CH 101: Chemistry

Organic Chemistry

Syllabus of Organic Chemistry

Stereochemistry of more than two stereo-centers, R&S and E&Z nomenclature, Conformation of cyclohexane and 1,2-disubstituted cyclohexane; Pericyclic reactions; Bioorganic chemistry: proteins, enzymes, carbohydrates, nucleic acids and lipids; Natural products: classification and origin of terpenoids, alkaloids and steroids. Macromolecules (polymers); Solid phase synthesis; Green chemical processes. Modern spectroscopic techniques in structural elucidation of organic compounds (UV-vis, IR, NMR).

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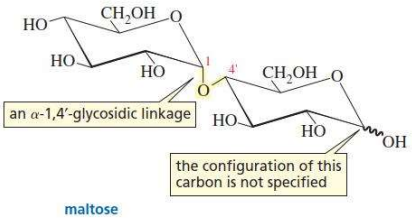
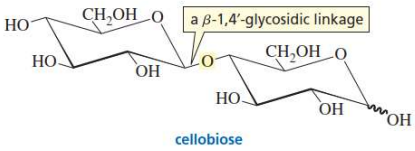
Disaccharides

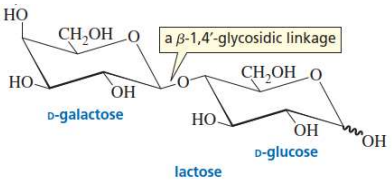


maltose



cellobiose

Lactose intolerance



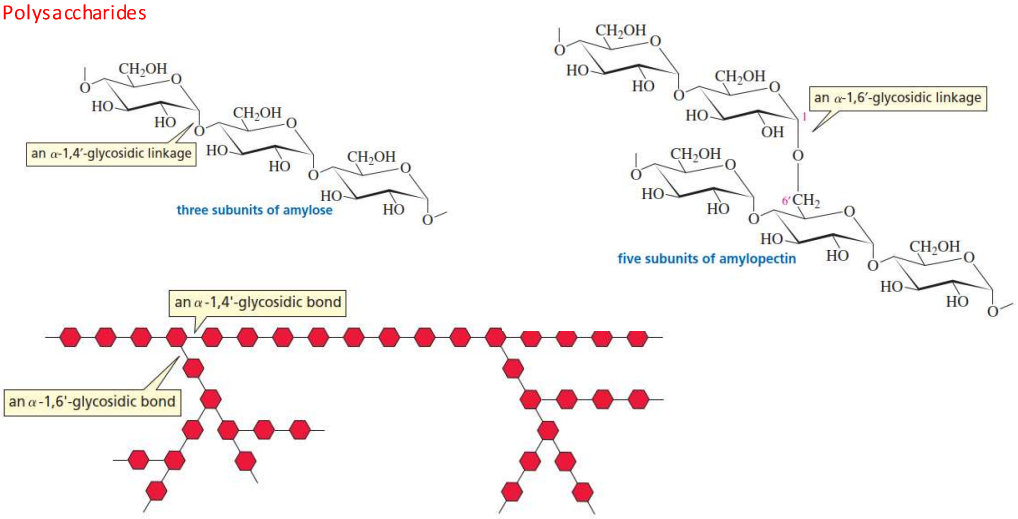
D-galactose

D-glucose

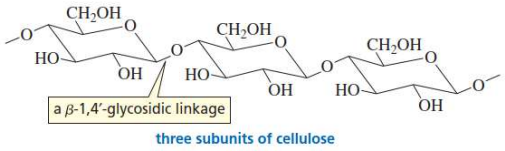
lactose

Galactosemia

Polysaccharides

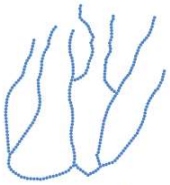


Starch is the major component of flour, potatoes, rice, beans, corn, and peas. Starch is a mixture of two different polysaccharides: amylose (about 20%) and amylopectin (about 80%).

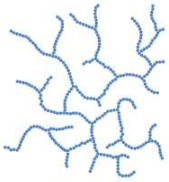


three subunits of cellulose

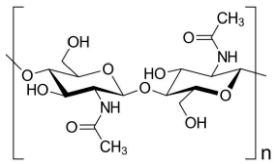
▲ Strands of cellulose in a plant fiber



amylopectin

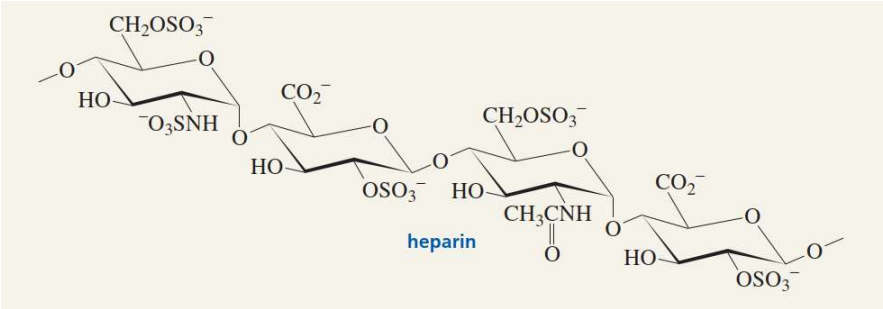


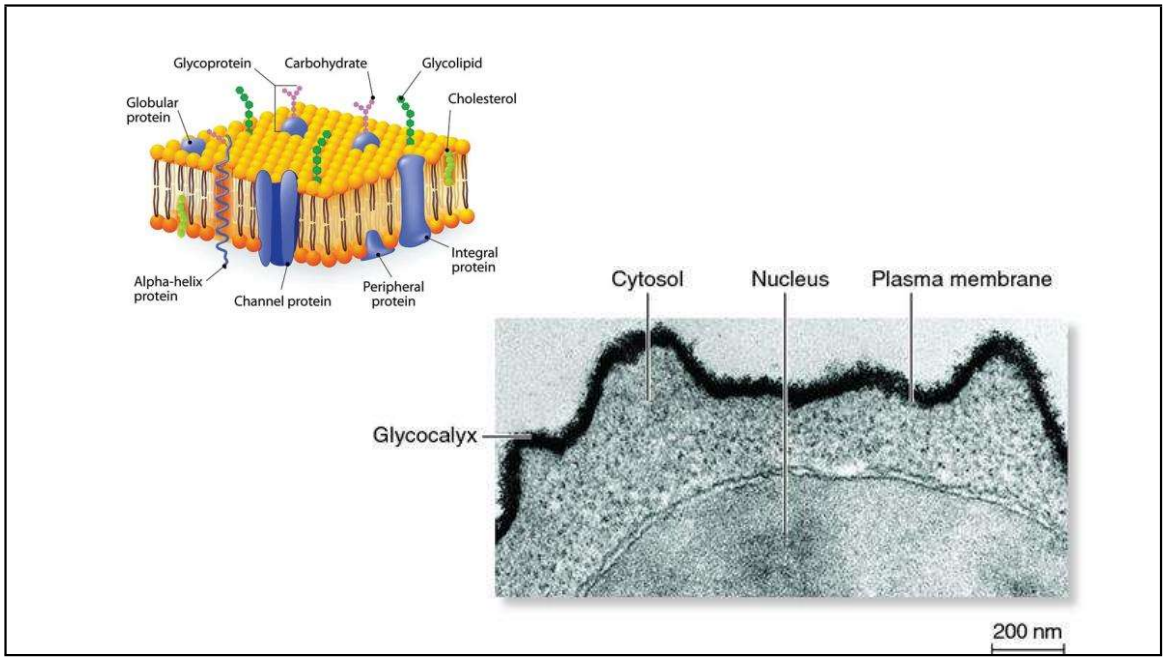
glycogen

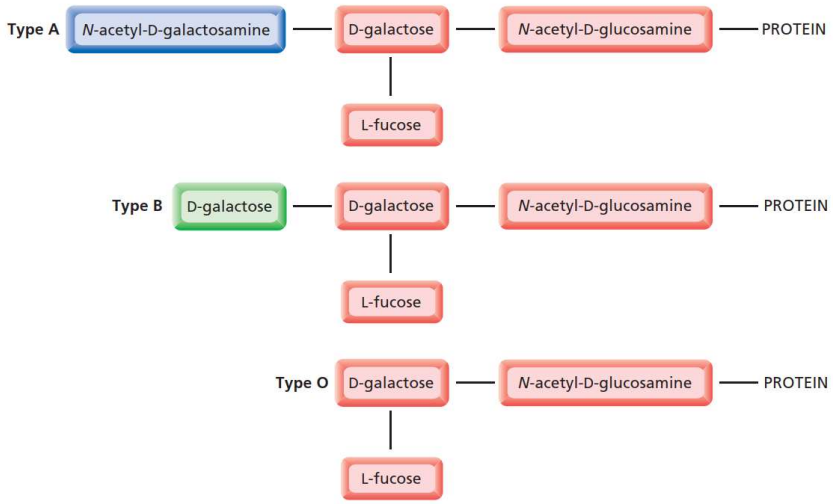


▲ The shell of this bright orange crab from Australia is composed largely of chitin.

Animals store their excess glucose in a polysaccharide known as glycogen

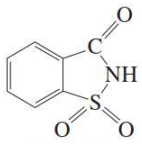

heparin


Glycoprotein
Carbohydrate
Glycolipid
Globular protein
Cholesterol
Integral protein
Alpha-helix protein
Channel protein
Peripheral protein
Cytosol
Nucleus
Plasma membrane
Glycocalyx
200 nm



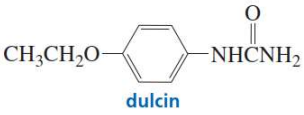
The percentage of carbohydrate in glycoproteins is variable; some glycoproteins contain as little as 1% carbohydrate by weight, where as others contain as much as 80%

The relative sweetness of glucose is 1.00, that of sucrose is 1.45, and that of fructose, the sweetest of all sugars, is 1.65.

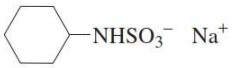


saccharin

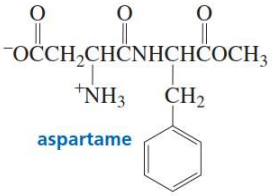
300 times sweeter than glucose



dulcin



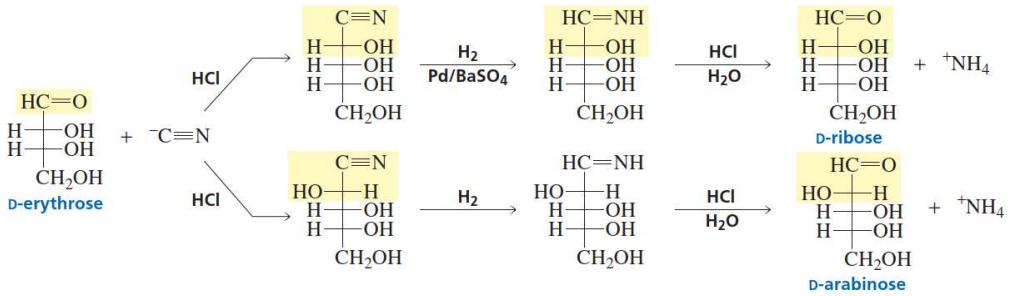
sodium cyclamate



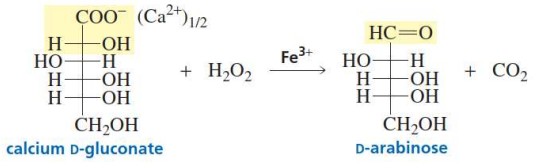
aspartame

200 times sweeter than sucrose

the modified Kiliani–Fischer synthesis

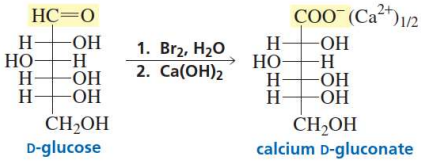


the Ruff degradation



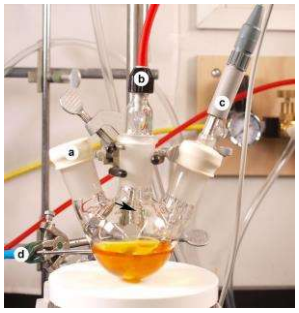
calcium D-gluconate — D-arabinose

The calcium salt of the aldonic acid necessary for the Ruff degradation is easily obtained by oxidizing an aldose with an aqueous solution of bromine and then adding calcium hydroxide to the reaction mixture.

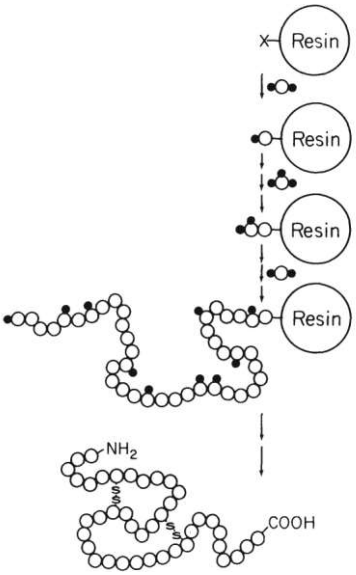


D-glucose — calcium D-gluconate

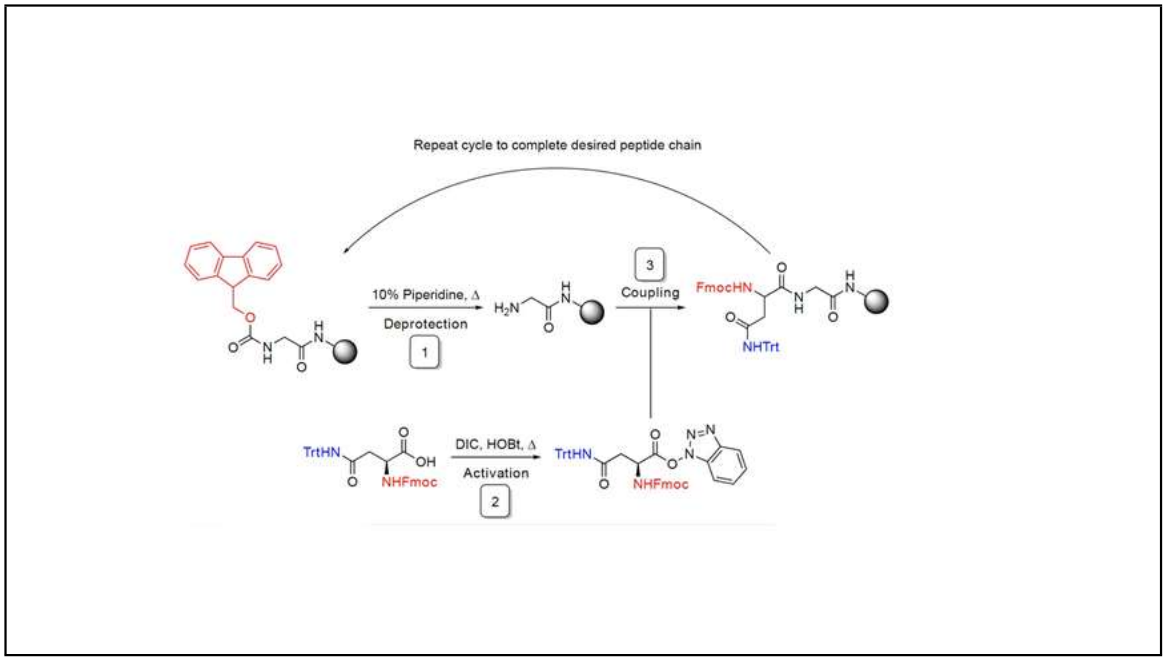
Solid Phase synthesis



Reaction in a flask

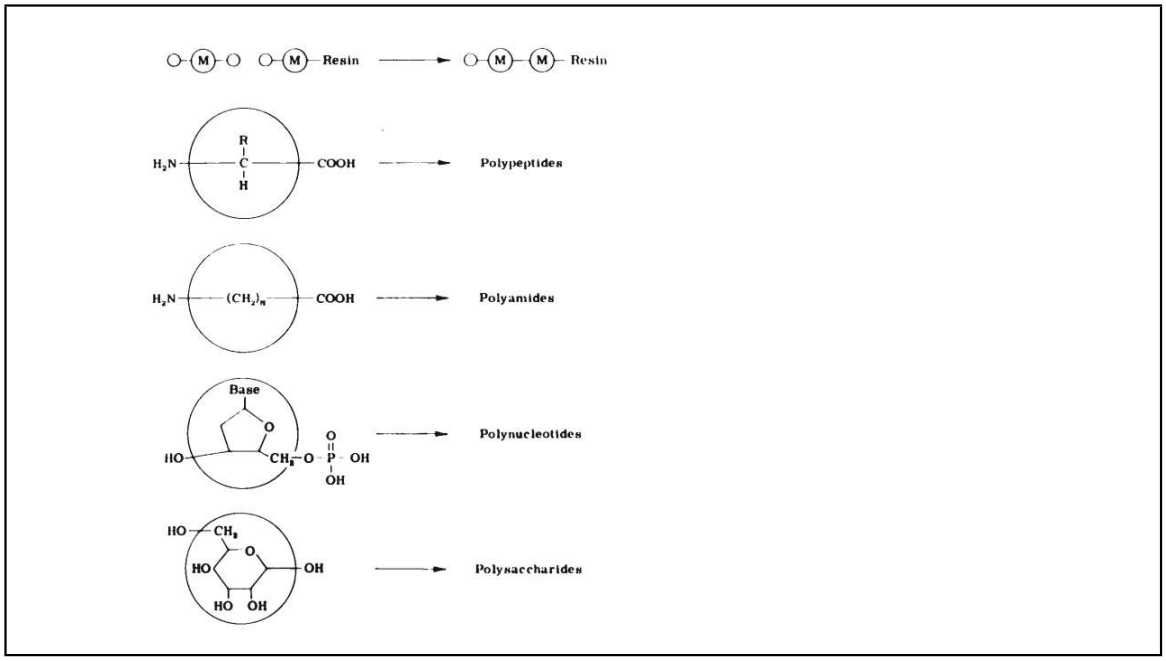


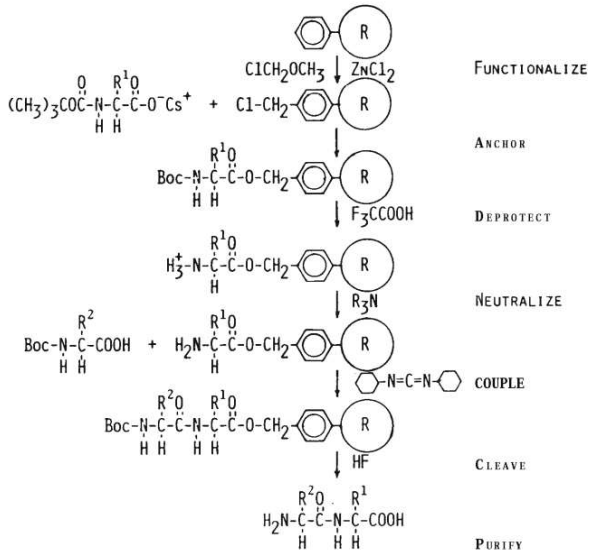
Solid Phase synthesis

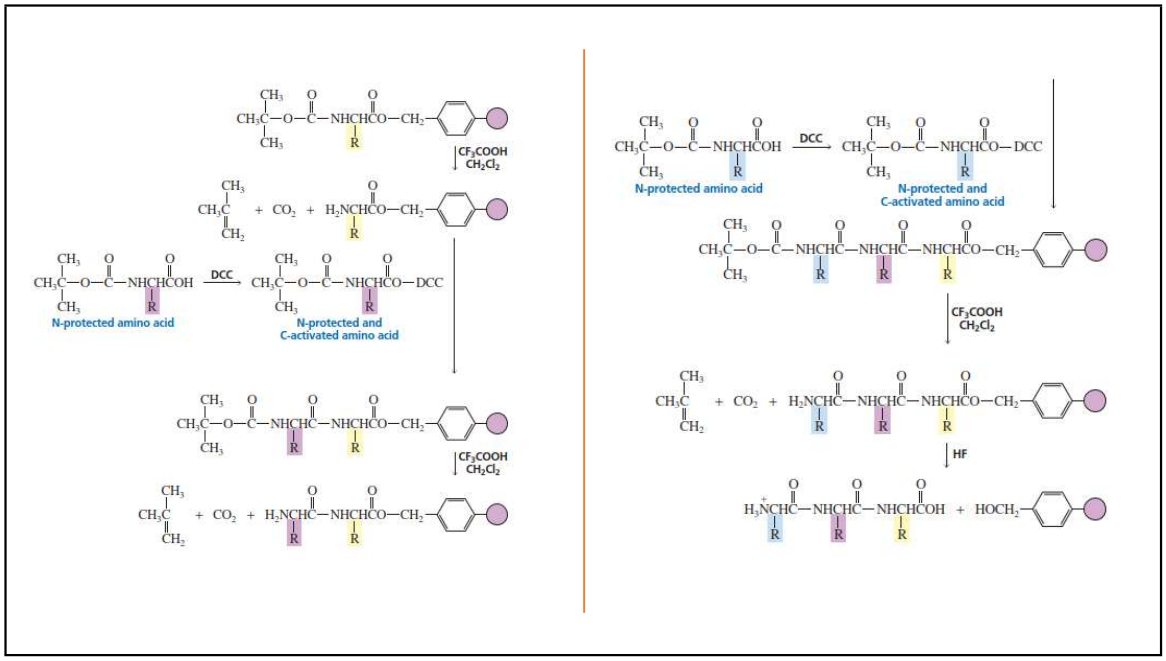

Repeat cycle to complete desired peptide chain
10% Piperidine, Δ
Deprotection
1
3
Coupling
FmocHN
NHTrt
TrtHN
NHFmoc
DIC, HOBt, Δ
Activation
2
TrtHN
NHFmoc

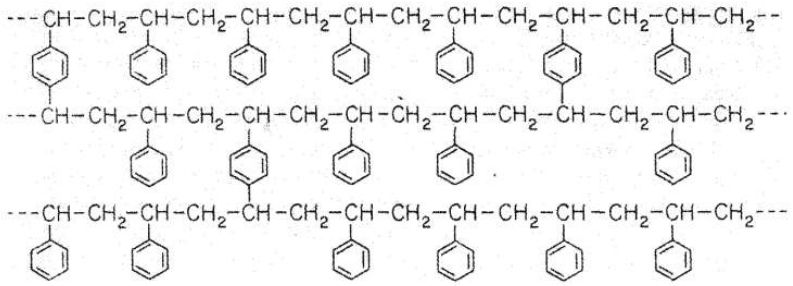
Advantages of Solid Phase Synthesis

- Synthetic intermediates don't have to be isolated.
- Quick process.
- Reagents simply washed away each step.
- Can be automated with robots!!


M
Resin
Polypeptides
Polyamides
Base
Polynucleotides
Polysaccharides


FUNCTIONALIZE
ANCHOR
DEPROTECT
NEUTRALIZE
COUPLE
CLEAVE
PURIFY


CF3COOH
CH2Cl2
DCC
N-protected amino acid
N-protected and
C-activated amino acid
HF



Styrene–divinylbenzene Copolymer