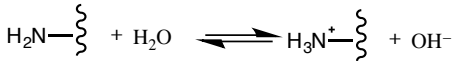
Chem 30B Handout: Reactions of Biological Molecules

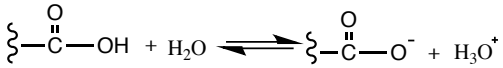
I. Amino Acids

1. Acid-Base Reactions

a) Amino End

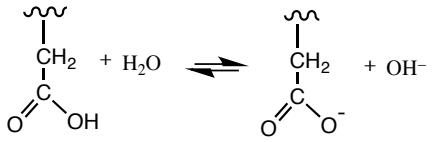


b) Carboxyl End

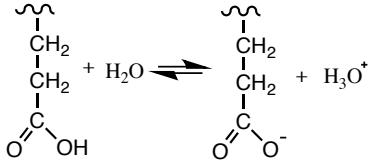


c) Side Chains

Acidic Side Chains

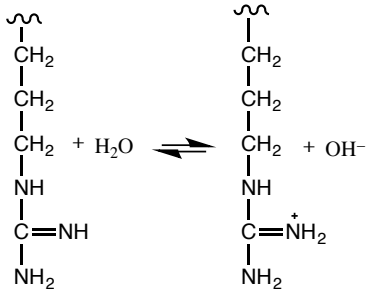


Asp

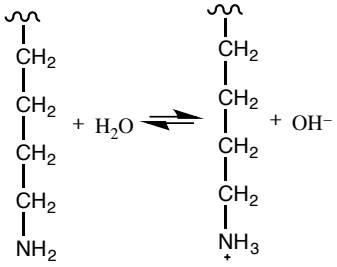


Glu

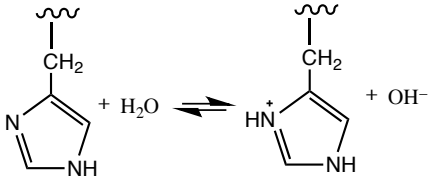
Basic Side Chains



Arg

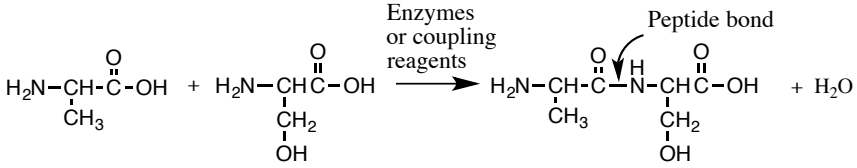


Lys

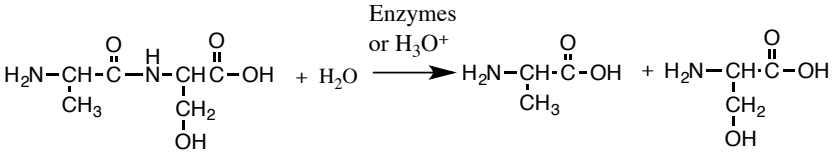


His

2. Condensation to Form Peptide Bond

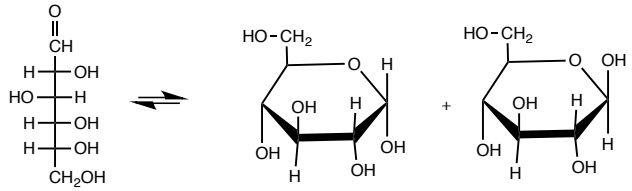


(Reverse of above reaction: Hydrolysis)



II. Monosaccharides

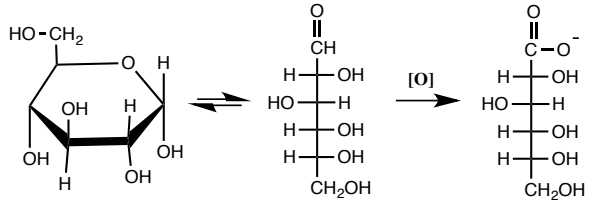
1. Cyclization (Internal reaction of aldehyde/ketone with alcohol). Leads to α and β anomers.



D-glucose α-D-glucose β-D-glucose

2. Oxidation

Carbohydrates that can be oxidized by mild oxidizing agent are called "reducing sugars."

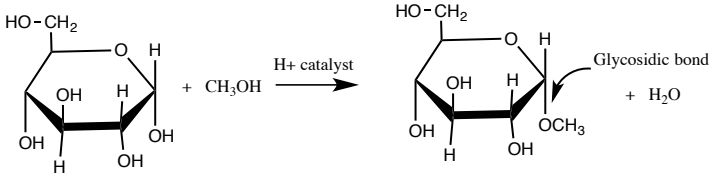


α-D-glucose D-glucose D-gluconate

Aldoses can be oxidized, but not ketoses. However, in basic solutions, ketoses can rearrange to become aldoses, which can then be oxidized. Thus, in basic solutions, both aldoses and ketoses are reducing sugars.

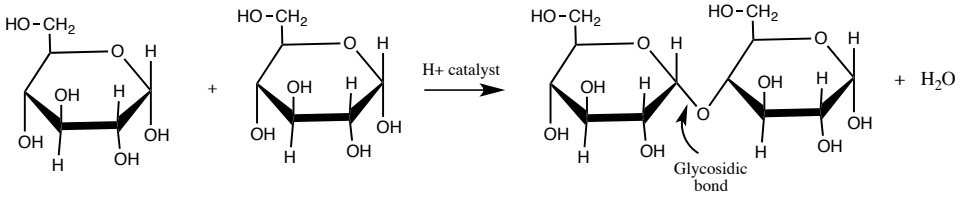
3. Reaction with Alcohols to Form Glycosidic Bond (Glycoside and Disaccharide Formation)

a) Glycoside Formation

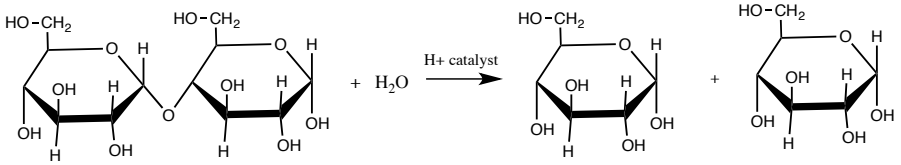


α-D-glucose (**hemiacetal**) methyl- α-D-glucose (**acetal**)

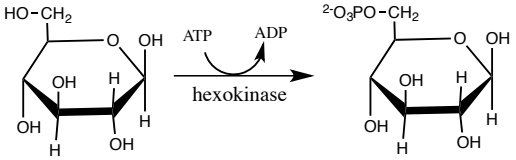
b) Disaccharide Formation



(Reverse of above reaction : Hydrolysis)

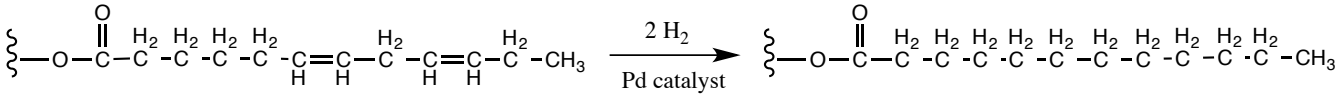


4. Phosphorylation



III. Triacylglycerols

1. Hydrogenation



2. Hydrolysis

Hydrolysis of fats and oil with strong aqueous bases is called saponification.
Saponification is used to make soap.