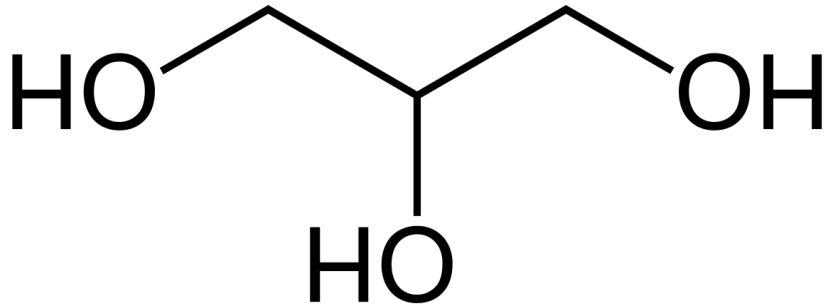
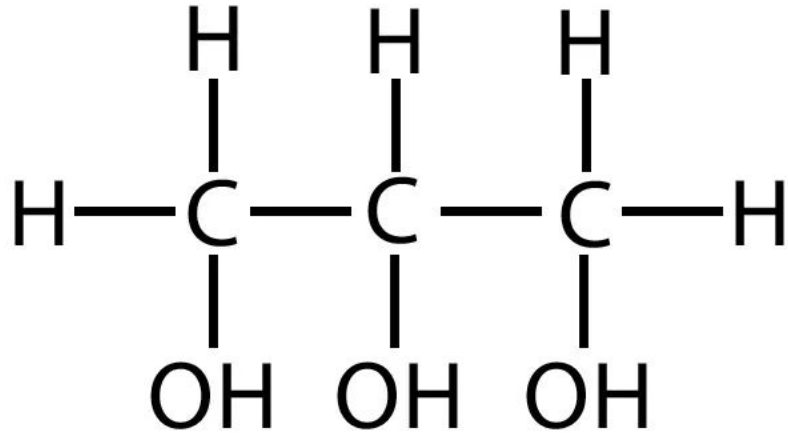


# Lipids



## Glycerol

What are glycerol's physical properties?



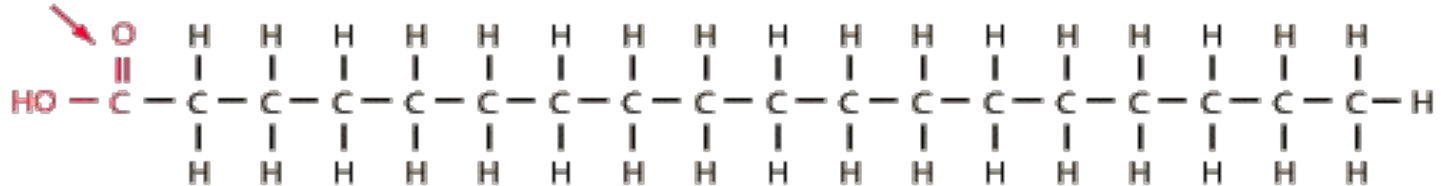
Uses:

- Food Industry
- Medical, Pharmaceutical & Personal Care Applications
- Botanical Extracts
- E-Cigarette liquid
- Antifreeze

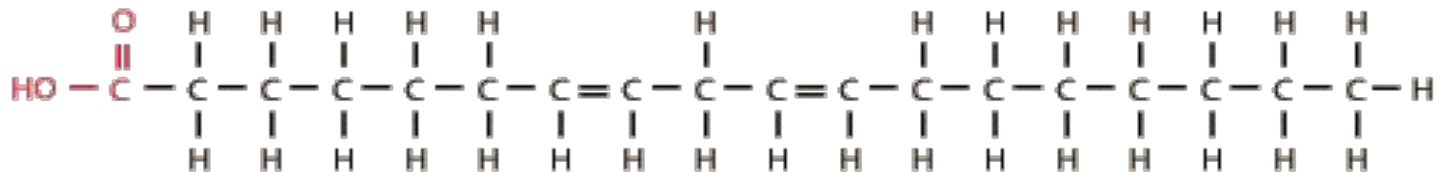
# Fatty Acid

A **fatty acid** is a carboxylic acid with a long aliphatic chain, which is either saturated or unsaturated

Carboxylic acid  
group

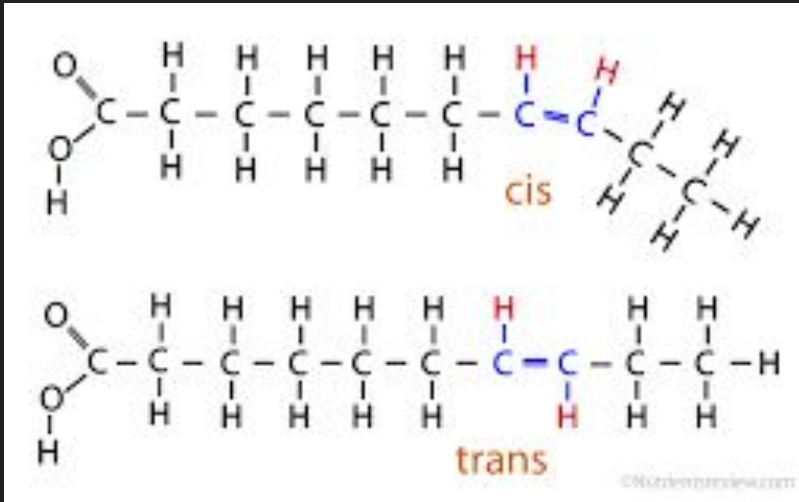


Stearic acid, an example of a saturated fatty acid



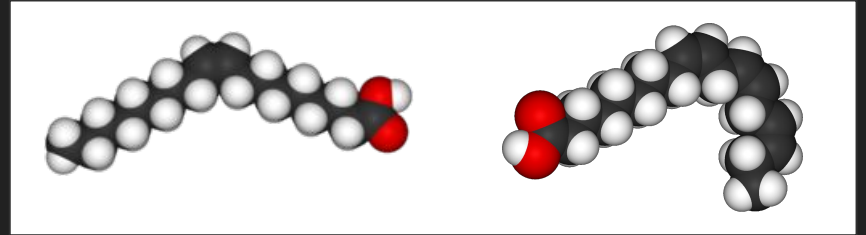
Linoleic acid, an example of an unsaturated fatty acid

## Cis vs. Trans Unsaturated Fatty Acids



The rigidity of the double bond freezes its conformation and, in the case of the *cis* isomer, causes the chain to bend and restricts the conformational freedom of the fatty acid. The more double bonds the chain has in the *cis* configuration, the less flexibility it has.

When a chain has many *cis* bonds, it becomes quite curved in its most accessible conformations. For example, oleic acid, with one double bond, has a "kink" in it, whereas  $\alpha$ -Linolenic acid, with three double bonds, favors a hooked shape

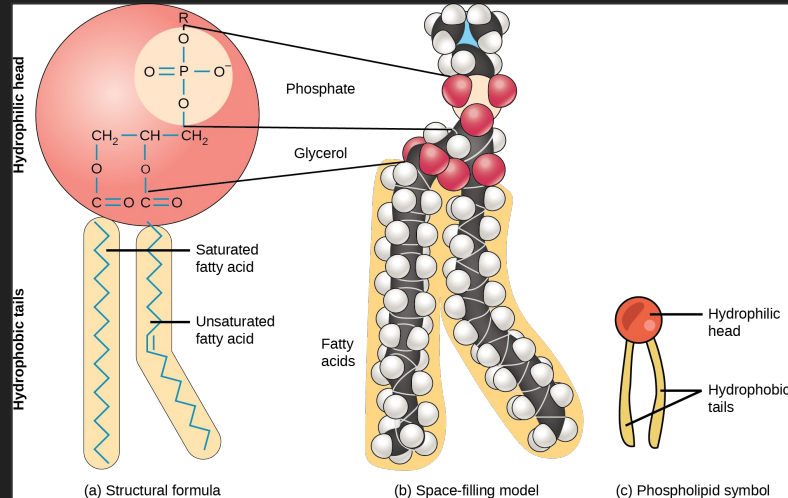


The effect of this is that, in restricted environments, such as when fatty acids are part of a phospholipid in a lipid bilayer or triglycerides in lipid droplets, *cis* bonds limit the ability of fatty acids to be closely packed, and therefore can affect the melting temperature of the membrane or of the fat. *Cis* unsaturated fatty acids, however, increase cellular [membrane fluidity](#), whereas *trans* unsaturated fatty acids do not

# Phospholipids

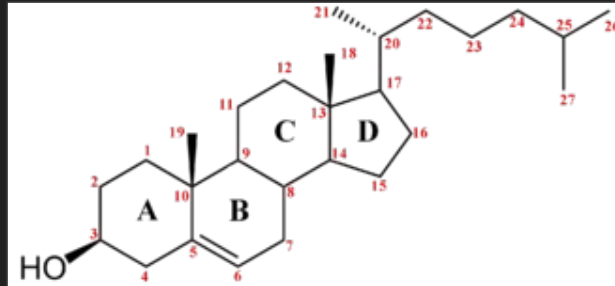
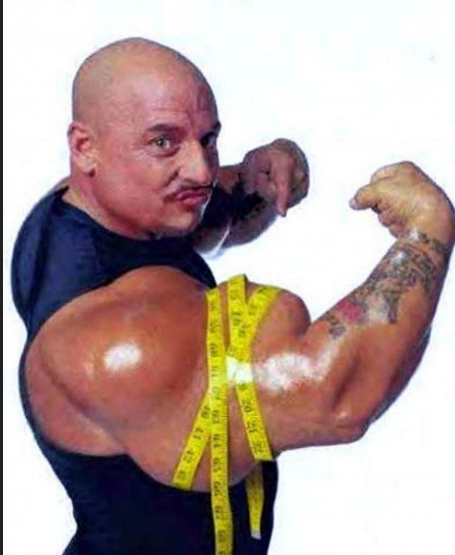
**Phospholipids** are a class of lipids whose molecule has a hydrophilic "head" containing a phosphate group, and two hydrophobic "tails" derived from fatty acids, joined by a glycerol molecule.

An **amphiphile** (a.k.a. amphipath; from the Greek *amphis*: both and *philia*: love, friendship) is a chemical compound possessing both hydrophilic (*water-loving*, polar) and lipophilic (*fat-loving*) properties.

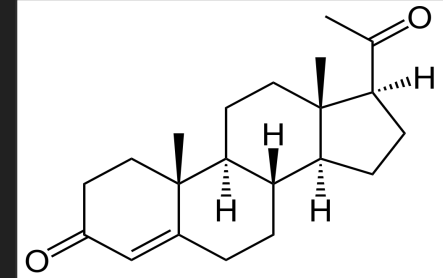


# Steroids

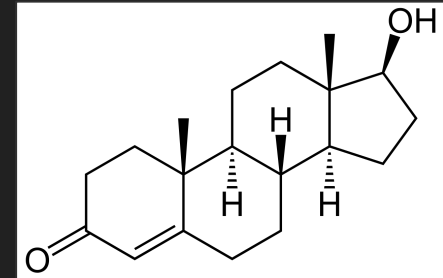
A **steroid** is a biologically active organic compound with four rings arranged in a specific molecular configuration. Steroids have two principal biological functions: as important components of cell membranes which alter membrane fluidity; and as signaling molecules. They are considered lipids because they are hydrophobic



Cholesterol



Progesterone



Testosterone