Lipids

- Lipids are nonpolar biological molecules
  - Because they are nonpolar, they are water-insoluble

Fatty Acid

Fatty acids consist of long carbon chains ending in carboxylic acids.

- Fatty acids can be saturated
  - That is, it is completely saturated with hydrogen
- Or they can be unsaturated
  - In which C=C bonds deprive the molecule of 2 or more hydrogens

Lipids are Water-Insoluble

Fatty Acid
Formation of Triglycerides

In (a) the glycerol molecule loses 3 hydrogens while each fatty acid loses a hydroxyl. Three bonds form, creating (b) a triglyceride. The displaced hydrogens and hydroxyls form water.

- The reverse reaction (hydrolysis) is used to break apart the fatty acids for use.

Phospholipids

- Phospholipids are like triglycerides, except that one fatty acid is replaced with a phosphate group. The polar phosphate group will point the opposite direction of the fatty acids.

- Their amphipathic nature makes phospholipids useful in constructing the cell membrane.

Glycolipids

- Glycolipids are like phospholipids, except that the phosphate group is replaced by a carbohydrate.

Steroids

- Steroids are lipids containing a distinctive 4-ring structure:
- It’s a good idea to know that cholesterol and vitamin D are two examples of steroids.
- A typical exam question might ask you to recognize that cholesterol and vitamin D are both steroids, then infer that cholesterol is a precursor to vitamin D.

- Lipid formations with a hydrophilic exterior and a hydrophobic interior.

Cholesterol and Vitamin D

Cholesterol and vitamin D are both steroids. More specifically, vitamin D₂ is a secosteroid because one of its rings is broken. Cholesterol is a precursor to vitamin D.

Terpenes

- Terpenes are another type of lipid.
- They consist of repeating isoprene units.

Vitamin A

Vitamin A is a terpene. Two isoprene units are highlighted in orange and green.

- In chemistry we learned about micelles.
- Lipid formations with a hydrophilic exterior and a hydrophobic interior.
- The hydrophobic core of this micelle allows it to dissolve nonpolar dirt, while its hydrophilic exterior allows it to be carried through polar solvents (like water).
- Since lipids are nonpolar, they need a way of being transported through the polar (aqueous) environments of the body.
- Lipoproteins work just like micelles:
  - They dissolve lipids in their hydrophobic core.
  - Then, their hydrophilic exterior allows them to carry the lipids in polar environments.