Amino Acids, Peptides and Proteins

Monday, April 5, 2021 11:12 AM

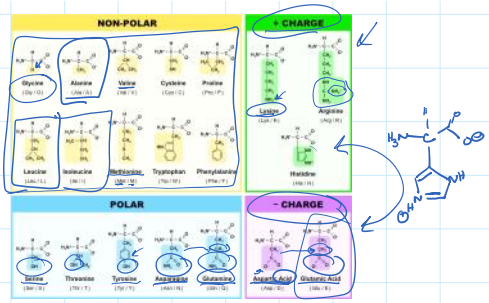
peptides - proteins.

structural -

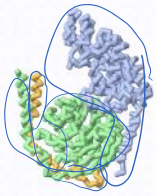
protective -

enzymes -

physiological -



Protein production and folding: https://www.youtube.com/watch?v=2dV5s6v2v8Q&ab_channel=SpronkStudio



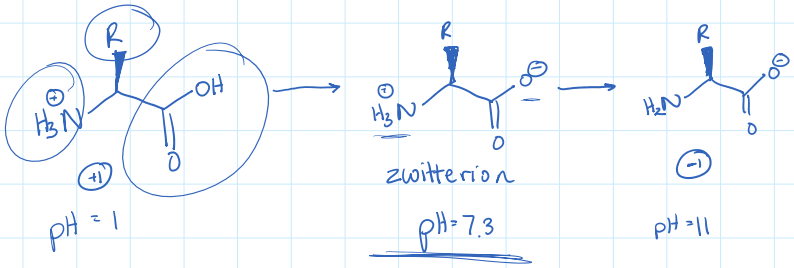
G-Protein

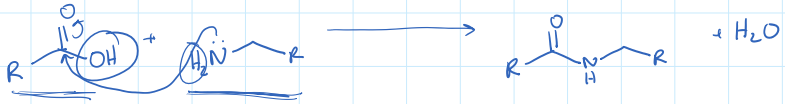
Has three non-identical amino acid chains

quaternary

trimer

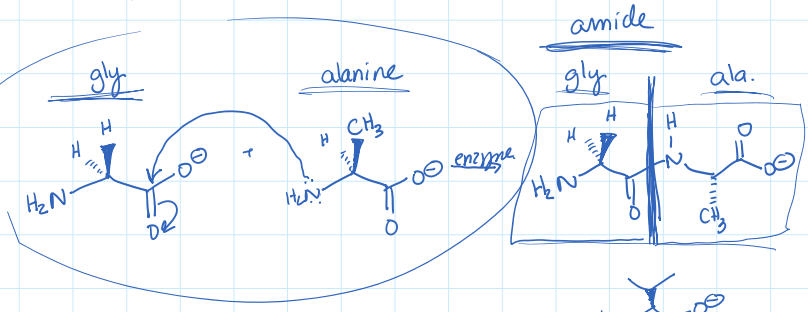
amino acids: D → L R-S





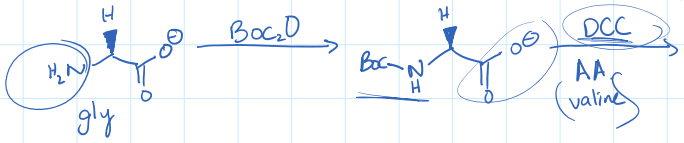
amide

gly alanine

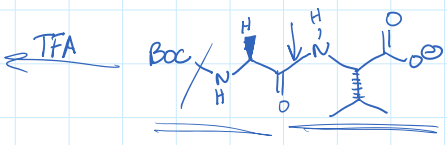


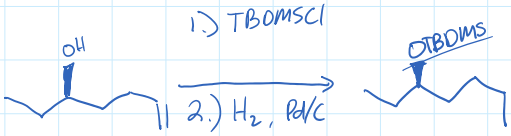
gly ala.

in the lab...



gly



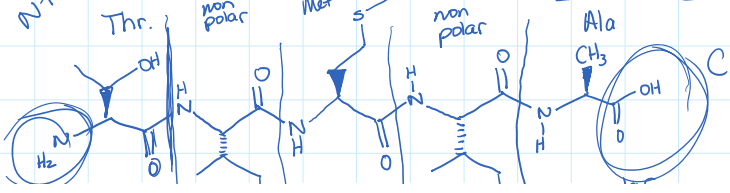


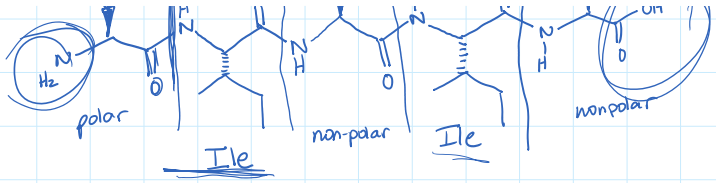
Polypeptide. N TIM IA C

N-terminal

T = Thr = Threonine. polar, nonpolar, ⊕ or ⊖

I = Ile = Isoleucine





Ile Ile

M = Met = Methionine

---

40 – 4000 AA

AA → peptide → protein

Protein Structures

primary = AA chain ↓ TIMIAALLIEGARYJOSEROSA

seconday = how the chain folds to decrease energy

α-helices

β-sheets

tertiary = 3D space = polar AA on exterior, non-polar AA on interior

quaternary = multiple tertiary structure required for activity

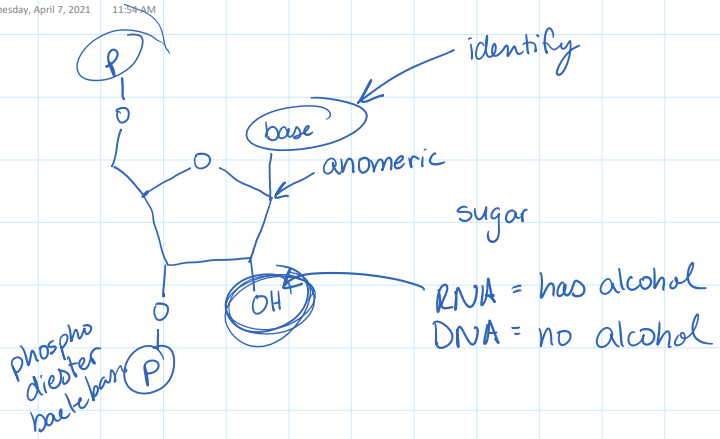
dimer, trimer, tetramer

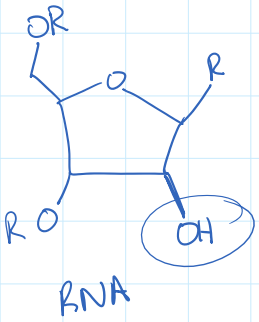
Protein Stability

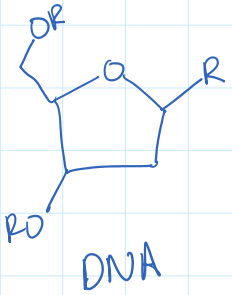
heat, pH, non-aqueous environment

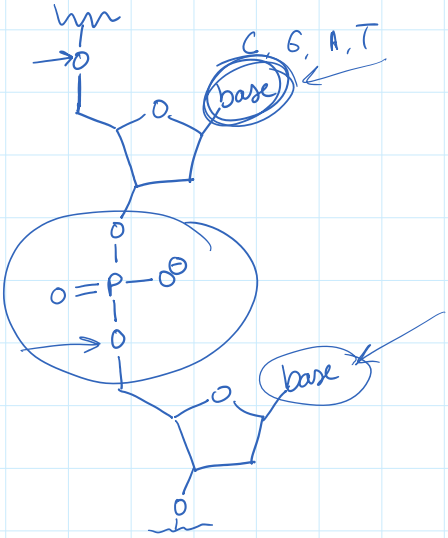
Nucleic Acids

Wednesday, April 7, 2021 11:54 AM





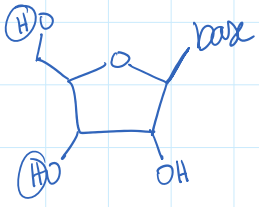




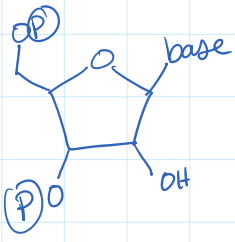
DNA = CGAT

RNA = CGAU

nucleoside

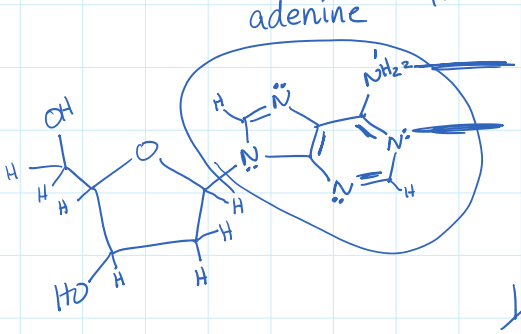


nucleotide



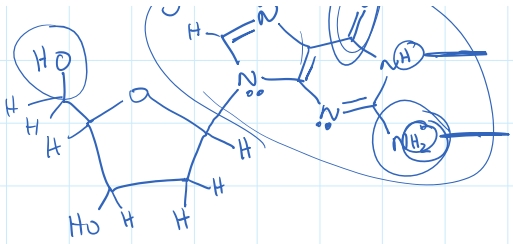
H-bonds

adenine



$C_{10}\ N_5\ O_3\ H_{13}$

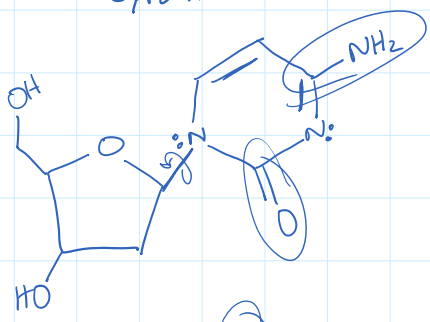
$C_{10}\ N_5\ O_4\ H_{13}$

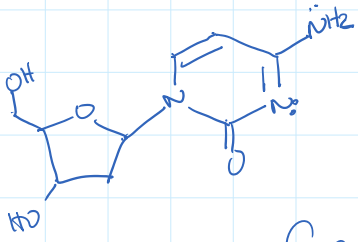


$C_{10}N_5O_4H_{13}$

IIII IIII III

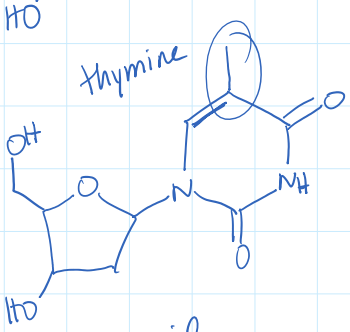
cytosine





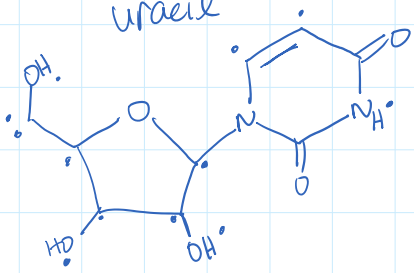
$C_9N_3O_4H_{13}$

thymine



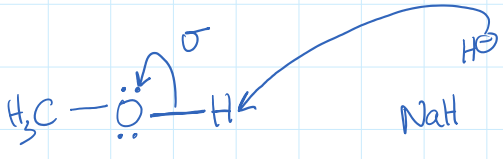
$C_{10}N_2O_5H_{14}$

uracil



$C_9N_2O_6H_{12}$

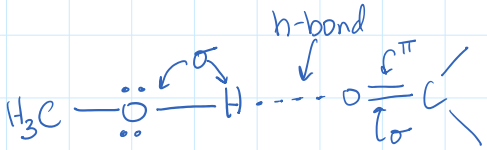
Hydrogen bonds

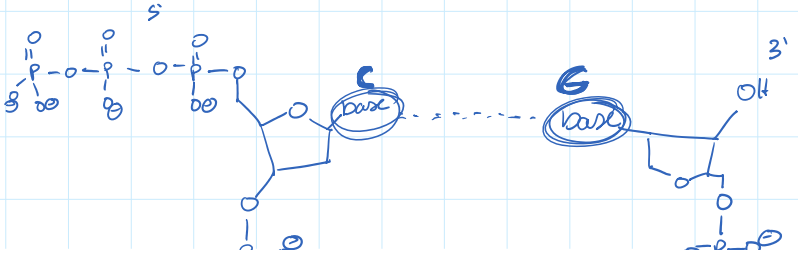


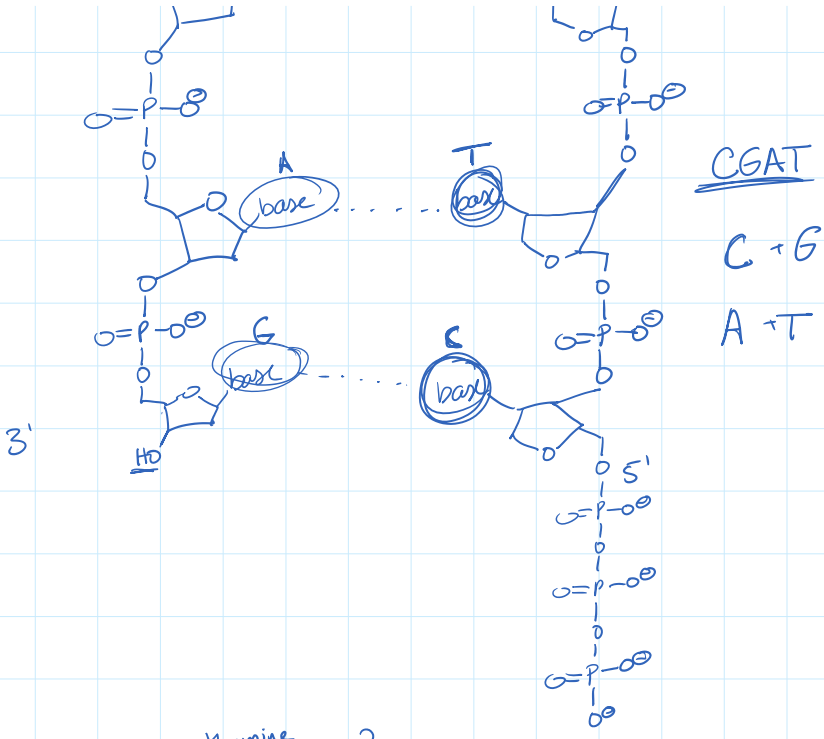
NaH

heteroatom = H

(N, O,)



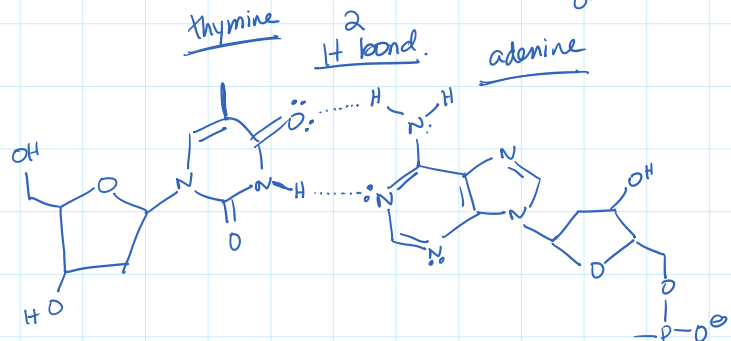


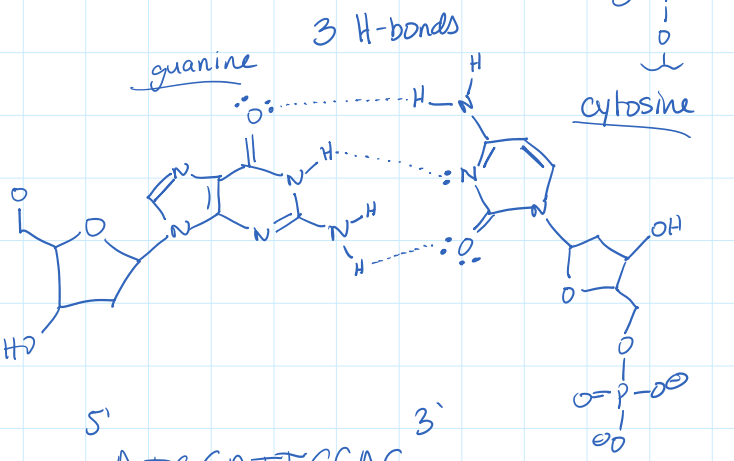


CGAT

C + G

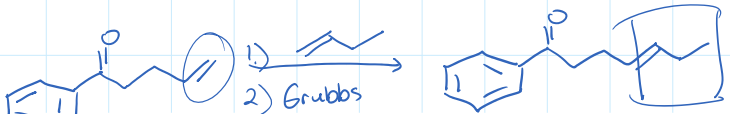
A + T

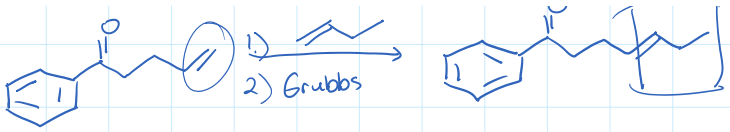




5' ATCGATTCGAG 3'

3' TAGCTAAGCTC 5'




1)
2) Grubbs

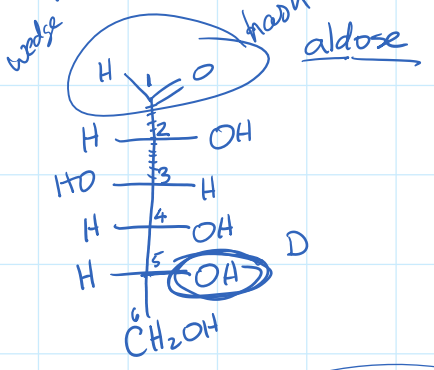
Carbohydrates

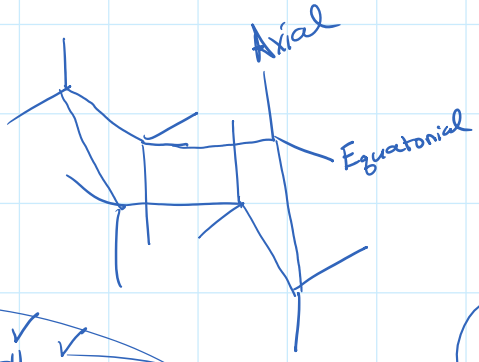
Thursday, April 8, 2021 12:00 PM

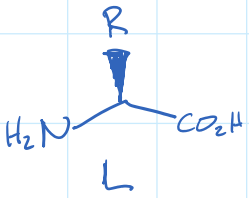
-ose Sugar, carbohydrate, saccharide

fructose, lactose, dextrose, maltose, galactose

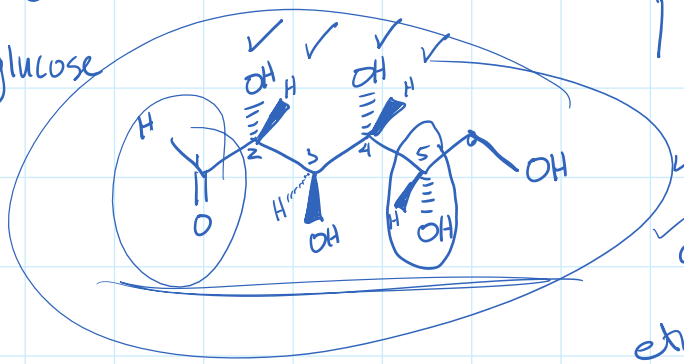
Fischer projection







D- glucose

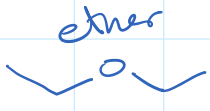


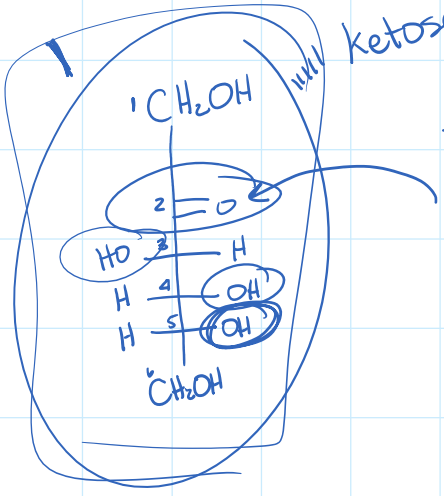
D vs L

4 stereocenters

$2^n = 2^4 = 16$

ether



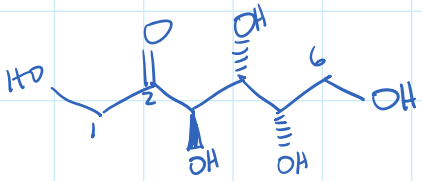


C? = 6

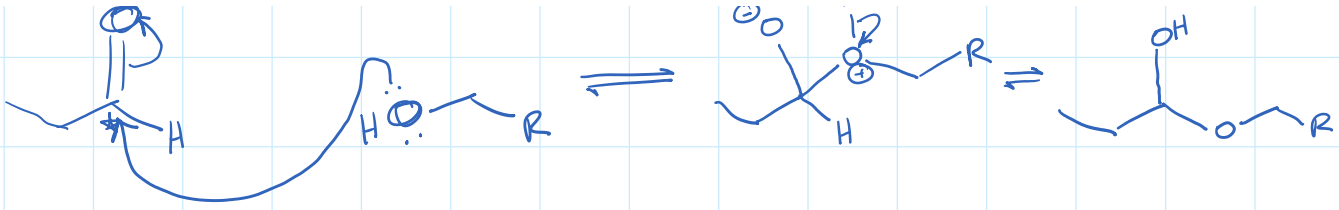
ketone

3 stereocenters

8 possible stereoisomers.

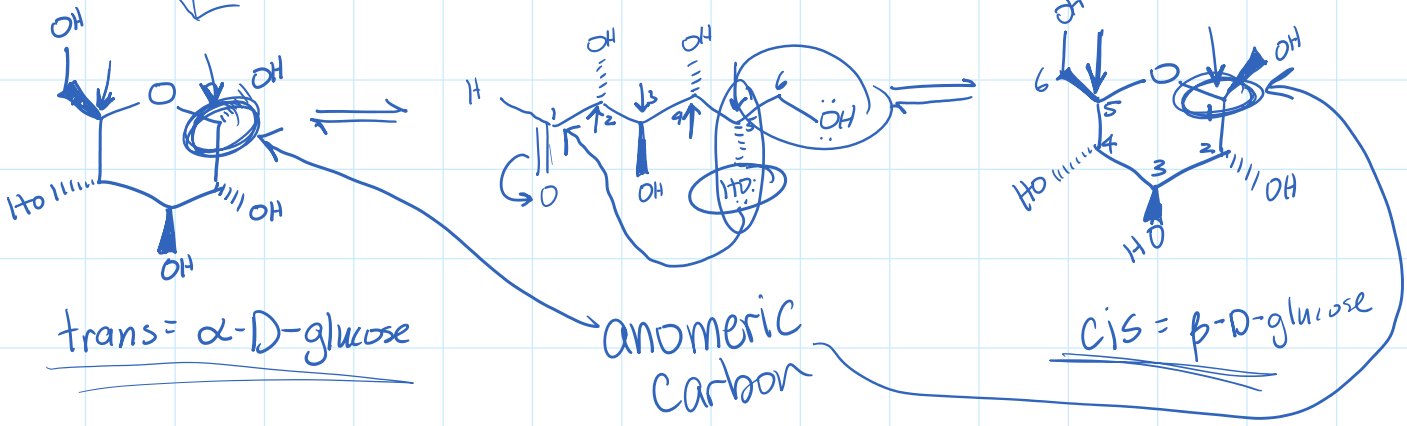


D-fructose



diastereomers

D-glucose



trans = α-D-glucose

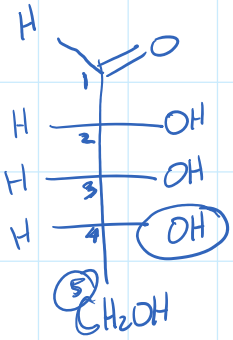
anomeric carbon

O—C—O

cis = β-D-glucose

aldose

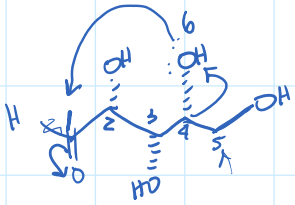
wedge dash



D-ribose

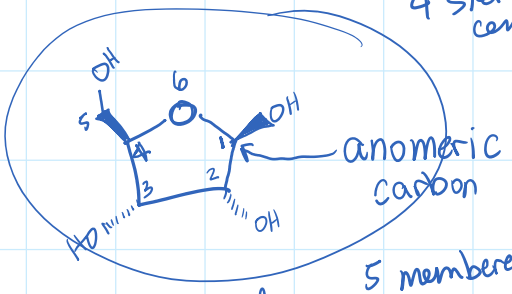
3 stereocenters

8 stereoisomers possible



D-ribose

4 stereo centers



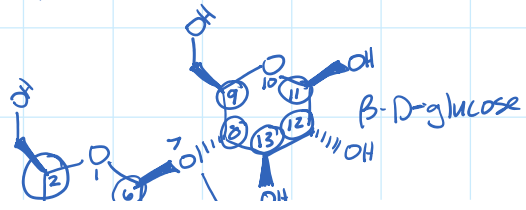
anomeric carbon

cis = β

5 membered ring = furanose

Polysaccharides

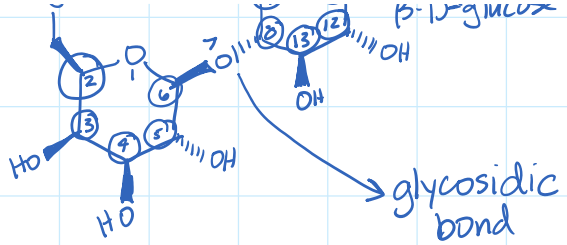
6-membered ring = pyranose



β-D-glucose

10 stereocenter

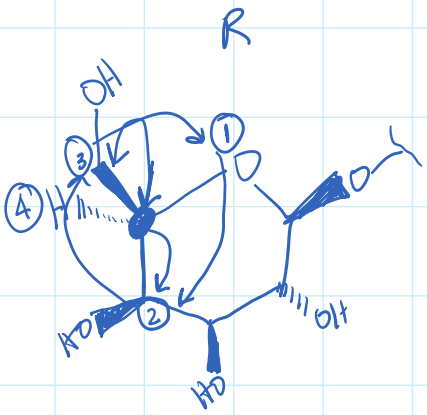
$2^{10} = 1024$ possible stereoisomers

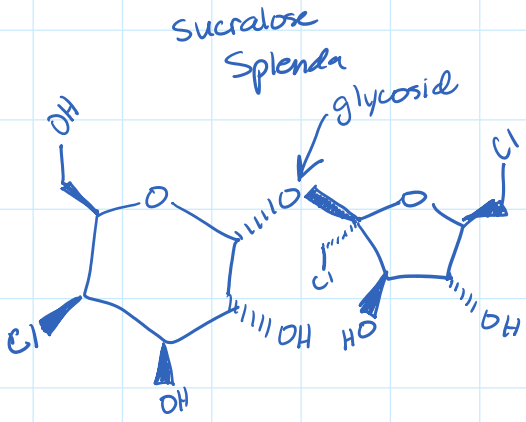


β – D-galactose

lactose

$2^{10} = 1024$ possible stereoisomers





α - β

Lipids

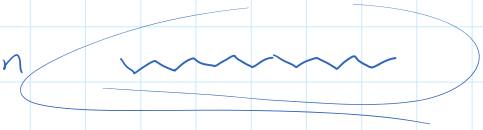
Thursday, April 8, 2021 12:00 PM

1. Amino Acid → peptides → proteins } life
2. Nucleic Acids → DNA + RNA
3. Carbohydrates } food
4. Lipid
5. Polymers - plastic } products

Lipid - insoluble in water H_2O

hydrocarbons

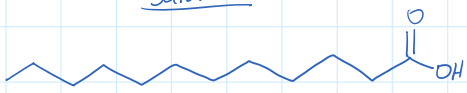
hydrogens → carbon



Fatty acids 12 C-s

saturated

even # of C



(no d.b.)

increase chain length = ↑ melting point

unsaturated fatty acids

Z-alkene

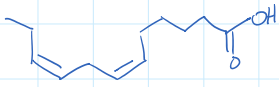
cis alkene

Z-alkenes

increase # d.b = ↓ melting points

many d.b.

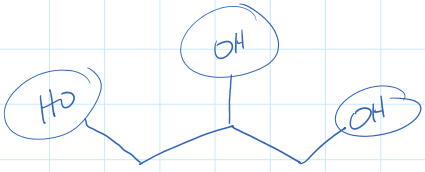
polyunsaturated fatty acid



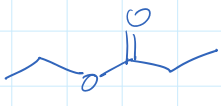
wax

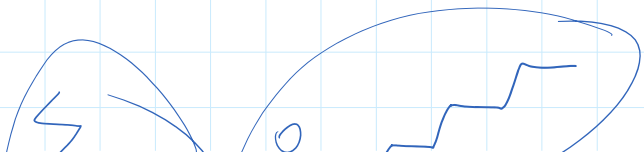
ester

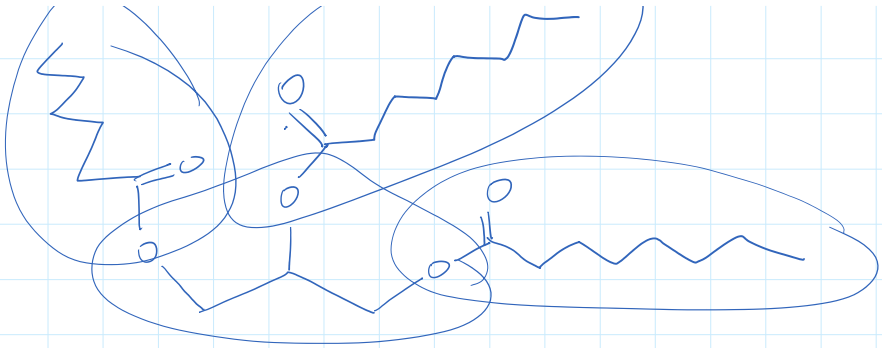
Triglycerides



glycerol

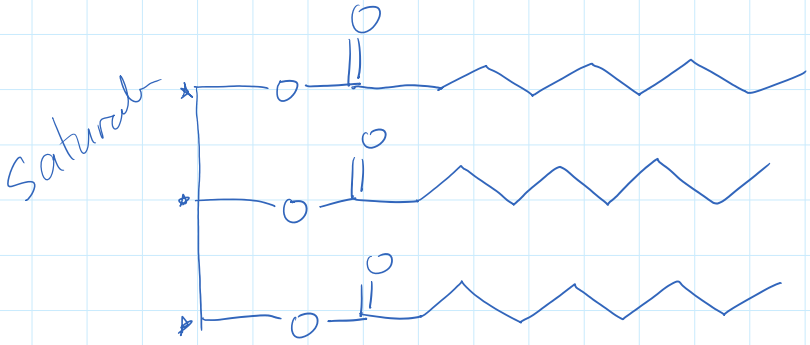






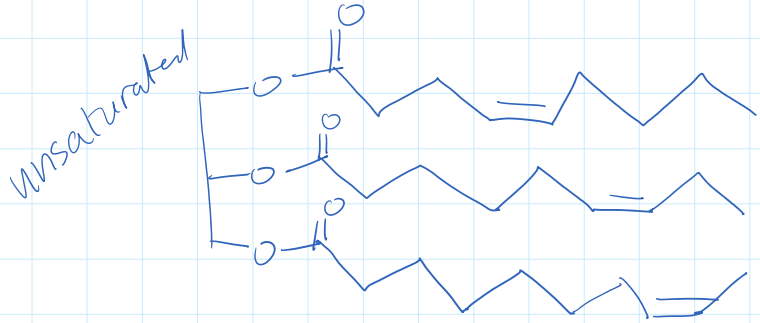
triglyceride

saturated

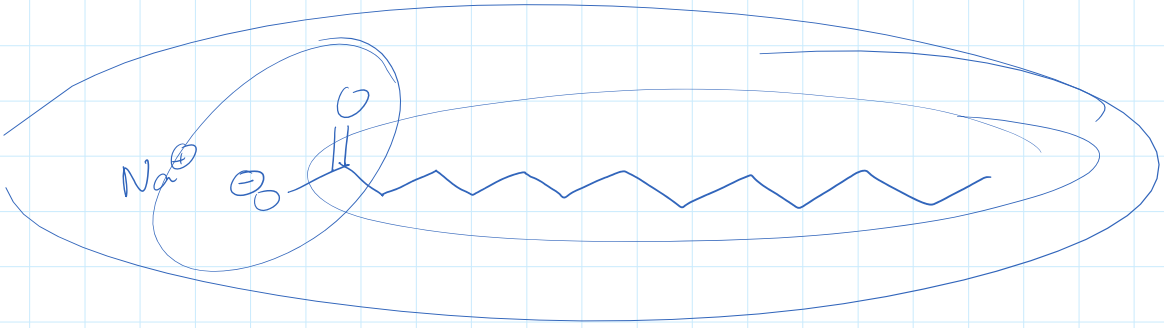


fat = solid @ room temperature

unsaturated

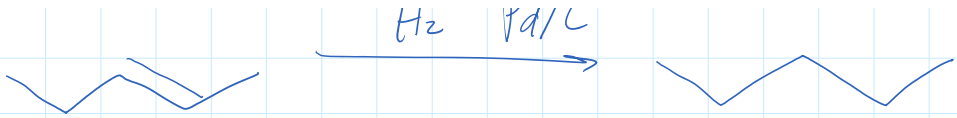


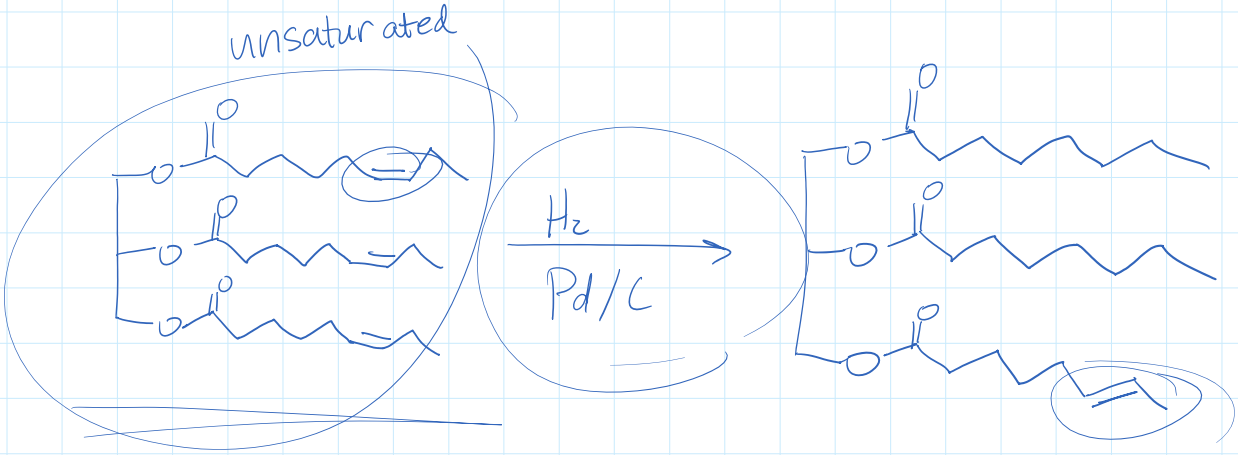
oil = liquid @ room temperature



hydrogenation

H_2 Pd/C

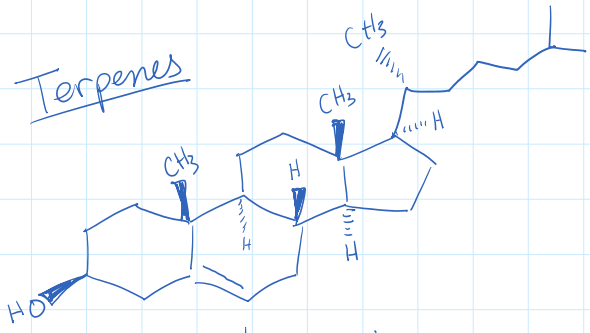




trans alkenes

trans fat

Terpenes



cholesterol

Peanut Butter

Calories

Total Fat: glycerol + fatty acid → triglycerides

trans fat:

cholesterol

sodium: salt content.

total carbohydrate: sugars.

protein polypeptides

Ingredients: roasted peanuts, sugar (sucrose), molasses, fully hydrogenated vegetable oils, mono and diglycerides (1, 2), salt.

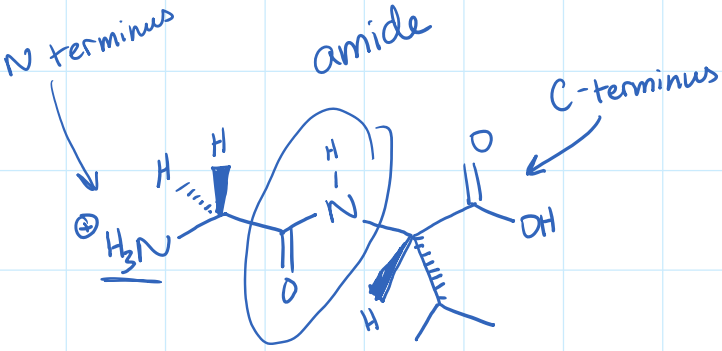
Office Hours

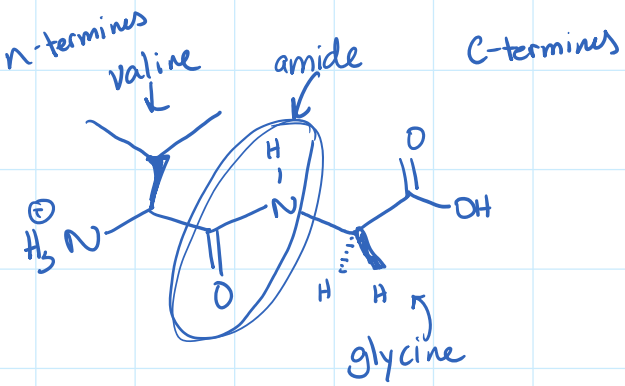
Thursday, April 15, 2021 12:03 PM

N' Gly-Val C'

glycine valine

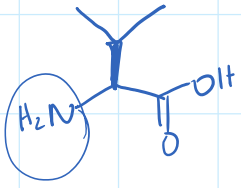
Val-Gly



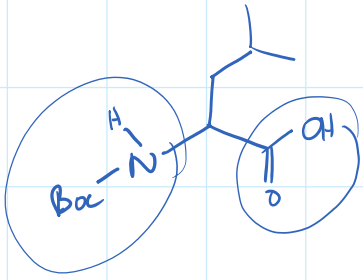


dipeptide

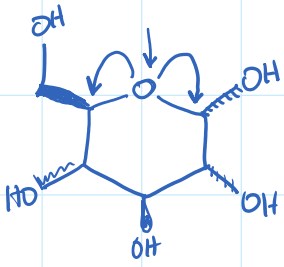
Valine



N-protected leucine

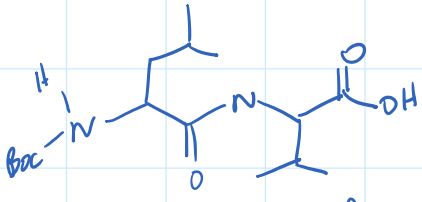


alpha vs beta



same ▌ or ⦙
↳ cis = β

different ▌ or ⦙
↳ trans = α



n-protected leu-val

Polymers

Monday, April 19, 2021 11:46 AM

1. Amino Acids
2. Nucleic Acids
3. Carbohydrates
4. Lipids
5. Polymers

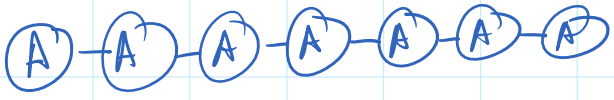
addition polymers $A + B \longrightarrow A\text{-}B$

condensation polymer $A + B \longrightarrow A\text{-}B + H_2O$

homopolymer - one unit repeating

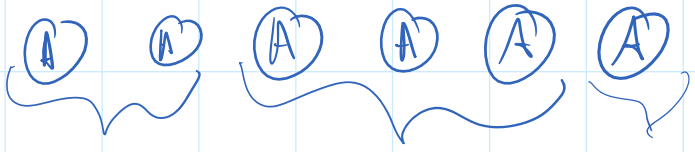
copolymer - multiple units

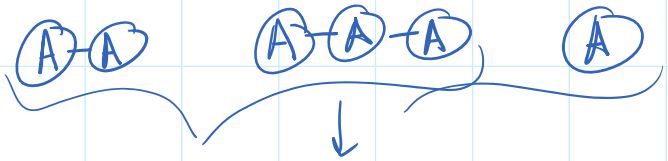
linear chain growth



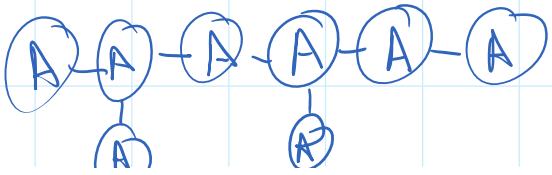
homopolymer

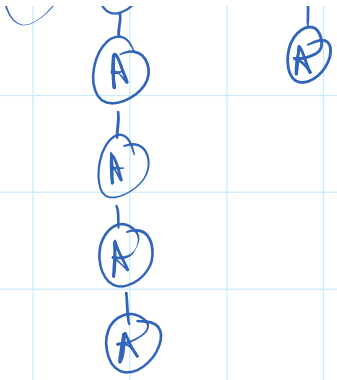
step growth





oligomers

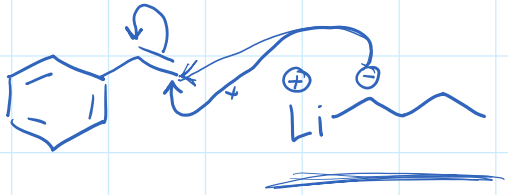


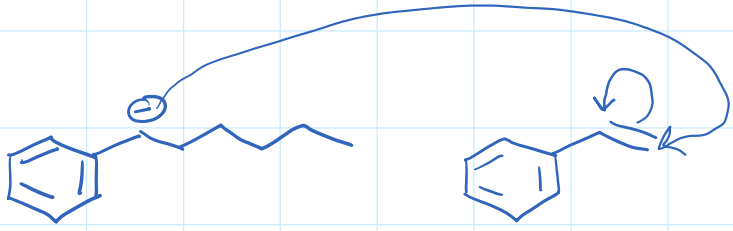


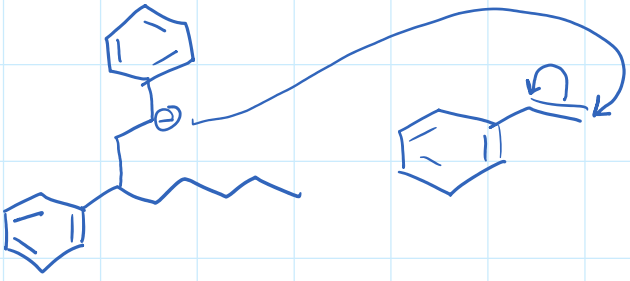
Mechanism:

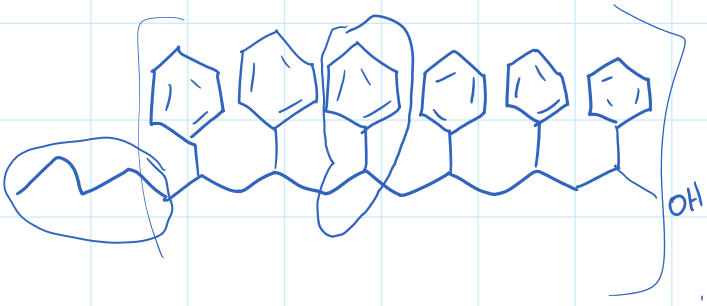
- ✗ Free Radical Chemistry
- Cationic polymerization ⊕
- anionic polymerization ⊖

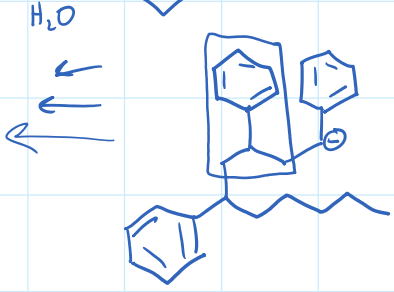
anionic polymerization



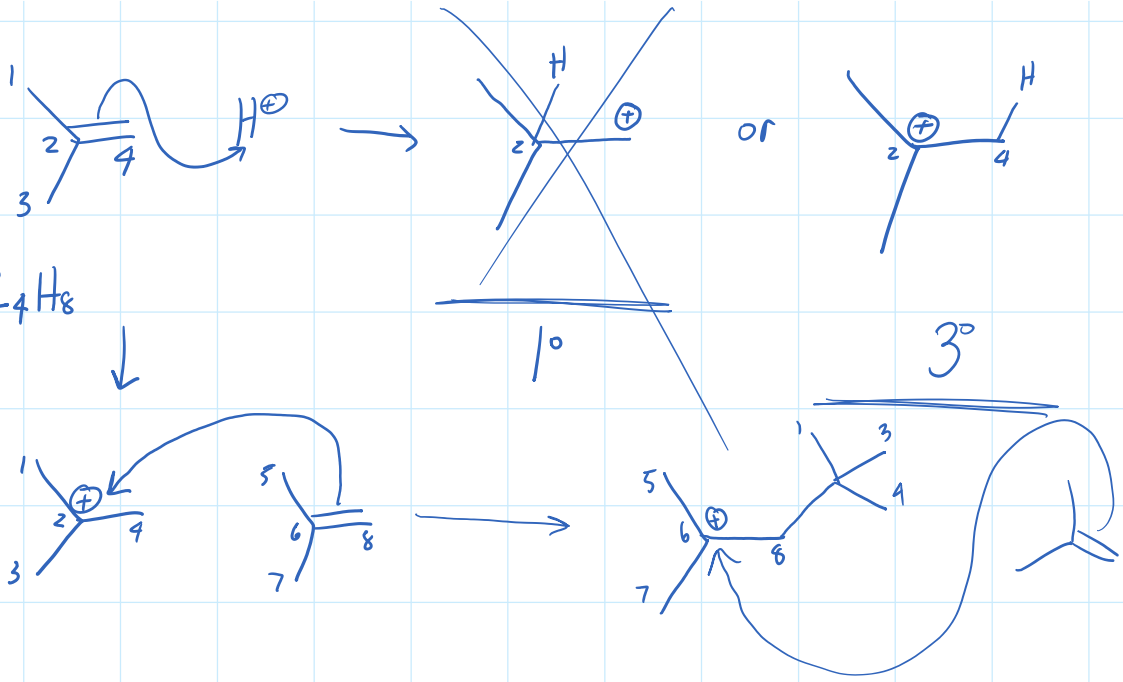


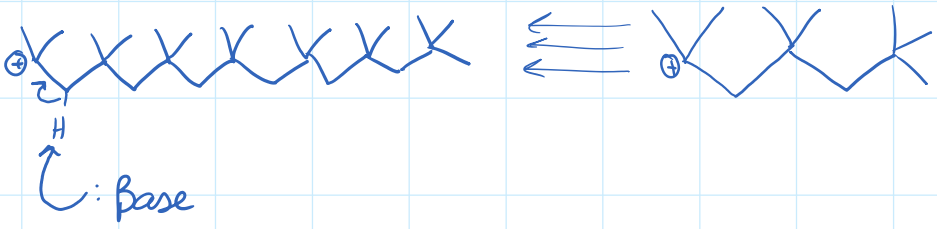


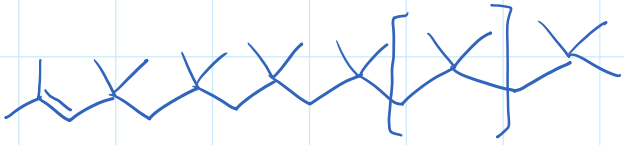




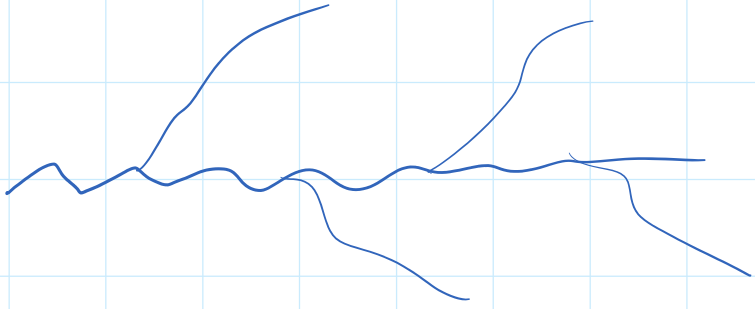
cationic polymerization







polyolefin



Branching

more branching → less dense

LDPE = low density poly ethylene

↳ grocery bag

HDPE = high density poly ethylene

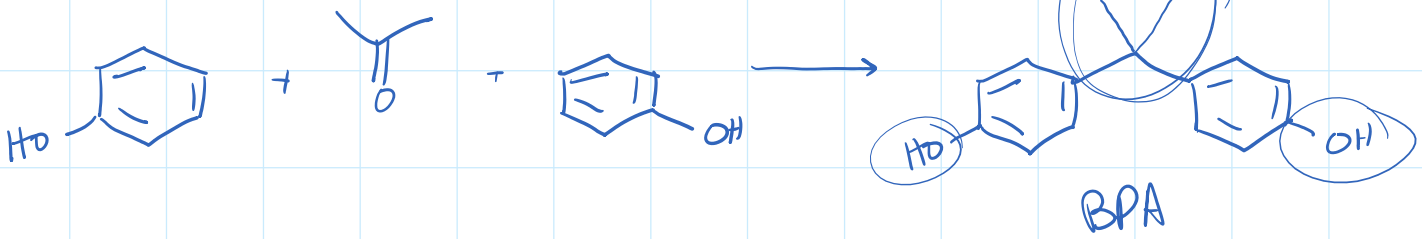
BPA

bis phenol A

2 ol

acetone

ketone



BPA

Review Session

Tuesday, April 20, 2021 7:02 PM

① Amino Acids

② Nucleic Acids

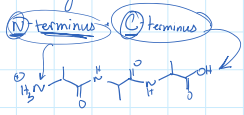
③ Carbohydrates

④ Lipids

⑤ Polymers

Amino Acids = given structures

identify amino acids



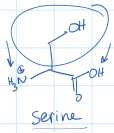
Proteins

1° ACDEFGH sequence

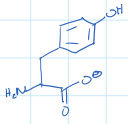
2° α-helices · β sheets fold

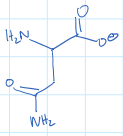
3° 3D structure

4° multiple peptide chains



tyrosine





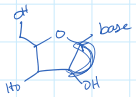
Nucleic Acids

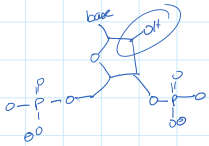
DNA + RNA

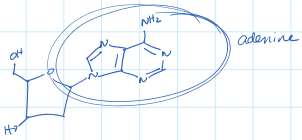
ATCG CGAU

DNA CG AT

RNA CG AU

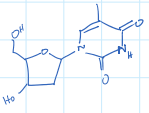


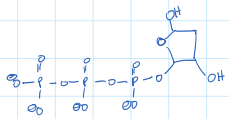




3' GCTATACGGTA 5'

5' CGATATGCCAT 3' DNA

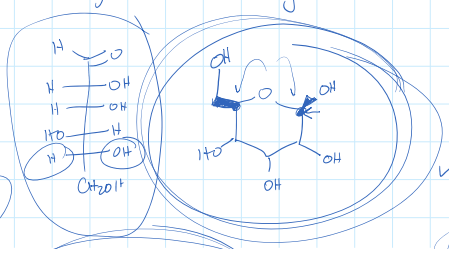




A-U 2 A-T 2

C-G 3

Carbohydrates = sugars



sugars:

anomeric carbon

stereocenters = 5

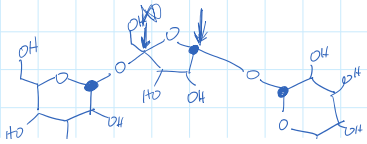
stereoisomers = 2^n = 32

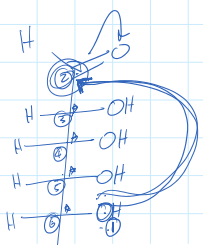
2^5 2·2·2·2·2

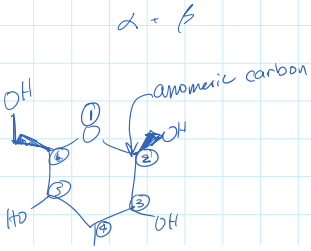
✓ pyranose

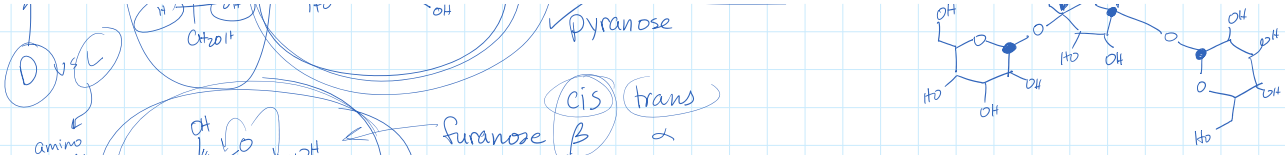
cis trans

trisaccharide






α + β
anomeric carbon



Lipids

Fatty acids

trans or cis

E or Z

unsaturated

saturated.

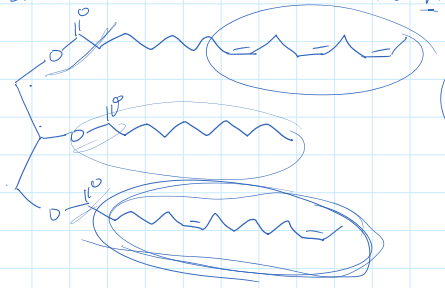
hydrogenation

$C_{26}\ O_2\ H_{46}$

H_2 Pd/C

H_2 Pt/C

ester.



↑ double bonds = ↓ packing

↓ melting points

Polymers:

copolymer: different units.

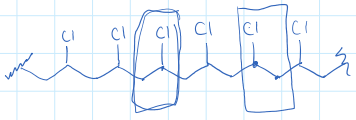
homopolymer: same units.

anionic = ⊖

cationic = ⊕

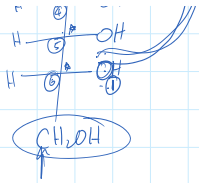
free radical chemistry..

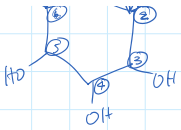
naromi:



PVC

↑ branching = ↓ density


H
OH
H
OH
CH2OH


HO
OH
OH

Exam 4 Review

Wednesday, April 21, 2021 12:01 PM

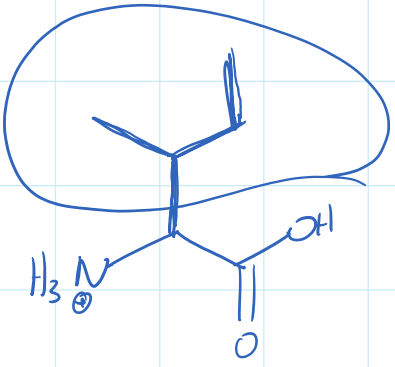
1.) Amino Acids

2.) Nucleic Acids

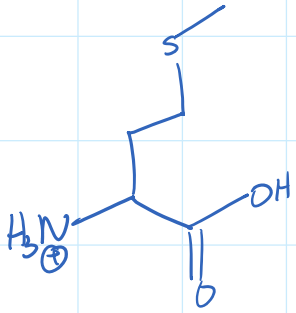
3.) Carbohydrates

4.) Lipids

5.) Polymers

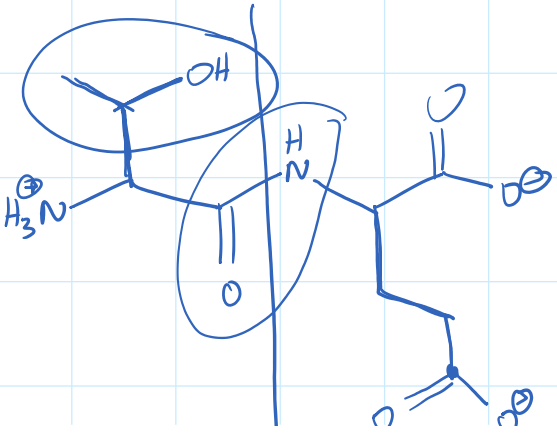


Isoleucine



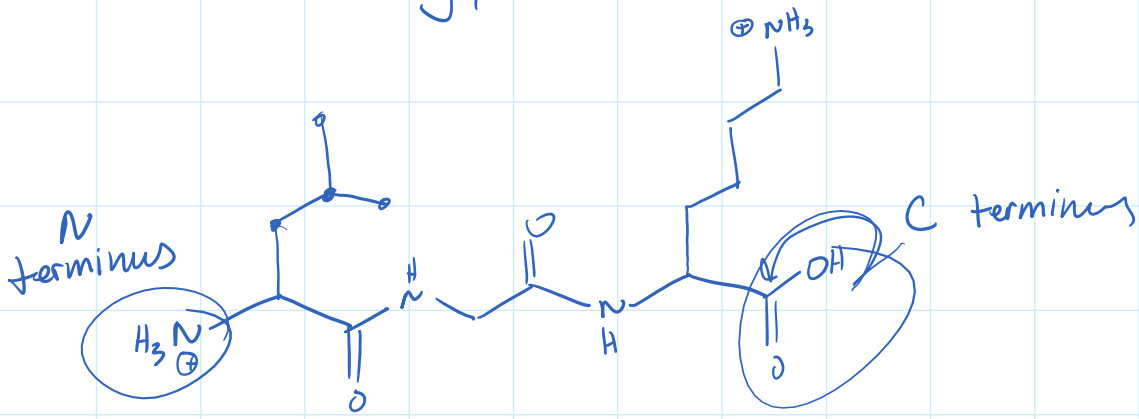
Methionine

Threonine



Glutamic Acid

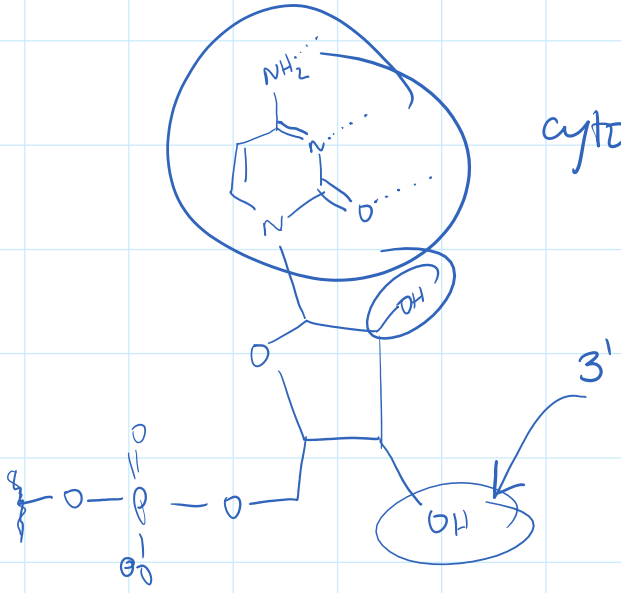
Leucine glycine lysine



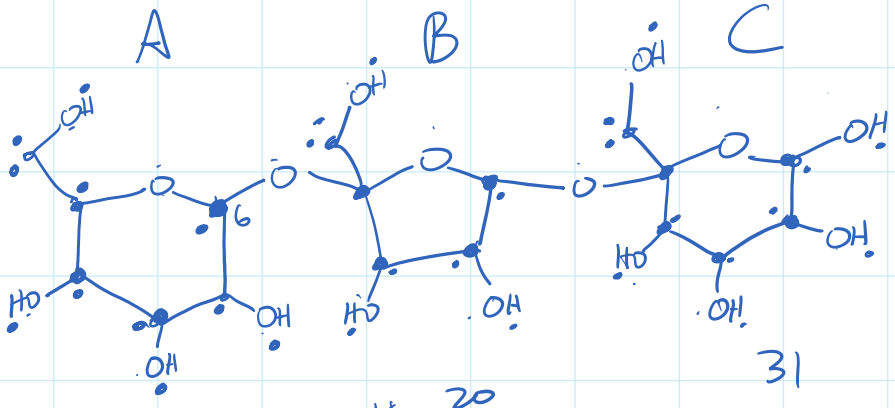
hydrogen
3

cytosine - guanine

5'



Trisaecharide



furanose
pyranose

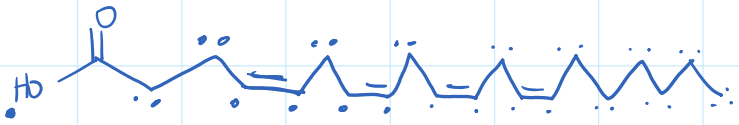
14 2^{14} 20 31

$C_{17}O_{11}H_{20}$

14 11 2^{14} 20 $C_{17}O_{17}H_{30}$

Lipids

fatty acid. or triglyceride



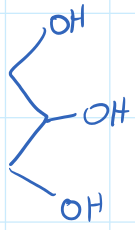
unsaturated

E or Z

cis-alkenes

Carboxylic acid

alkenes $C_{20}O_2H_{32}$



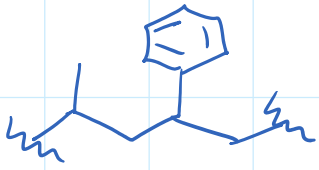
H_2 Pd/C

H_2 Pt/C

E

trans

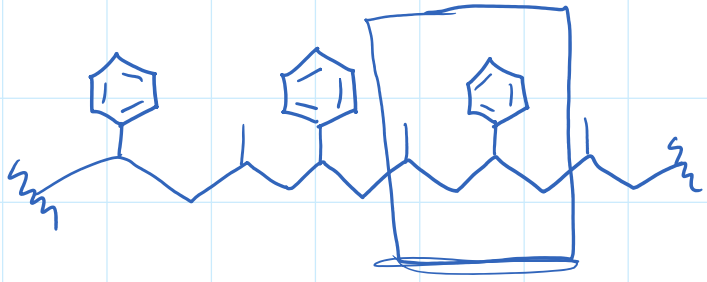
Polymers



~~free radical~~.

cationic ⊕

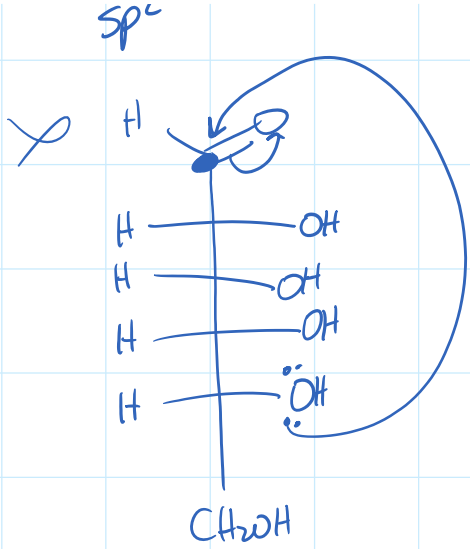
anionic ⊖

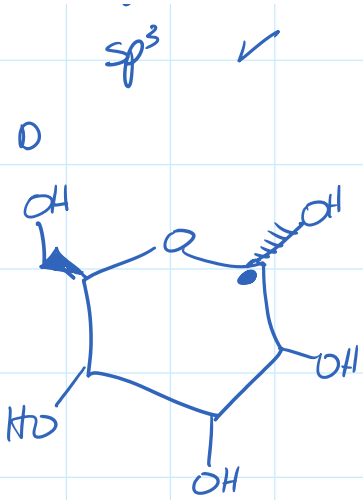


Branching

sp^2

sp^3 ✓


sp²
H
H
OH
H
OH
H
OH
H
OH
CH₂OH


sp³
O
OH
OH
OH
OH
OH