D-mannose → 1) NaBH₄ 2) H⁺ → **an alditol, D-mannitol**
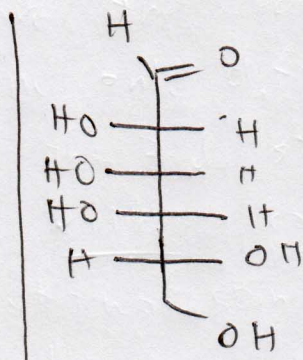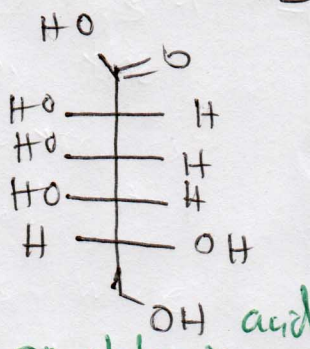
D-Talose → Br₂ / H₂O → **an aldonic acid, D-talonic acid**
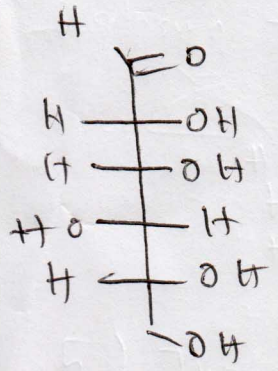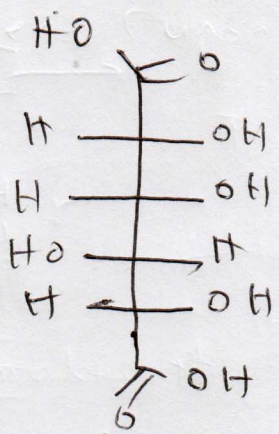
D-gulose → HNO₃ → **an aldaric acid, D-gularic acid**
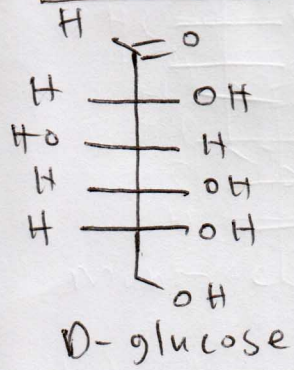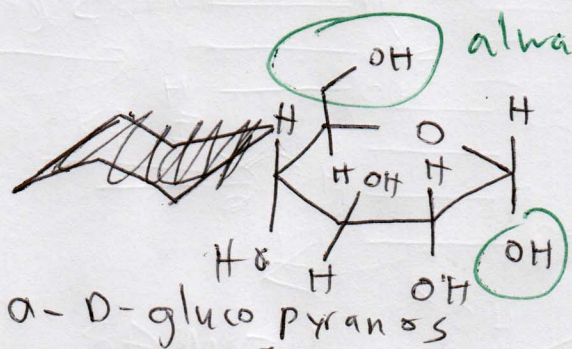
D-glucose → H⁺ → **α-D-glucopyranose** +112.2° specific rotation

OH — always up for D sugars

OH — always down for α-D sugars

 # Knowing the optical rotation of the α-D form of glucose does not help in determining the optical rotation of β-D-glucose since they are epimers — not enantiomers. So there is no relationship between their optical activities.
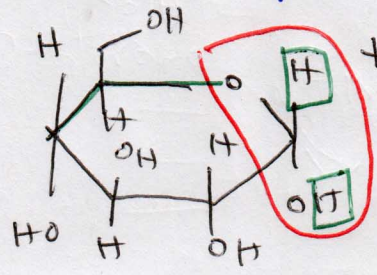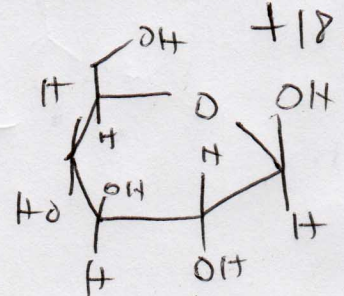
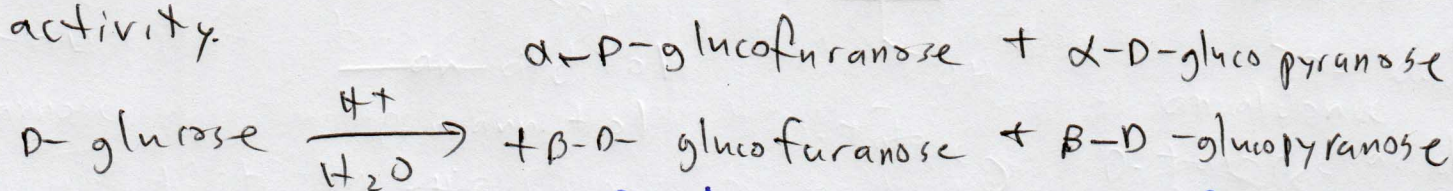+112.2° → H⁺, H₂O / time → [52.7°] ← H⁺, H₂O ← +18.7

hemiacetal

B-D-glucopyranose

Mutarotation - Whenever a pure sample of an α or β aldopyranose is placed in solution, the α + β forms will interconvert, achieving an equilibrium between the two forms with an equilibrium optical activity.

$$\text{D-glucose} \xrightarrow[\text{H}_2\text{O}]{\text{H}^+} \begin{array}{l} \alpha\text{-D-glucofuranose} + \alpha\text{-D-glucopyranose} \\ + \beta\text{-D- glucofuranose} + \beta\text{-D -glucopyranose} \end{array}$$

The exact proportion of the various ring forms that will result from a particular sugar depends on the intra molecular interacts that occur upon cyclization that are unique to each sugar

Glycoside

HY, CH$_3$OH

H$^+$

acetal

CH$_3$OH

glycoside

-H$^+$

OCH$_3$

OCH$_3$
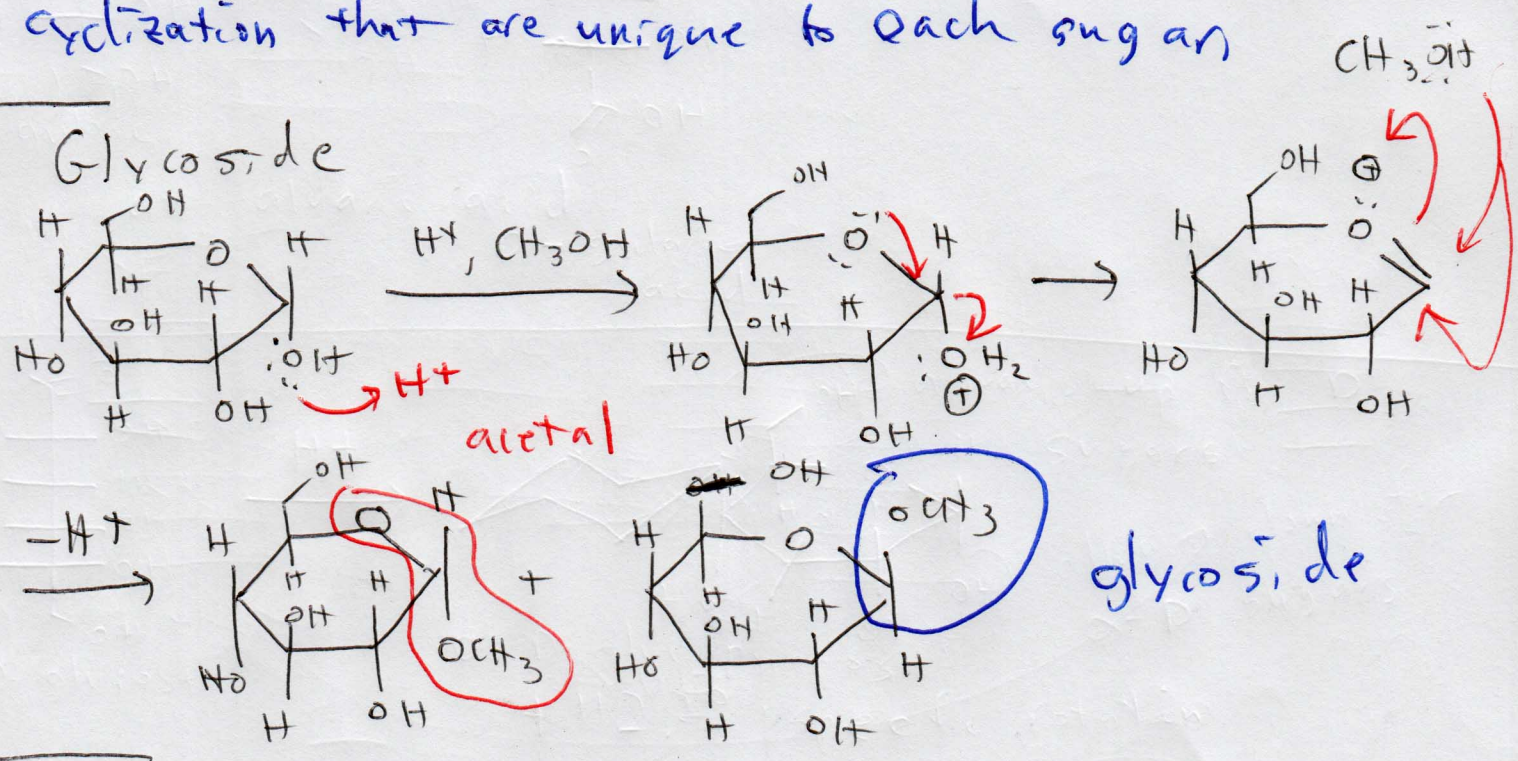
Monosaccharide — "one sugar unit"
   — no glycosidic linkages. (only one "$C=O$")
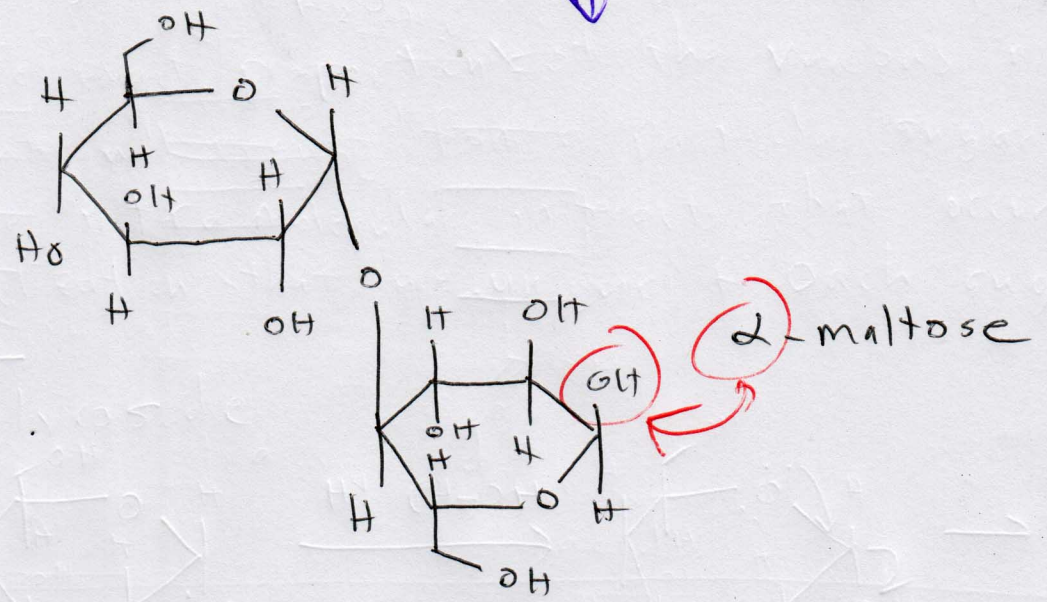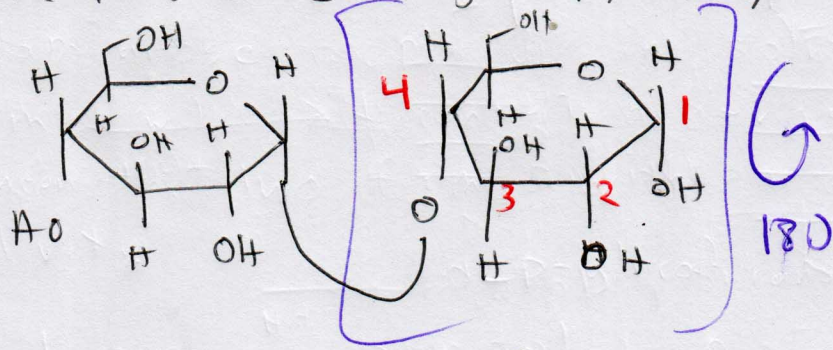Disaccharide — a complex sugar formed by joining two mono saccharides through a glycosidic link,
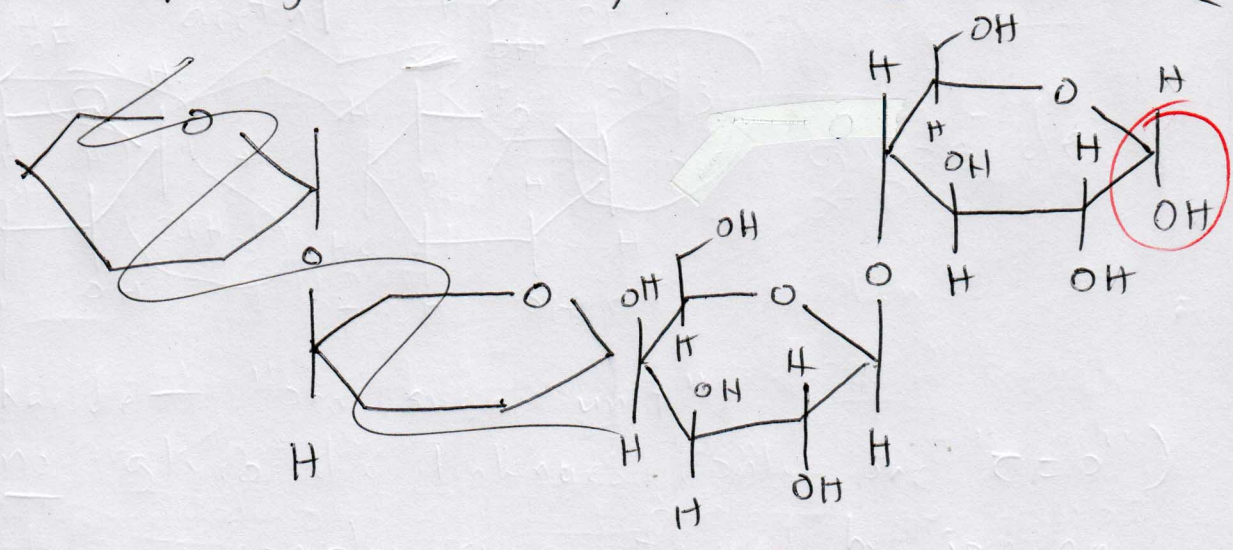   sucrose ; maltose; lactose; cellubiose
     Oligo — "several"
     Poly — " many"

maltose i 4-O-(α-D-glucopyranosyl)-α-D-glucopyranose

↓

α-maltose

lactose! 4-O-(β-D-galactopyranosyl)-α-D-glucopyranose

α-lactose