Learning objectives 9/19

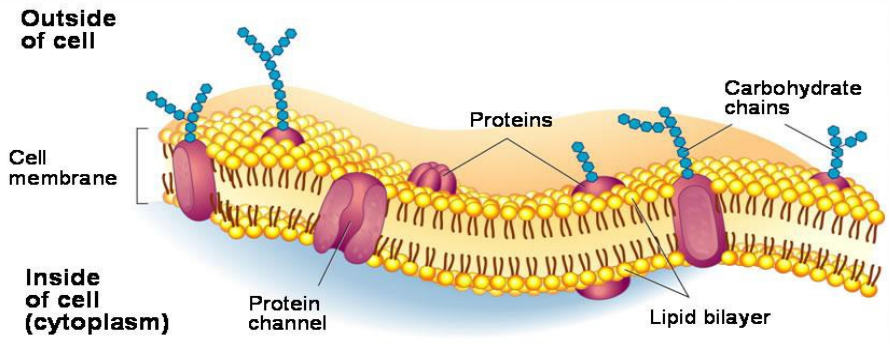
- I can name the elements that compose lipids
- I can explain the difference between saturated and unsaturated fats
- I can describe at least one of the functions of lipids

Class 2: Lipids

- The only class that **does not** form polymers
- Lipids are *hydrophobic* because they consist **mostly of carbon and hydrogen** (but also some oxygen and in occasionally nitrogen)
- Purpose: fuel storage, cell membranes, signaling

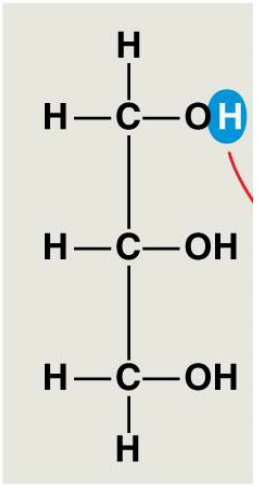
Examples of lipids

- The most biologically important lipids are **triglycerides (fats)**, **phospholipids,** and **steroids**
- Examples of Lipids: Oils, lard, butter, Vitamin D, Cholesterol

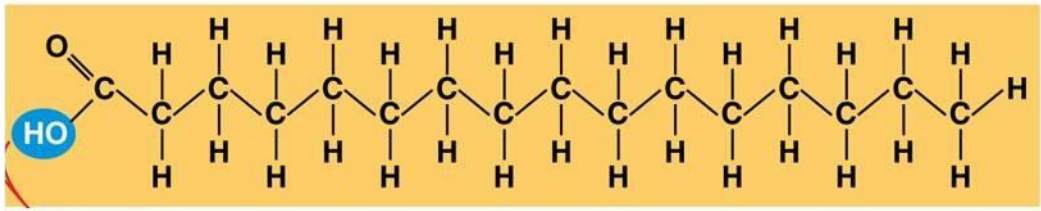


Triglycerides (Fats)

- Two components: glycerol and 3 fatty acids
- The major function of fats is energy storage



Glycerol



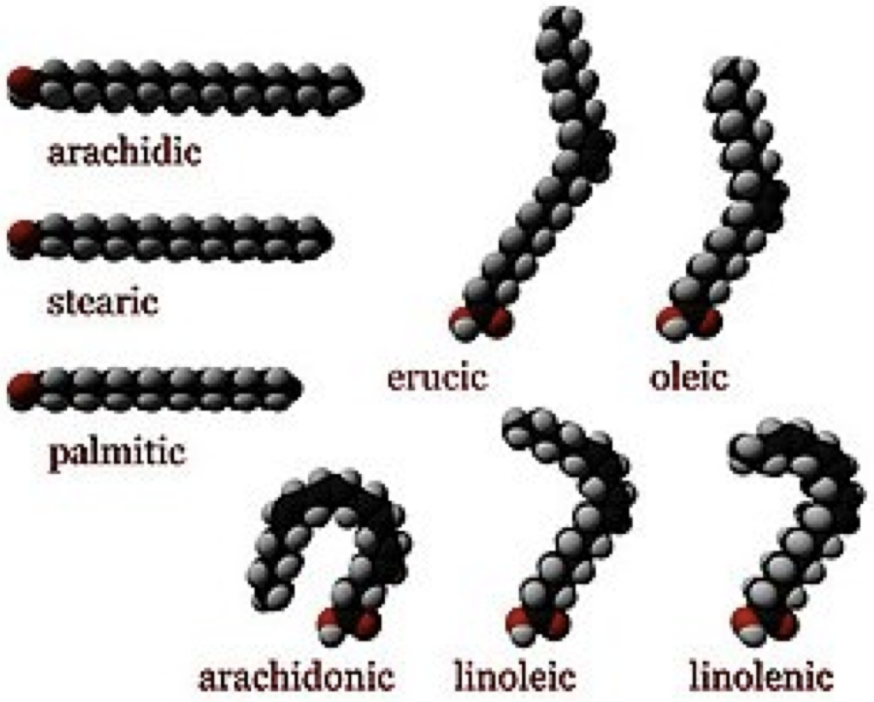
Fatty acid
(in this case, palmitic acid)

X3

Fatty Acids

- Fatty acids are an important component of Lipids

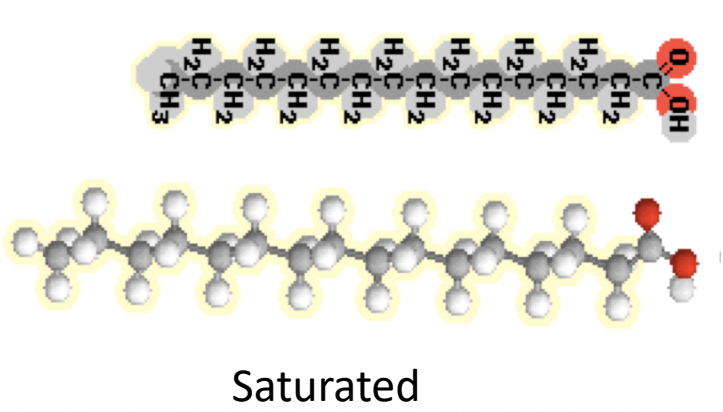
- Fatty acids vary in length (number of carbons) and in the number and locations of double bonds



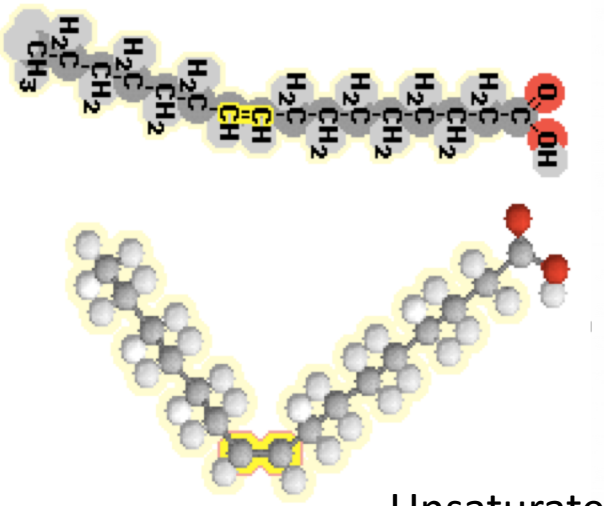
Fatty Acids

- **Saturated fatty acids** have the maximum number of hydrogen atoms possible and no double bonds
  - Each carbon ‘saturated’ with hydrogens

- **Unsaturated fatty acids** have one or more double bonds

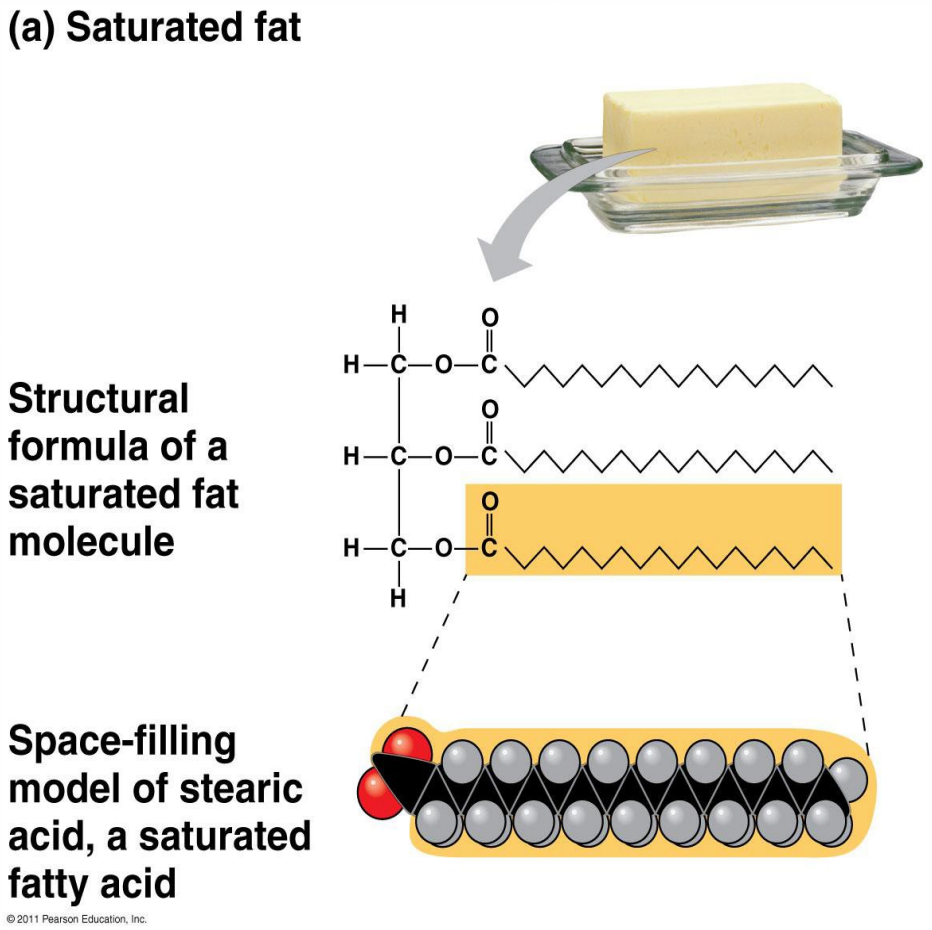


Saturated



Unsaturated

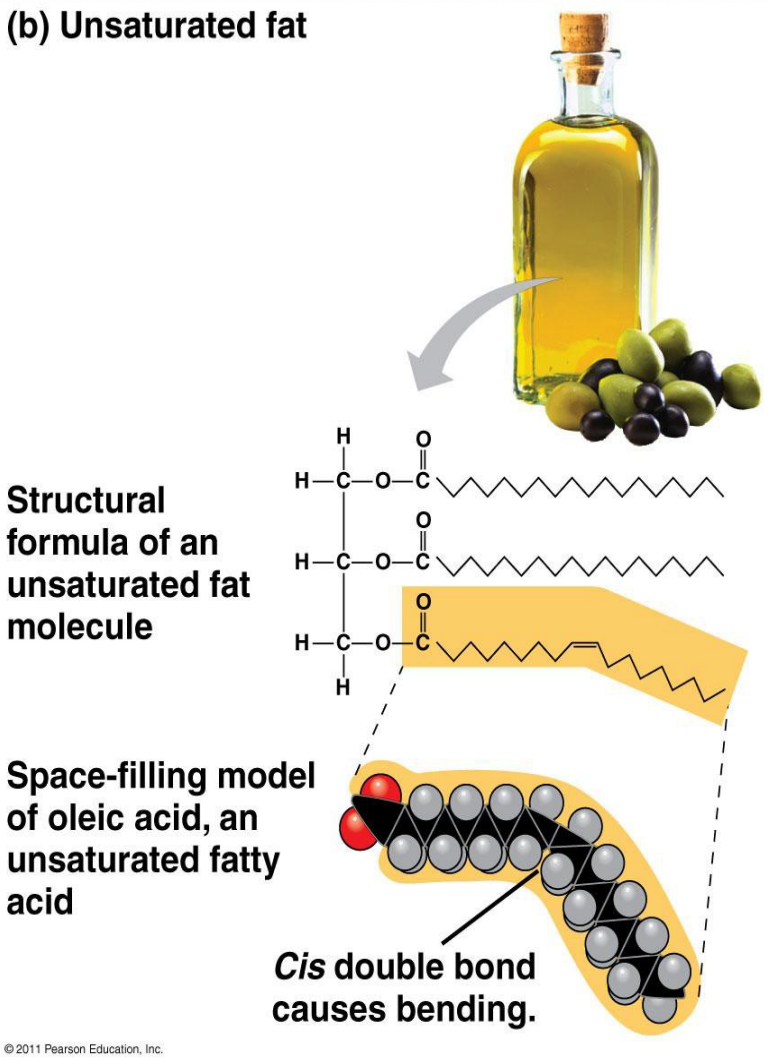
Saturated fats (triglycerides)



- The **straight** hydrocarbon chains "stack" very closely together
- Because they are so densely packed, saturated fats tend to be **solid** at room temp- butter, lard etc!

Unsaturated Fats (triglycerides)

- The double bond "**bends**" the fatty acid so it is no longer straight
- The molecules don't stack so easily and so are less densely packed.
- Unsaturated fats tend to be **liquid** at room temp- oils!



Which of the following statements about lipids is **FALSE**?

A) They include Oils and Fats
B) They are important signaling molecules
C) They form polymers
D) They are important for cell membranes

Why are saturated fats likely to be liquid at room temperature

A) They have no double bonds
B) They do not “stack” well
C) The molecules are bent
D) Saturated fats aren’t liquid at room temperature

What are the two components that make up a triglyceride?

A) Saturated fatty acids and lipids

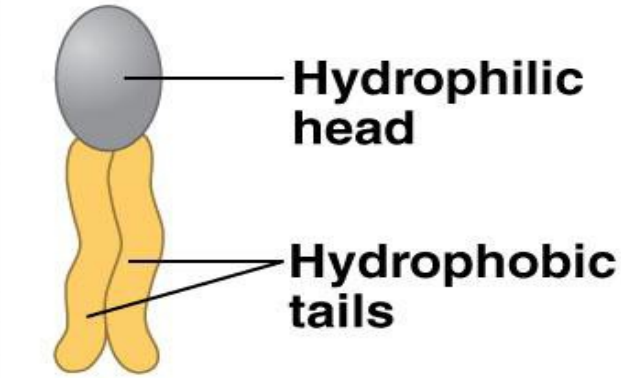
B) Glycerol and fatty acids

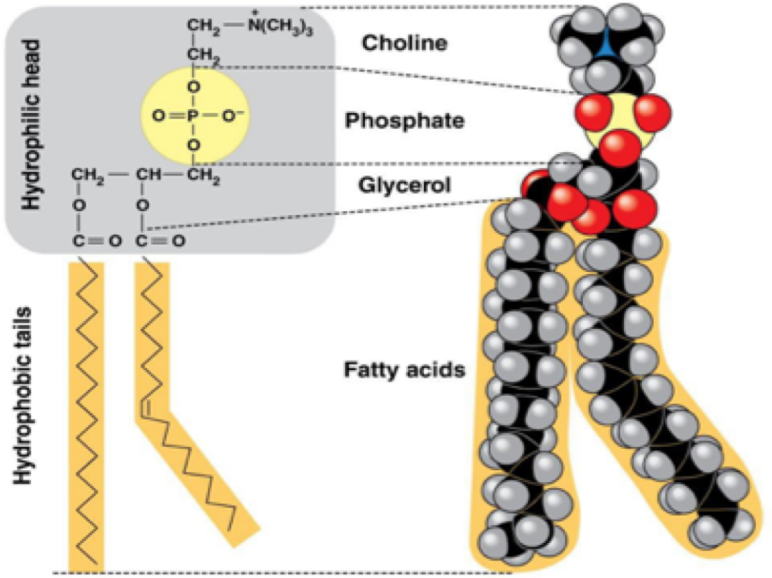
C) Phospholipids and Cholesterol

D) Cholesterol and fatty acids

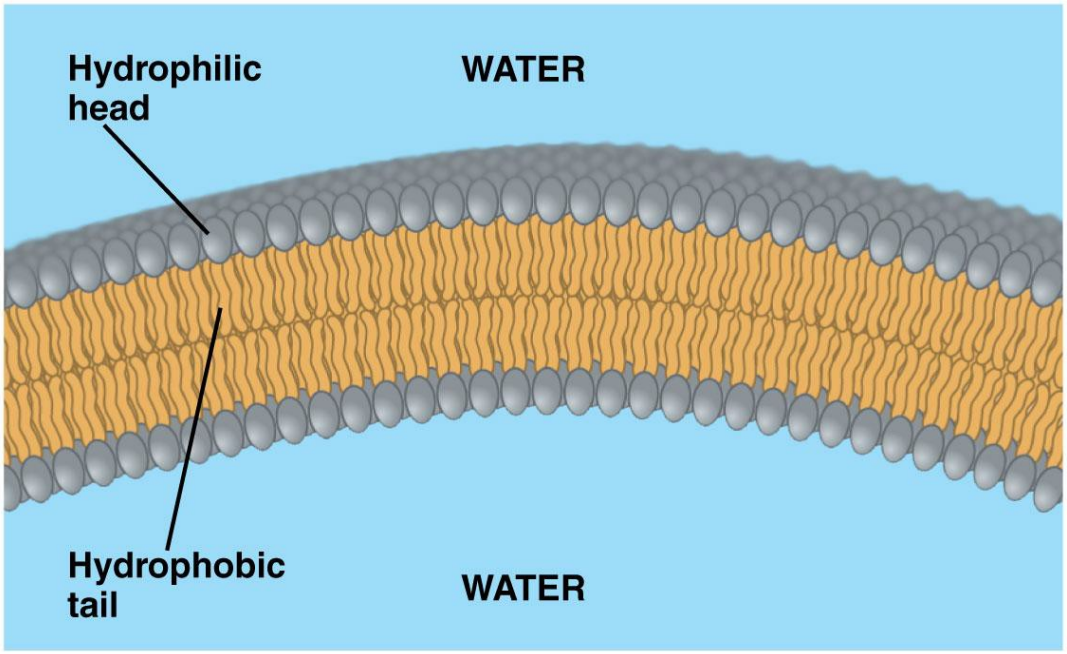
Phospholipids

- Phospholipids are the major component of all cell membranes
- Made of a head group and 2 fatty acids tails
- Head group hydrophilic and is composed of glycerol, a phosphate group, and choline





Phospholipids: the secrets of cell membranes

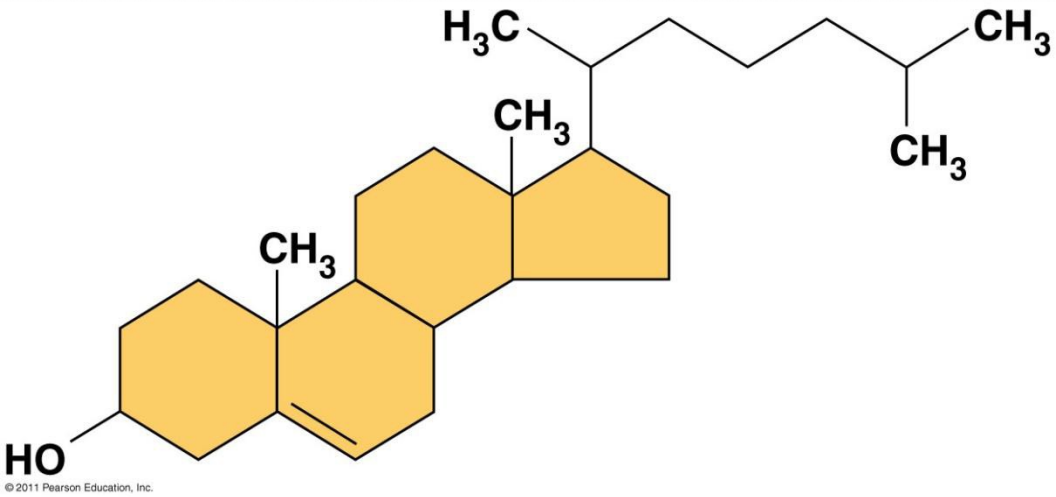


- When added to water, phospholipids self-assemble into a bilayer, with the hydrophobic tails pointing toward the interior

- The structure of phospholipids results in a bilayer arrangement found in cell membranes

Steroids

- **Steroids** are lipids characterized by a carbon skeleton consisting of four fused rings
- **Cholesterol**, an important steroid, is a component in animal cell membranes



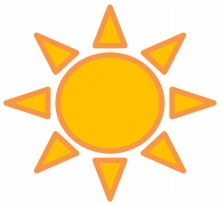
Cholesterol: not such a bad guy?

- Too much cholesterol can damage cell walls and cause atherosclerosis
- However cholesterol is an **important precursors** to various human hormones

Steroids

- Steroids are important signaling molecules within the body- examples: testosterone, progesterone

- Vitamin D is a steroid that has a significant role in calcium absorption, homeostasis, and metabolism



- They also have medical uses :

Corticosteroids: used to treat a huge array of diseases and symptoms

Anabolic steroids: mimic the effect of testosterone

Describe/draw the structure and function of the three main types of lipids

	Fats	Phospholipids	Steroids
Structure			
Function			

Triglycerides(fats) and phospholipids have what in common?

A) They both have glycerol as at least part of their heads group

B) They both have 3 fatty acid tails

C) They both have choline head groups

D) Both A and B

Which part of a phospholipid is hydrophilic (water loving)?

A) The fatty acid tails

B) The head group

C) Neither part

D) Both parts

Model

9 point assignment grade

Build a small model of each of the three types of lipids

Fatty acids should be consistent in all models

Each model should be no larger than 4” in any direction

Card Sort

5 point participation grade

Sort picture cards first according to the class of biological molecule

Then match each function with a corresponding molecule and place it next to that molecule

Show me both for grades!