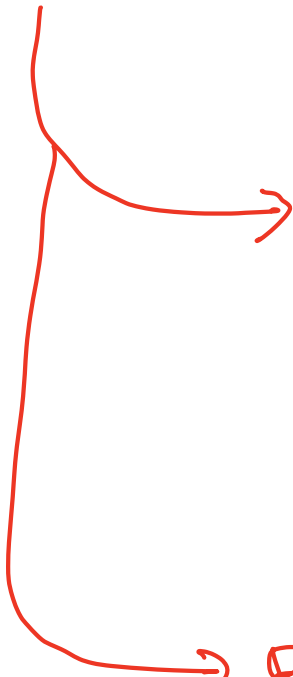
In RNA and DNA →

Lipids → Biological molecules that are not soluble in water

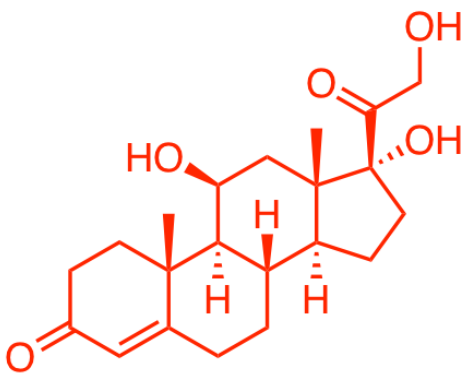
Triglycerides → Fats and oils



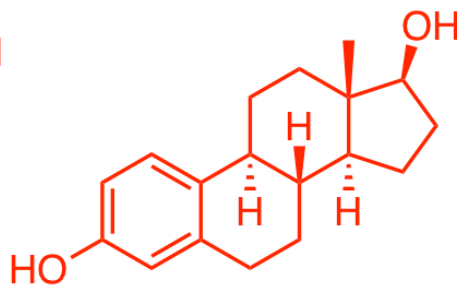
Steroids → Rigid multiring structures that are important signals



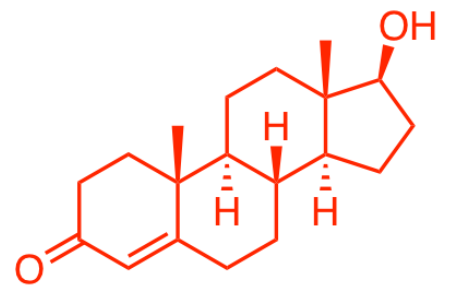
Rigid structure ensures high degree of for these critical functions



Cortisol



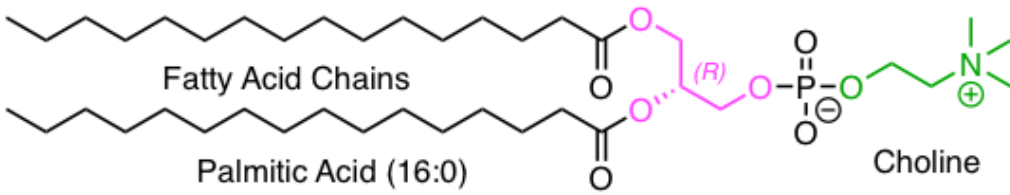
Estradiol



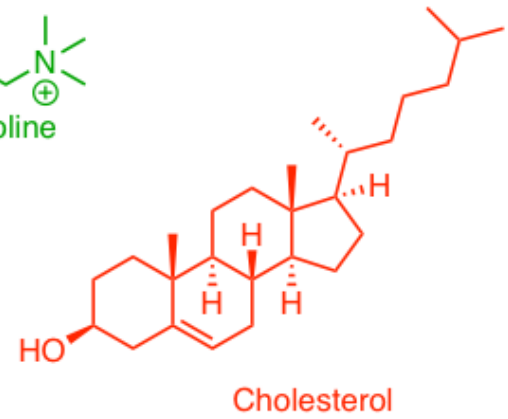
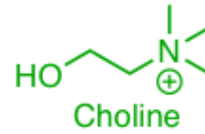
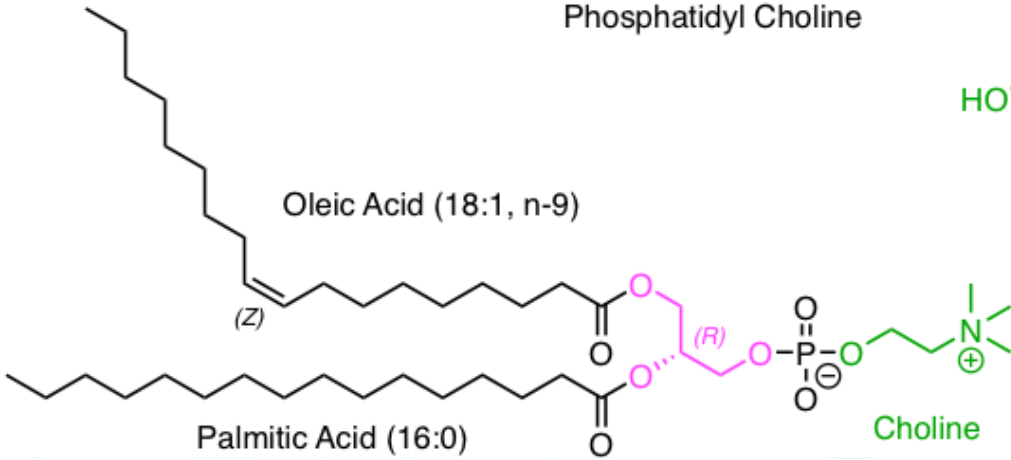
Testosterone

Phospholipids → Make up cellular membranes

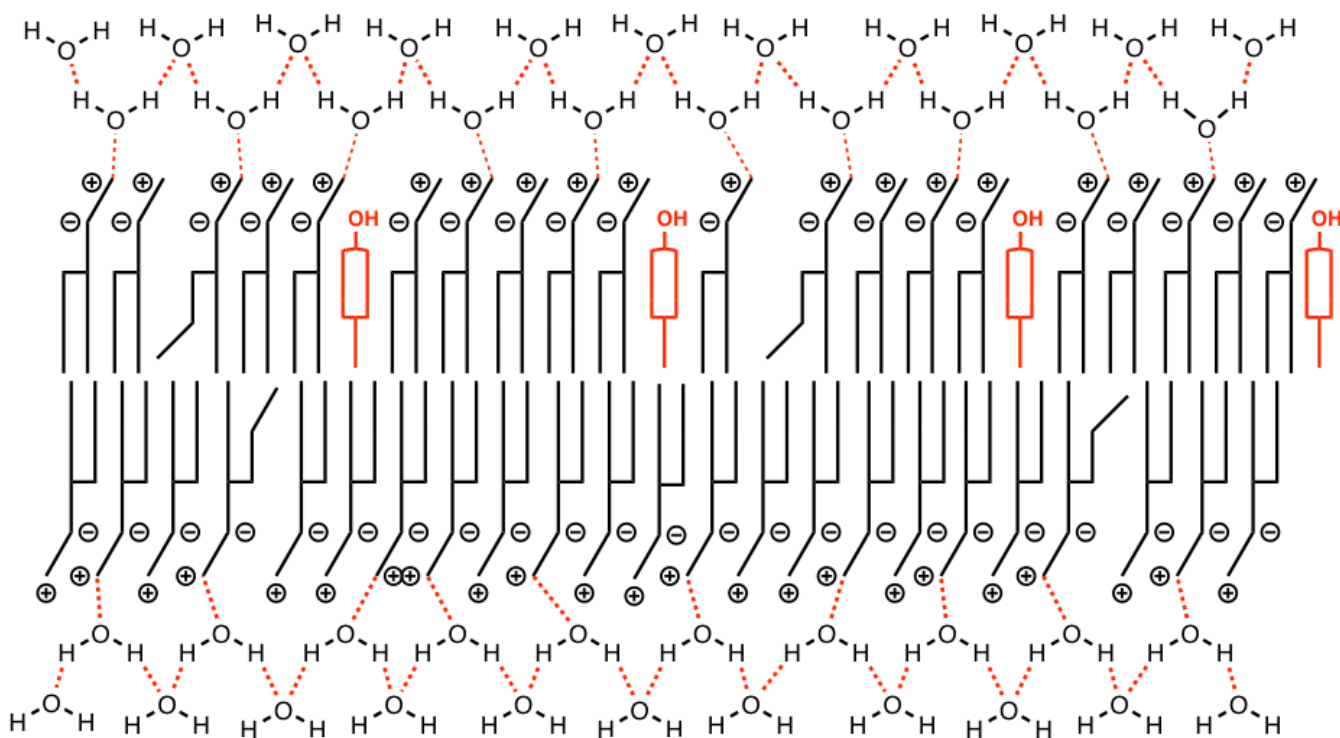
Palmitic Acid (16:0)



Phosphatidyl Choline



Phospholipid membrane bilayers → The
and combine
to make the membranes enough
to operate effectively



So what holds membranes together?

The fatty acid chains are not soluble in water → The in water prevent the from "dissolving" into the water → Only things that can interact with polar water molecules dissolve in water. → To break up hydrogen bonds a molecule must be charged and/or be capable of strong

"Like likes like" → Key rule of solvents

!!!
→ The cannot interact with water so they must therefore associate providing the to hold membranes together