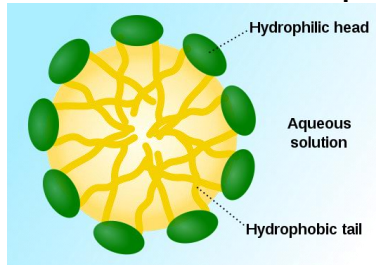


100 pts. 1-34 2pts, 35-40 8pts. (choose 4 of 6)

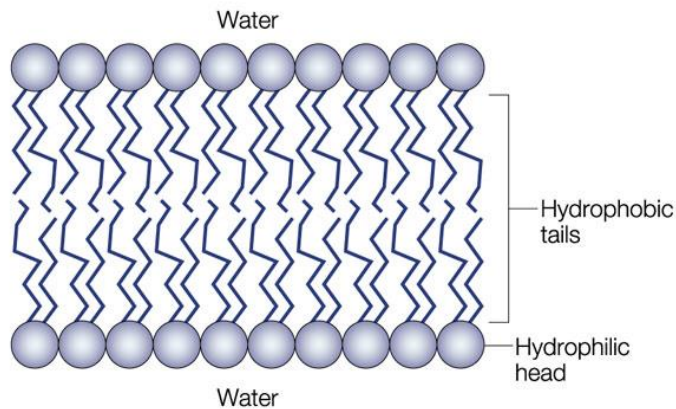
- 1) A lipid is composed of
 - A) **Polar and nonpolar parts**
 - B) 2 polar heads
 - C) Phosphate and fatty acids
 - D) A long hydrophobic tail
 - E) 2 fatty acids

- 2) What has the highest melting point?
 - A) **Stearic acid (18:0) Saturated fat (all single bonded carbons) has a higher melting point than unsaturated fat (contains 1 or more double bonds between carbons). The longer the carbon chain, the higher the melting point**
 - B) Oleic acid (18:1) ← this annotation means 18 carbon chain, 1 double bond. So this is an unsaturated fat = low melting point. Think vegetable oil (unsaturated fat) vs. butter (saturated fat). 1 is a liquid at room temp and the other is solid at room temp
 - C) Myristic acid 14 carbon saturated fat. 2nd highest melting point out of 5 options
 - D) Linoleic acid unsaturated fat, omega-6. Super low melting point due to multiple double bonds
 - E) Butyric acid very short carbon chain. But = 4 carbons.

- 3) Lipids allow for the formation of _____ and _____.
 - A) Membranes, lips can form membranes but not lips
 - B) **Micelles, bilayers micelles are formed by lipids having a nonpolar, hydrophobic carbon chain tail and a polar, hydrophilic head. The nonpolar tails stick together to avoid H₂O while the polar heads act as a barrier and touch the water in solution. This makes a kind of bubble with all the nonpolar tails stuck together and the polar heads around the outside. A bilayer is formed in a similar way. Remember "like likes like" so "polar likes polar" and "nonpolar likes nonpolar"**



← micelle



← bilayer

- C) Micelles, polar lipids
- D) Bilayers, polar lipids
- E) Membranes, polar lipids

4) Lipid contains one or more fatty acids which are composed of _____.

- A) Long chain lipids
- B) Long, polar carbon chains
- C) Long phosphate chains
- D) Long chain alcohols
- E) **Long chain carboxylic acids**

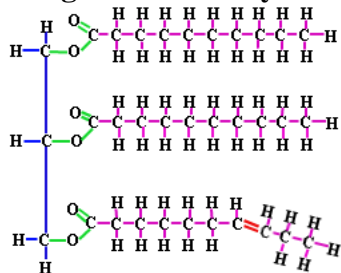


Diagram: Blue is glycerol, the green oxygens and purple carbon chains are the long chain carboxylic acids.

5) What is the name of $\text{CH}_3(\text{CH}_2)_4\text{NHCH}_2\text{CH}_2\text{CH}_3$?

- A) N-propyl-pentamide
- B) N-methylbutyl propamine
- C) N,N- propyl-N pentamine.
- D) **N-propyl-pentamine** The longest carbon chain coming off of the nitrogen has 5 carbons so pent (5) amine but there is also a shorter propyl (3 carbons) chain coming off the amine. The N must go before propyl because the extra carbon group is attached at N and not coming off of the longest carbon chain.
- E) N-pentyl-propamine

6) Stearic acid (18:0) is a(n) _____ fat with _____ double bonds This annotation (18:0) means 18 carbons with 0 double bonds

- A) Unsaturated , 18
- B) Unsaturated, 0
- C) Unsaturated, 1
- D) **Saturated, 0**
- E) Saturated, 1

7) Melting points of fatty acids _____ with chain length and _____ with unsaturation.

- A) Increase, increase
- B) Increase, do not change
- C) **Increase, decrease**
- D) Decrease, increase
- E) Decrease, decrease

8) The human body _____ polyunsaturated fatty acids and are therefore essential.

A) Cannot synthesize

B) Can synthesize

C) Can hydrogenate

D) Can brominate

E) Cannot hydrolyze

“Essential” because they are essential to survival. You have to get them from your diet because you can’t synthesize them. Don’t have to remember all amino acids but acronym

PVT. TIM HAL for essential is helpful

Essential amino acids	Non-essential amino acids
Histidine	Alanine
Isoleucine	Arginine
Leucine	Asparagine
Lysine	Aspartic acid
Methionine	Cysteine
Phenylalanine	Glutamic acid
Threonine	Glutamine
Tryptophan	Glycine
Valine	Proline
	Serine
	Tyrosine

9) Waxes contain an ester linkages and are composed of _____ and _____.

A) Long chain carboxylic acids, amides

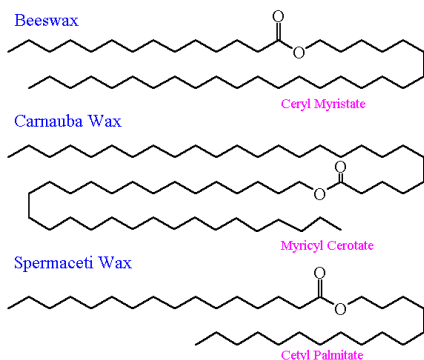
B) Long chain carboxylic acids, nitrogen

C) Fatty acids, long chain alcohol

D) Fatty acids, long chain carboxylic acids fatty acids are long chain carboxylic acids!

E) False, composed of phosphate ester bonds.

Waxes

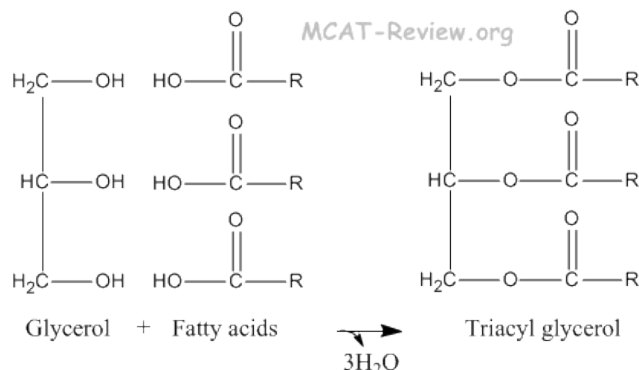


10) _____ are composed of glycerol and ___ fatty acids

A) Triglycerides, 2

B) Triacylglycerides, 2

- C) **Triglycerides, 3** both names are acceptable but **3 fatty acids** must be attached to glycerol
 D) Triacylglycerides, 0
 E) none of the above

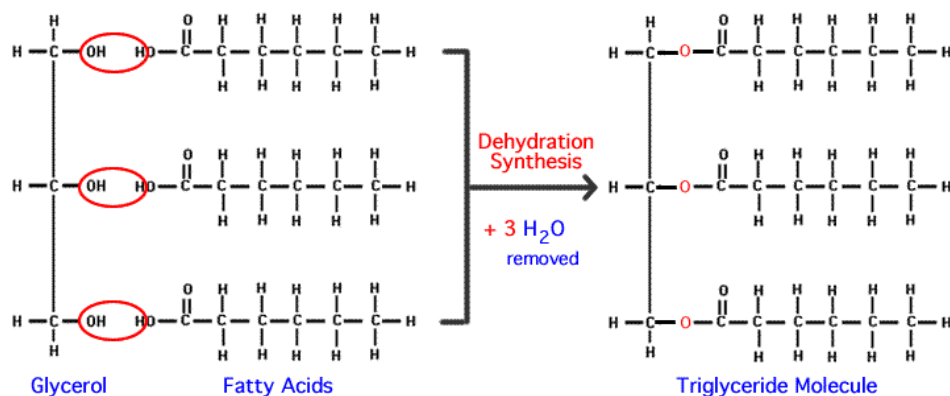


- 11) _____ of unsaturated fats and oils removes the double bond from a fatty acid, increases melting point
- A) Hydrogenation adds Hydrogens to each carbon that were originally part of double bond and forms single bond.
 B) Bromination adds Bromines to each carbon that were originally part of double bond and forms single bond.
 C) Hydrolysis
D) A and B
 E) A and C
- 12) Unsaturated fatty acids oxidize to form _____
- A) **aldehydes**
 B) alcohols
 C) carboxylic acid + alcohol
 D) carboxylic acids
 E) aldehyde + ketone

Unsaturated fatty acids may oxidize and cleave to form aldehydes:



- 13) The base Hydrolysis of a triacylglyceride composed of linoleic acid, stearic acid, and myristic acid result in.
- A) Glycerol, steric acid, linoleic acid
 B) Steric acid, glycerol, myrstic acid
 C) **Steric acid, linoleic acid, myristic acid** it also produces glycerol! Hydrolysis results in a bond breaking and water leaving
 D) Myristic acid, steric acid
 E) It cannot hydrolyze

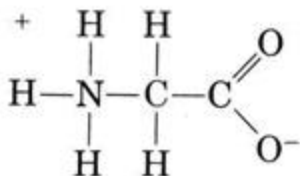


14) _____ are composed of glycerol, 2 fatty acids, a phosphate group, an amino group.

- A) **Glycerolphospholipids**
- B) glycerophosphoamine
- C) glyceridelipid
- D) glycerolphosphate
- E) glycerolcarboxylipid

15) A zwitterion contains both a _____

- A) **positive and negative charge the charges will balance out to an overall 0 charge**



This is the zwitterion form of glycine, an amino acid

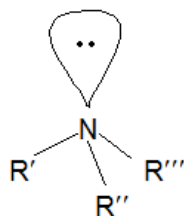
- B) phosphate and ester bond
- C) amide and phosphate ester bond
- D) balanced charge and phosphate group
- E) long chain carboxylic acid and alcohol

16) In a lipid bilayer the head is _____ and the tail is _____, composed of long carbon chains

- A) nonpolar, polar
- B) nonpolar, hydrophobic
- C) **hydrophilic, hydrophobic hydrophilic = polar. Hydrophobic = nonpolar**
- D) hydrophilic, polar
- E) hydrophobic, hydrophilic

17) Amines are derivatives of ammonia and the geometry about the nitrogen is _____

- A) **Trigonal pyramidal**



- B) Trigonal planar
- C) tetrahedral
- D) bent
- E) linear

18) Which of the following can hydrogen bond?

- A) Primary amines
- B) Water and amines
- C) Amines with amines
- D) None of the above
- E) **All of the above**

Tertiary amine CANNOT hydrogen bond. Primary and secondary amines still have a lone pair of electrons and at least one hydrogen that react and can form hydrogen bonds.

19) What is the name of the following compound? What type of amine?



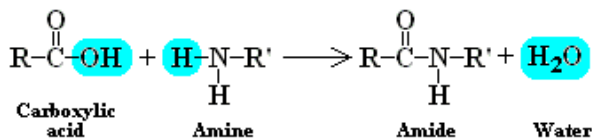
- A) **5-aminopentanoic acid, primary**
- B) 5-aminopentanoic acid, secondary
- C) N-pentanoic acid, primary
- D) N-pentanoic acid, secondary
- E) N-pentanoic acid, tertiary

20) _____ cannot hydrogen bond and have lower boiling points.

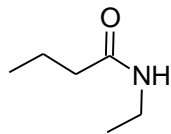
- A) **Tertiary amines hydrogen bonds increase boiling points because the molecules have a harder time spreading out enough and turning into a gaseous state. Tertiary amines cannot hydrogen bond, therefore they turn into a gas easier than primary and secondary amines**
- B) amides
- C) aldehydes
- D) primary amines
- E) secondary amines

21) Amines react with carboxylic acids to form _____

- A) Amine salts
- B) **amides**
- C) amide salts
- D) carboxylates
- E) sodium amide



22) Which reactants are needed to complete the reaction?



- i) Butanoic acid
- ii) propanoic acid
- iii) Ethylamine
- iv) N-methyl-ethamine

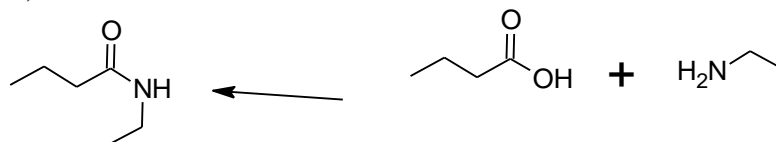
A) i, ii, iv

B) ii, iv

C) i, iii

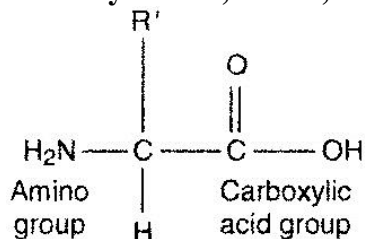
D) i, iv

E) ii, iii



23) Amino acids are composed of _____.

A) Carboxylic acid, amine, R-group



B) Nucleotides, carboxylic acids

C) Amides, carboxylic acids

D) Amides, phosphate group, carboxylic acids

E) Amines, carboxylic acids

24) List the amino acids in order of increasing polarity from basic to acidic.

- i) Glycine
- ii) Threonine
- iii) aspartic acid

A) i, ii, iii,

B) ii, i, iii,

C) iii, ii, i

D) I, ii, iii

Use handout of amino acids listed in basic, nonpolar and acidic groups

25) Amino acids are linked together by _____ bonds.

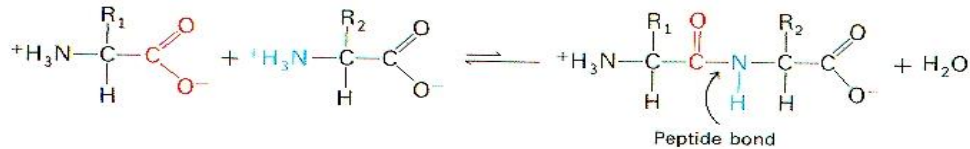
A) Ester bonds

B) Phosphate ester bonds

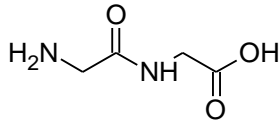
C) Hydrogen bonds

D) Peptide bonds**E) Disulfide bonds**

A polypeptide is another name for multiple amino acids bonded together. The N terminus (amino group) is always on the left and the C terminus (carboxylate group) is on the right. The peptide bond is formed by the carboxylate linking to the nitrogen.



26) Which carbon has the peptide bond?



- A) 1
- B) 2**
- C) 3
- D) 4
- E) B and D

Number carbons left to right. The peptide bond occur between the carboxylate carbon of the first amino acid and the nitrogen in the amino group of the second amino acid

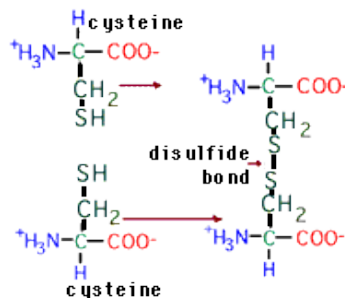
27) For the amino acid below, _____ is the N-terminal residue and _____ is the C-terminal residue.

Tyr-Gly-Gly-Phe-Met-Thr

- A) Tyrosine, Glycine
- B) Threonine, Tyrosine
- C) Tryptophan, Tyrosine
- D) Tyrosine, Threonine**
- E) Methionine, Threonine

28) A _____ between 2 cysteines help to fold proteins

- A) Peptide bond
- B) Hydrogen bond
- C) Disulfide ring
- D) Thiol bond**



- E) Disulfide bridge**

29) Polar Basic Amino Acids have which functional group?

- A) $-\text{NH}^+$, $-\text{NH}_2^+$, $-\text{NH}_3^+$
- B) NH_2 , COO^-
- C) OH , SH , CONH_2
- D) Alkyl, aromatic, thioester
- E) A and B

Use amino acid sheet and observe functional groups under polar basic amino acids.

30) Alkyl, aromatic, or thioester functional groups are found in which type of amino acids?

- A) Asparagine
- B) Cysteine
- C) Glutamate
- D) Glutamic acid
- E) Phenylalanine

Recognize primary amines, secondary amines, and amides given condensed formula. Review naming! Know what reactants result in the products for triglycerides, amides, amino acids, etc. Know the structure of choline and ethanolamine – both are amino alcohols

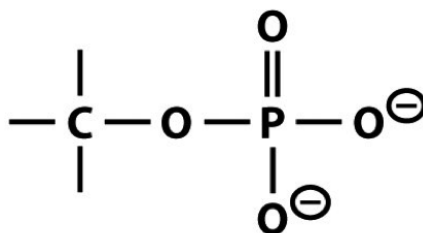
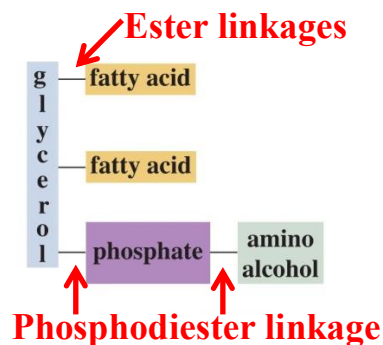
Choline



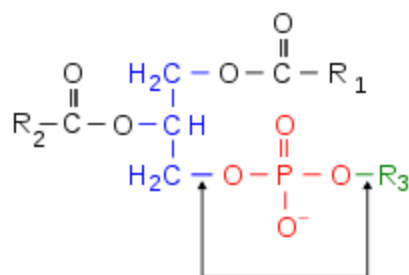
ethanolamine



Draw the cartoon diagram of a glycerolphospholipid. Label each linkage type.



Above: This is a phosphate ester linkage. Only 1 R group is attached to the phosphate.

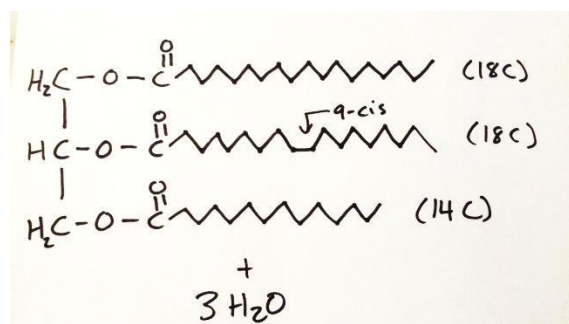
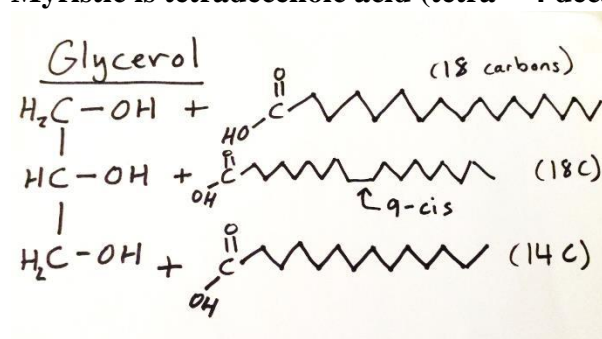


Above: The arrow shows a phosphodiester linkage. 2 R groups are attached to 2 different oxygens of the phosphate.

A triglyceride is composed of stearic acid, 9-cis-octadecenoic acid and myristic acid. Draw the compound.

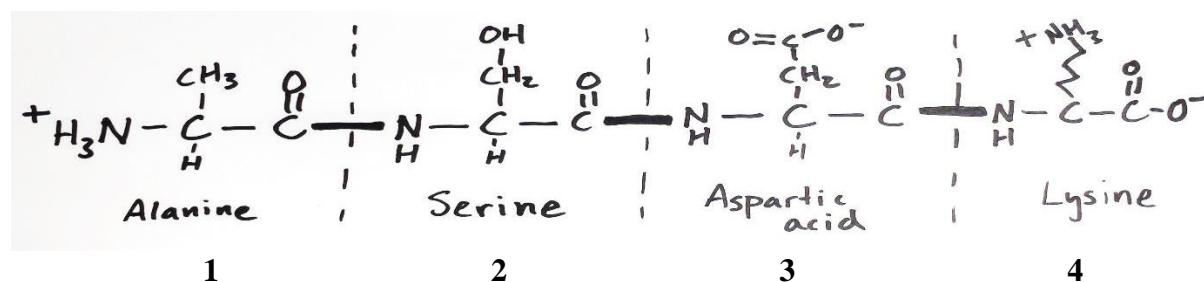
Stearic acid or octadecenoic acid (octa = 8, deca = 10 so 18 carbons)

Myristic is tetradecenoic acid (tetra = 4 deca = 10 so 14 carbons)

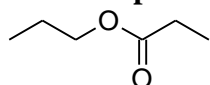


Draw a tetrapeptide containing 1 hydrophobic residue, 1 neutral polar amino acid, 1 polar acidic residue, and 1 polar basic residue. Number the residues, give the 1 and 3 letter codes. State the overall charge of the peptide. Overall charge is 0! The charge in the R group provides charge. Ala = 0, Ser = 0, Asp = -1, Lys = +1. Therefore: $0+0-1+1=0$. Dark lines = peptide bond. Dashed lines divides the amino acids

Ala-Ser-Asp-Lys (3 letter code name) A-S-D-K (1 letter code name). Keep same order and use 19.1 figure!



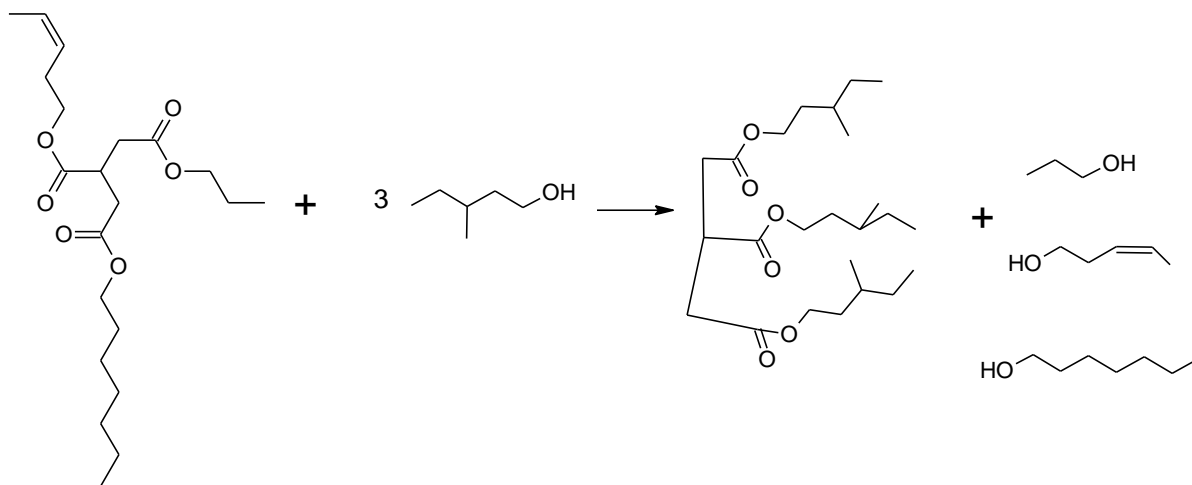
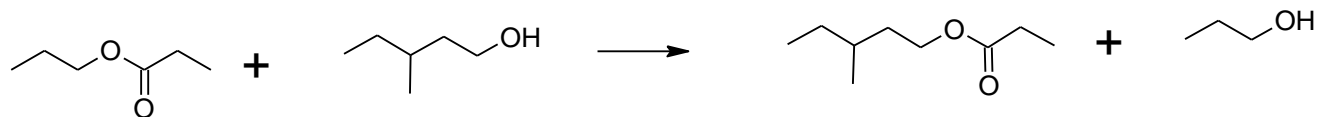
Draw all products from transesterification with 3-methyl-pentanol.



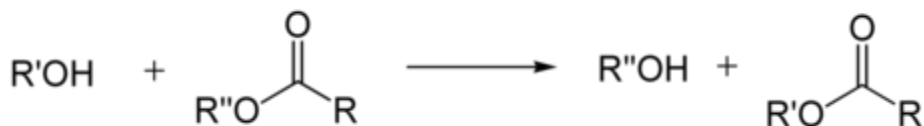
Starting material

3-methyl-pentanol

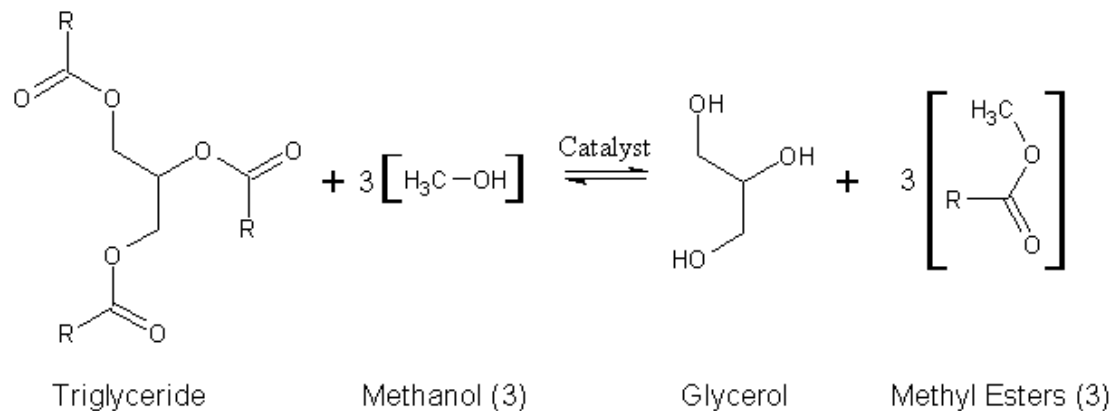
transesterification products



Examples of Transesterification (switch out the alcohol carbon chain!)



R' is different from R''. R = carbon chain



Be sure to know how to make amides! Know the notation for amides and amines. Know the structure for glycerol and triglycerides.