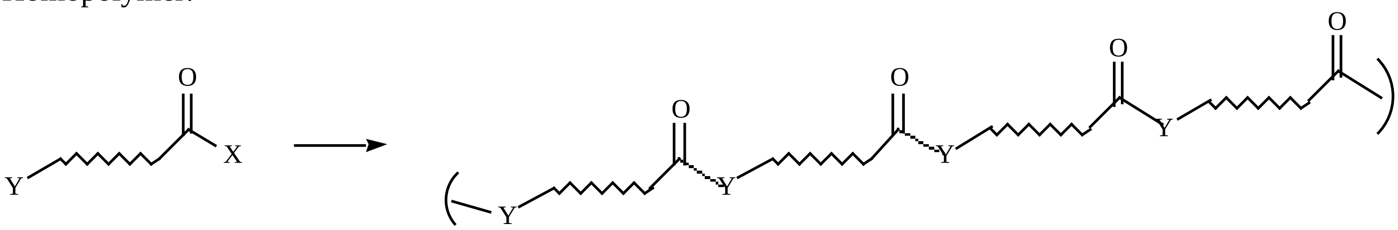
Exam: Monday evening, 7:30-10 pm, McCosh 50 Open book, etc.
Review sessions:
- **Today: 5-6 pm Rm 124 Frick**
- **Sunday: 8-9:30 pm Rm 324 Frick**
- **Monday lecture 9 am, Rm 120 Frick**

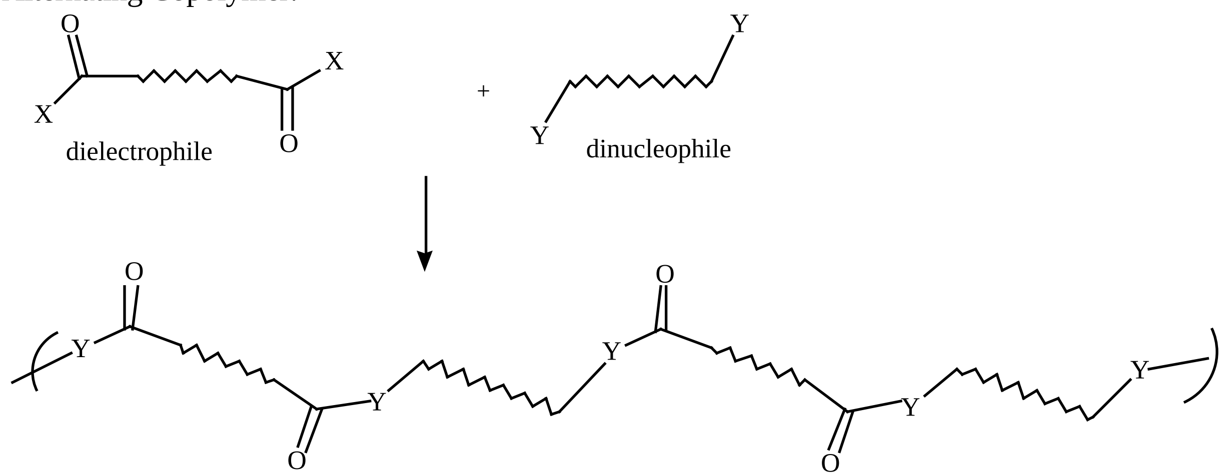
NOTE: Extra copies of the handouts, problem sets, and lecture notes are in the Resource Center, Rm 323 Frick. Let me know if they run out.

Polymerization of Bifunctional Acyl Derivatives:

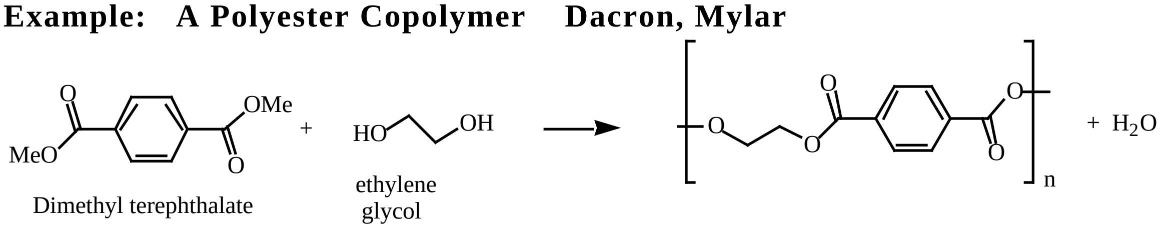
Homopolymer:

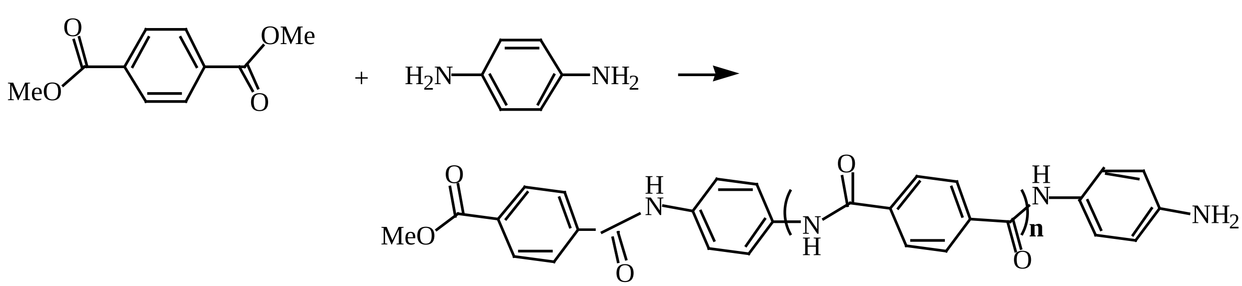


Alternating Copolymer:



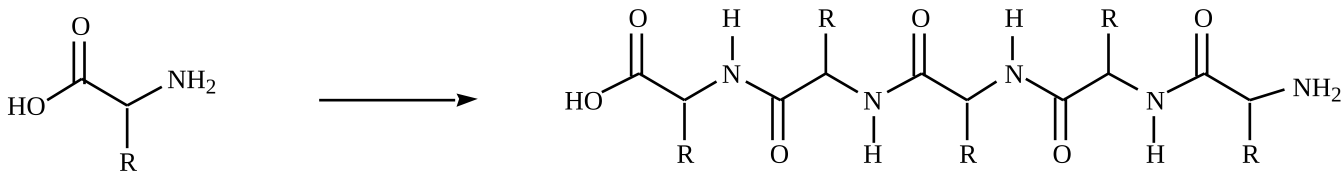
Example: A Polyester Copolymer Dacron, Mylar



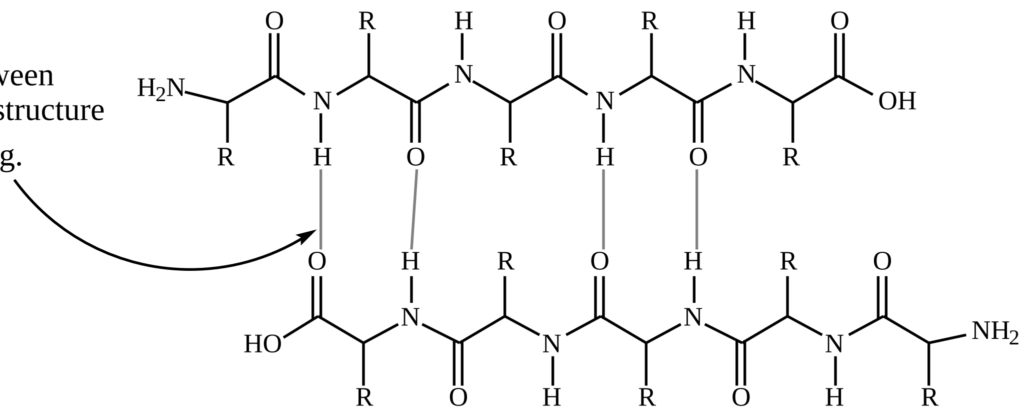


Example: Polyamide

a. homopolymer of α-amino acids

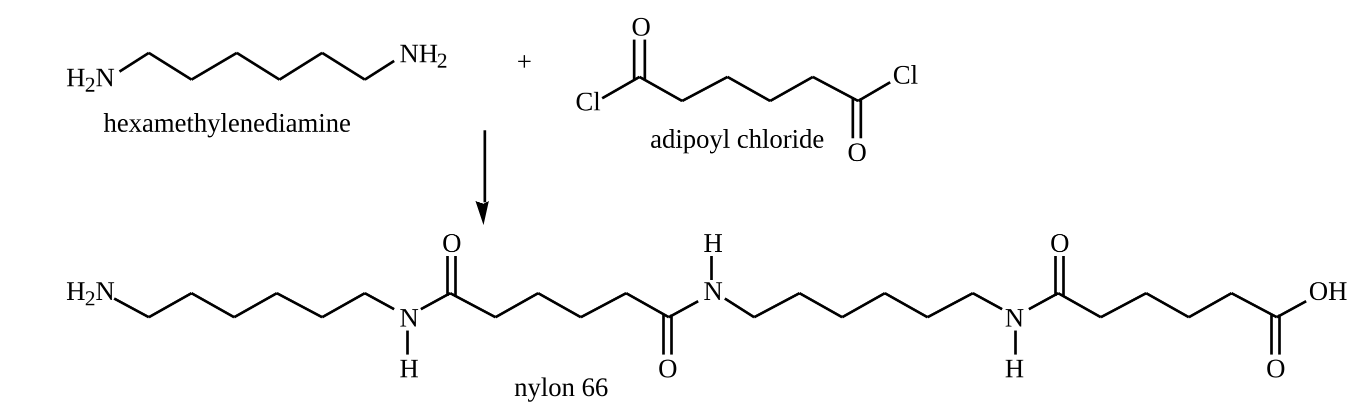


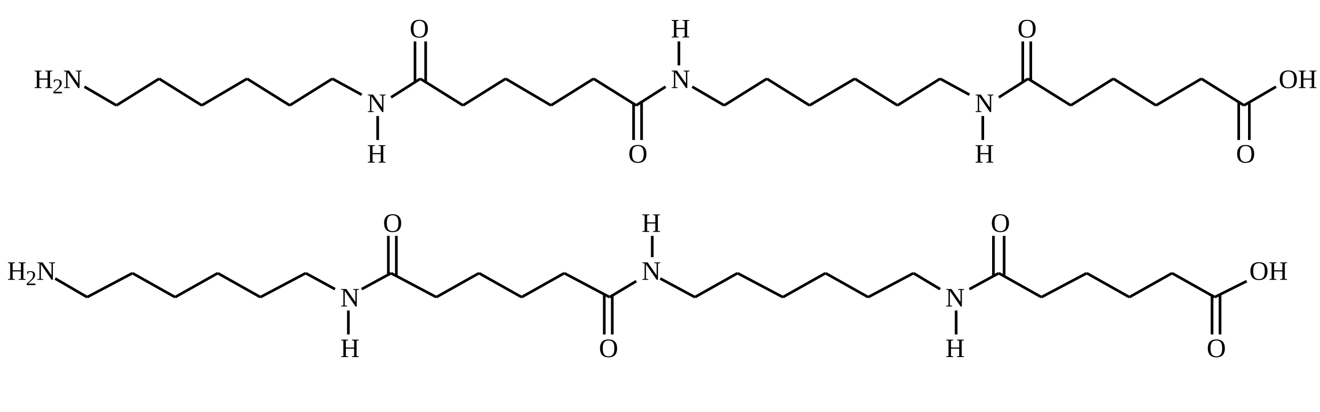
Strong H-bonding between chains determines the structure (fibers, helical, etc) e.g.



The polymer of α-amino acids is called a polypeptide; this amide bond is a **peptide** bond.
Large natural polypeptides are **proteins**

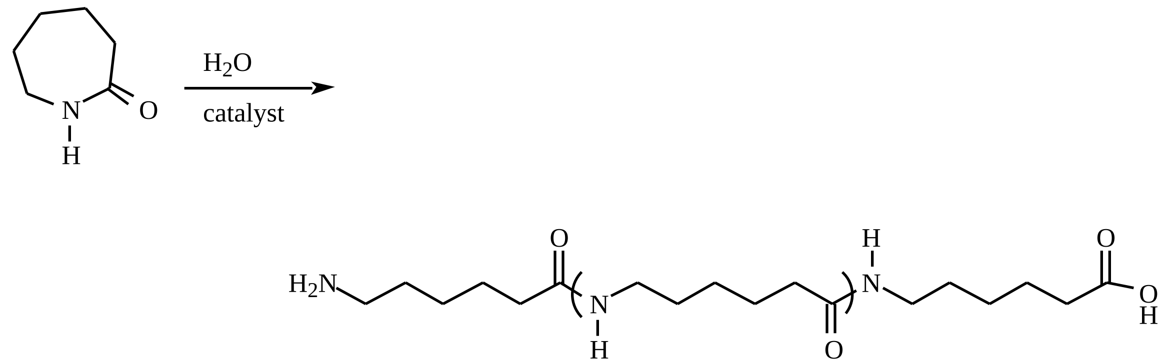
Alternating copolymer:





Note:

caprolactam



nylon 6

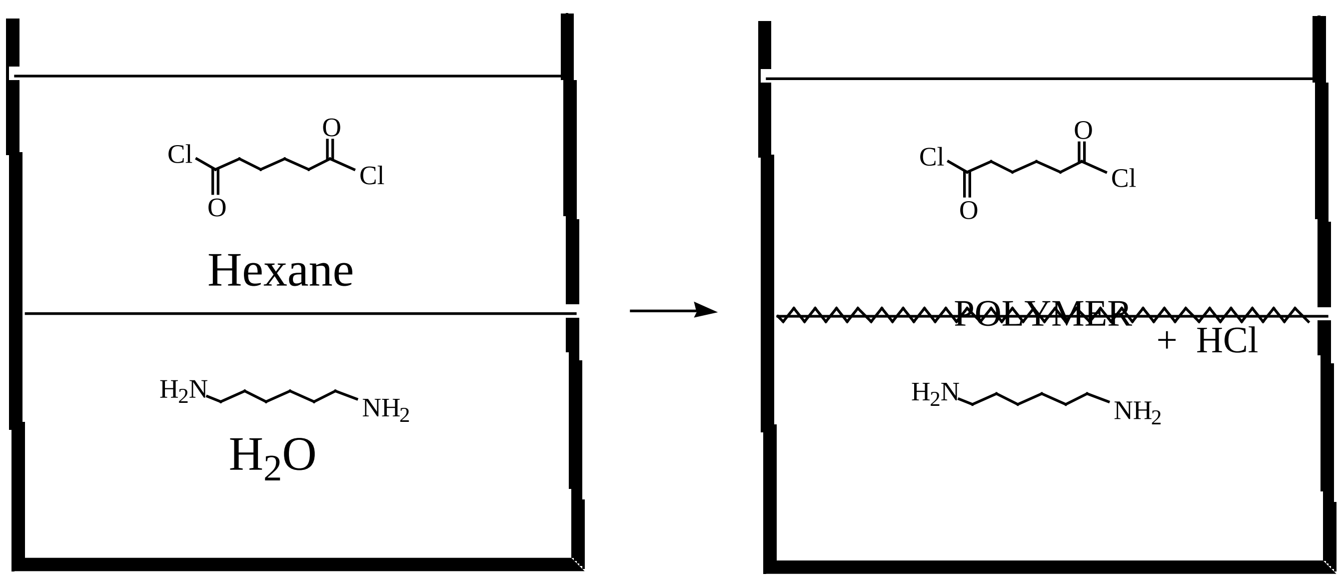
Mechanism?

NYLON Synthesis:

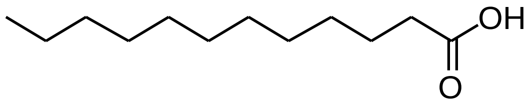
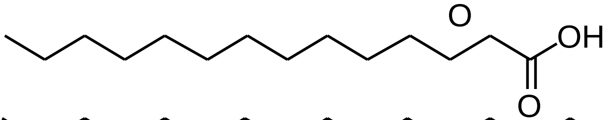
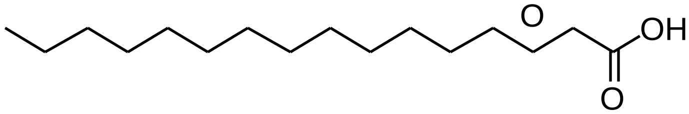
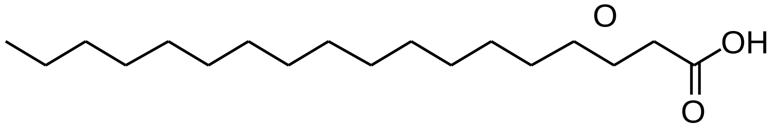
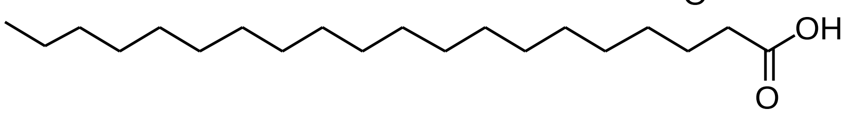
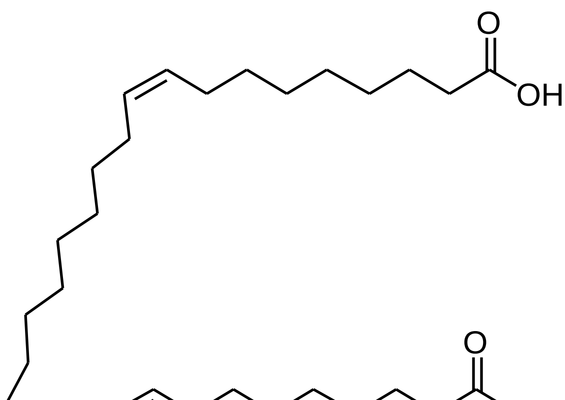
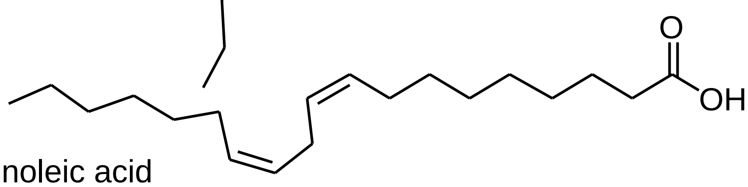
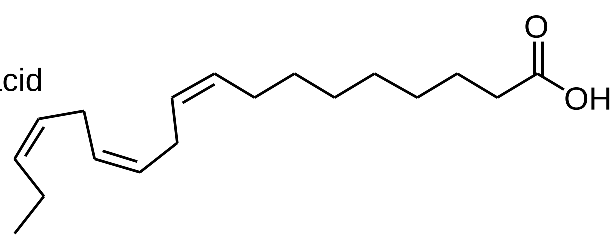
adipoyl chloride in hexane

(non-polar, non-nucleophilic, lighter than water)

1,6-diaminohexane in water



Reaction at the interface of the two immiscible solutions gives a layer of polymer. One can mechanically remove the layer as a strand by hooking into it and pulling up. As the polymer is pulled away, more forms at the interface and a fairly continuous rope of nylon is obtained.

			mp
12		lauric acid	44 ^{o}C
14		myristic acid	58 ^{o}C
16		palmitic acid	63 ^{o}C
18		stearic acid	69 ^{o}C
20			77 ^{o}C
18		oleic acid	13
18		linoleic acid	-5
18		linolenic acid	-11

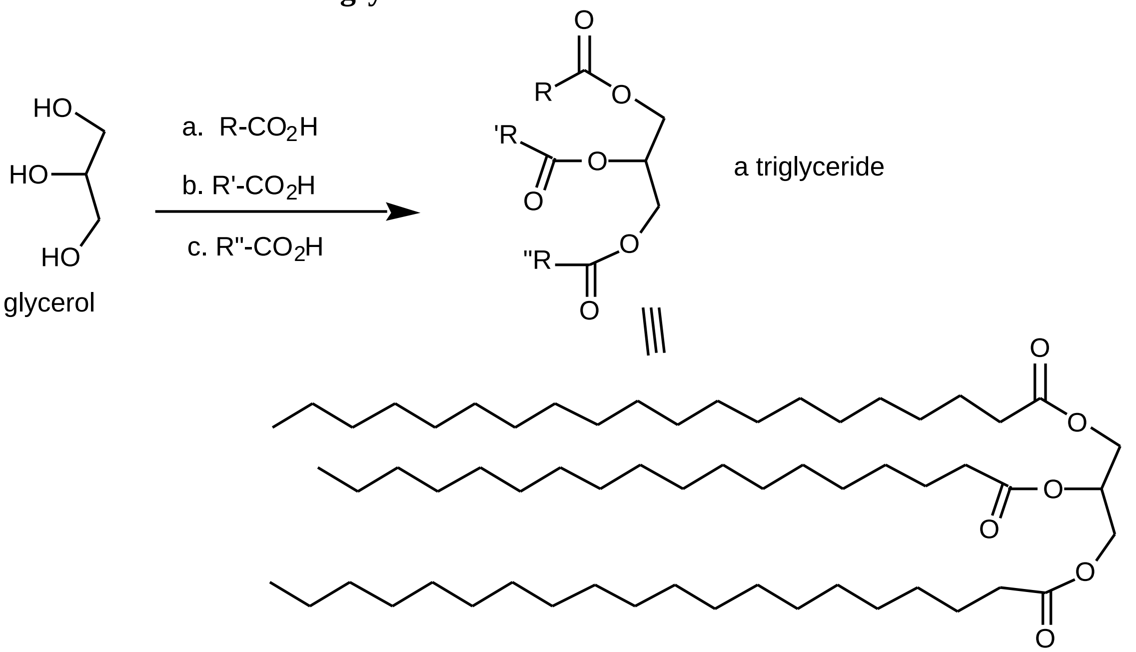
Always an even number of carbon atoms: biosynthesized from acetate (later)

Saturated fatty acids (no double bonds) can "pack" tightly in regular arrays through van der Waals interactions:
relatively high mp, solids at room temperature Longer = higher mp

Unsaturated fatty acids pack together less well, lower mp.
Mp depends on number and configuration of double bonds.

[Blow-up of fatty acid conformations: p 2 of handout 1 on fatty acids]

FATS AND OILS: Triglyceride



[structure of triglycerides: blow-up of structures, p 4 of handout 1 on fatty acids]

Triglycerides are a primary energy storage form.

carbohydrate: $C_nH_{2n}O_n + n\ O_2 \rightarrow n\ CO_2 + n\ H_2O$

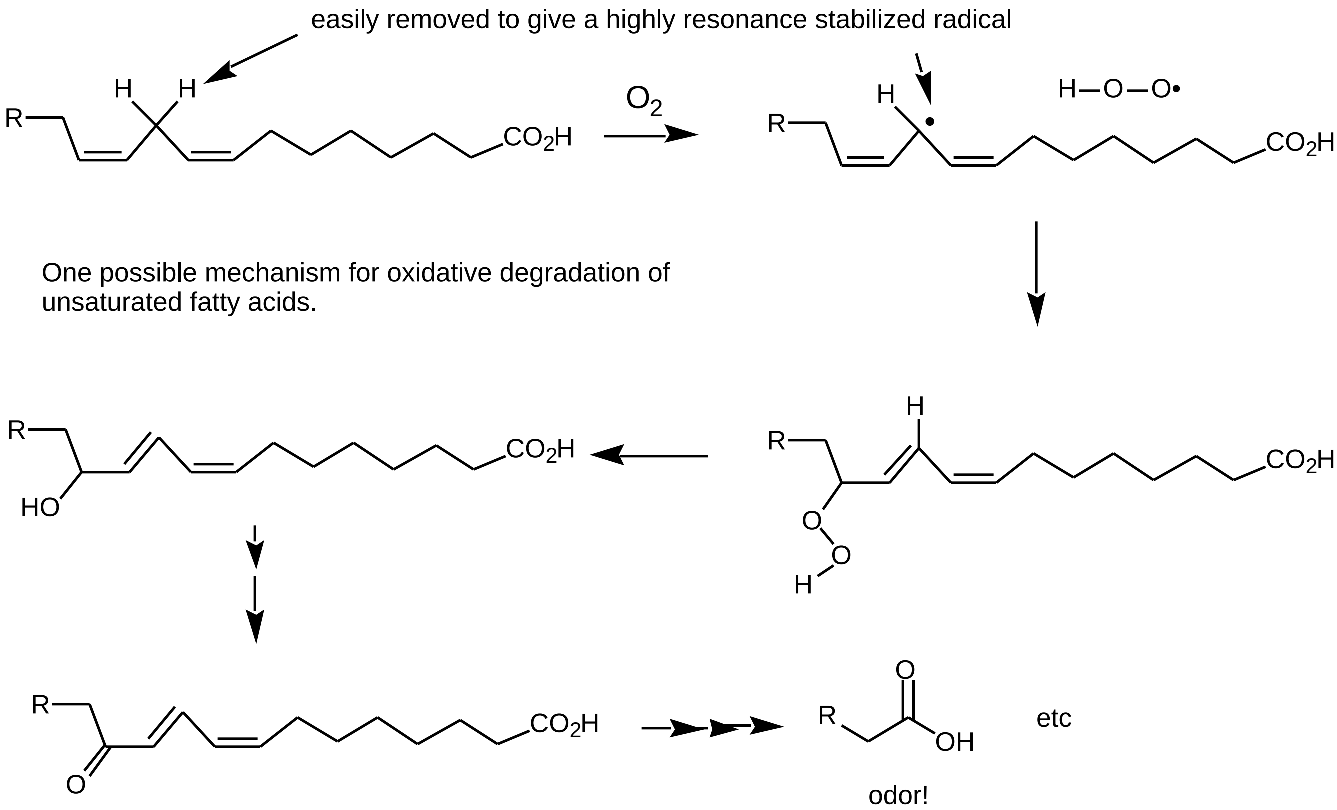
fats: approx: $C_{10n}H_{20n}O_n + (n+x)\ O_2 \rightarrow 10n\ CO_2 + 10n\ H_2O$

More O_2 consumed, more energy out

Unsaturated fatty acids are more reactive: the alkene unit is a reactive center.

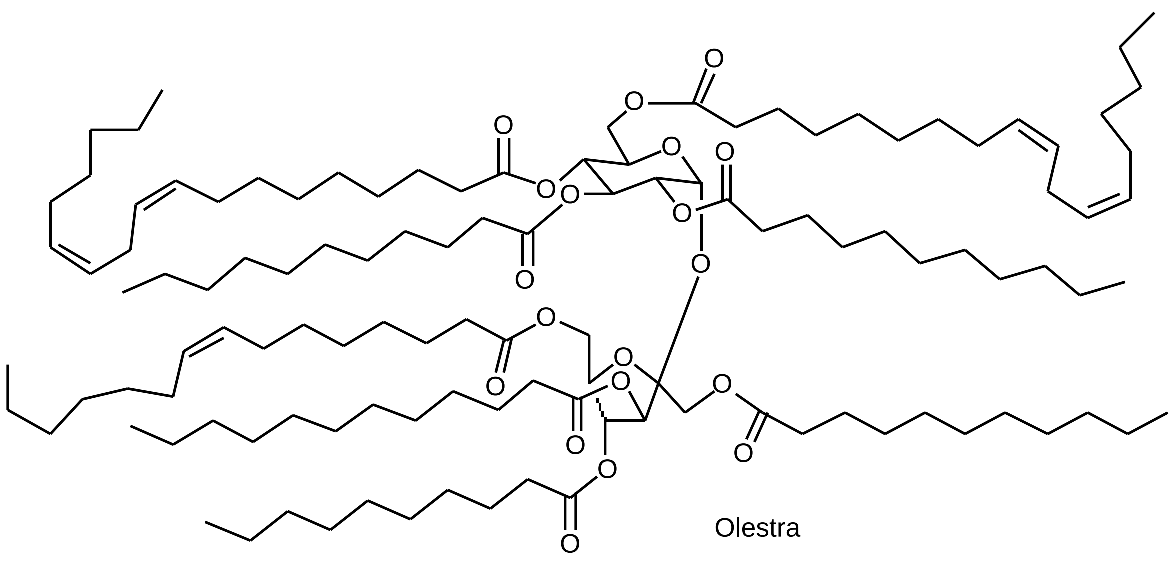
Good feature: easily metabolized
more soluble

Oxidative instability of unsaturated fatty acids:



Artificial Fats: Taste like fat but are not broken down to fatty acids and stored.

Prepared by synthesis: sucrose + fatty acids (natural ingredients)

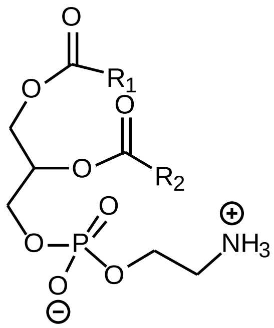


Olestra

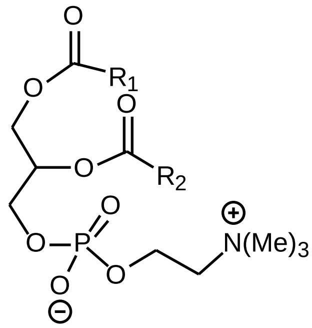
Enzymes that normally break down fats cannot hydrolyze these esters.

Fatty Acids in Biological Membranes:

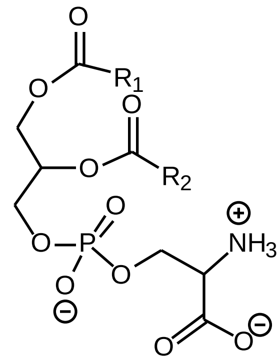
Phospholipids: Polar "head groups" and hydrophobic (non-polar) "tail" (R_1, R_2)



a cehpalin



a lecithin



a phosphatidylserine

R_1, R_2 = fatty acids

In water, the polar head groups strongly associate with the water, but the non-polar ends groups are driven away, into interaction with themselves. A stable arrangement is a bilayer, with two polar surfaces and a non-polar inside of a "sandwich".

[Blow-up of simple membrane structure: 2 versions]

These provide structure for cell walls. More-or-less rigid depending on the frequence of unsaturated fatty acids in the mix. Also, cholesterol, a very rigid molecule, can be incorporated into the non-polar layer and add rigidity. The membranes can be modified by insertion of proteins which can provide "communication" through the cell wall.

[Blow-up of :Fig 17.4]

The bilayer can fold onto itself, forming a spherical structure with a large cavity = **vesicle.** The inner core of aqueous solution can carry collections of proteins and other molecules from one location to another inside the cell or between cells. The membranes are permeable and also can "fuse" with other bilayer membranes to spill the contents.