Lipids

-macromolecule which is not polymer

-consisted of C,H,O

-hydrophobic molecule

-some lipids are amphipathic = having both polar and nonpolar region in the same molecule

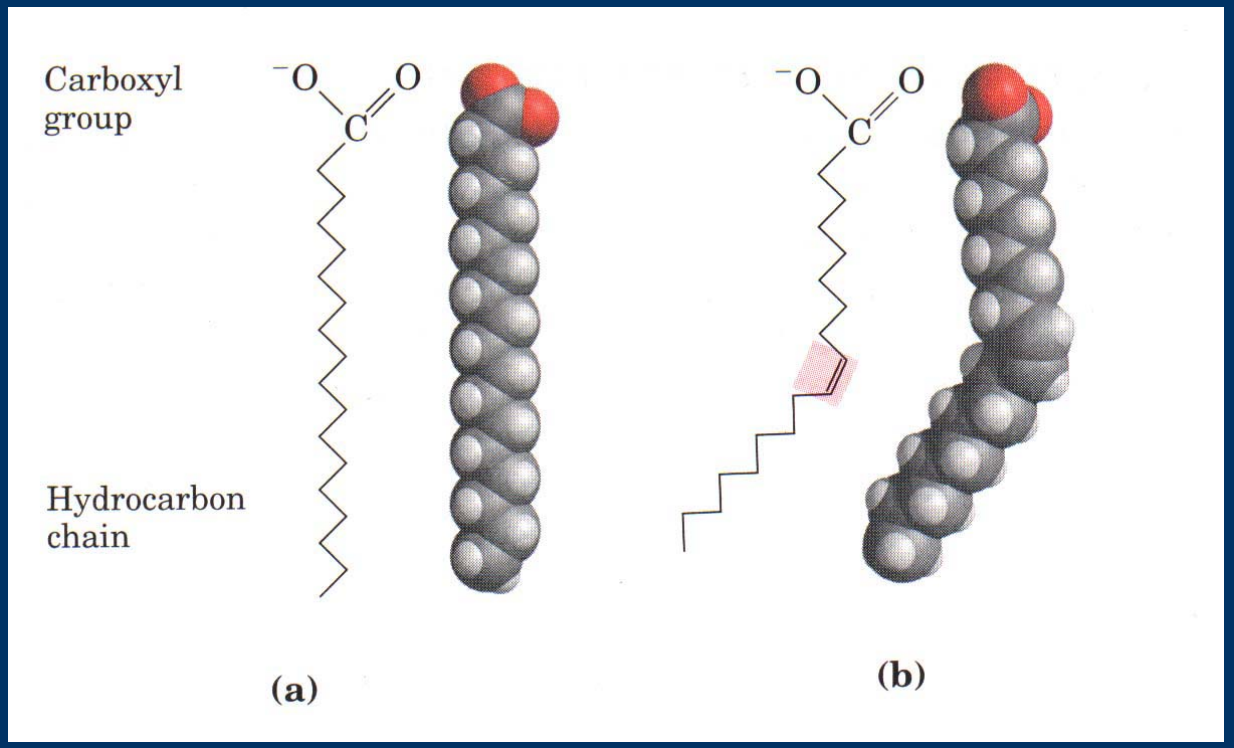
-fatty acids, triacylglycerols (triglycerides or fats) , phospholipids and steroids

(lipids also include wax)

Fatty acids

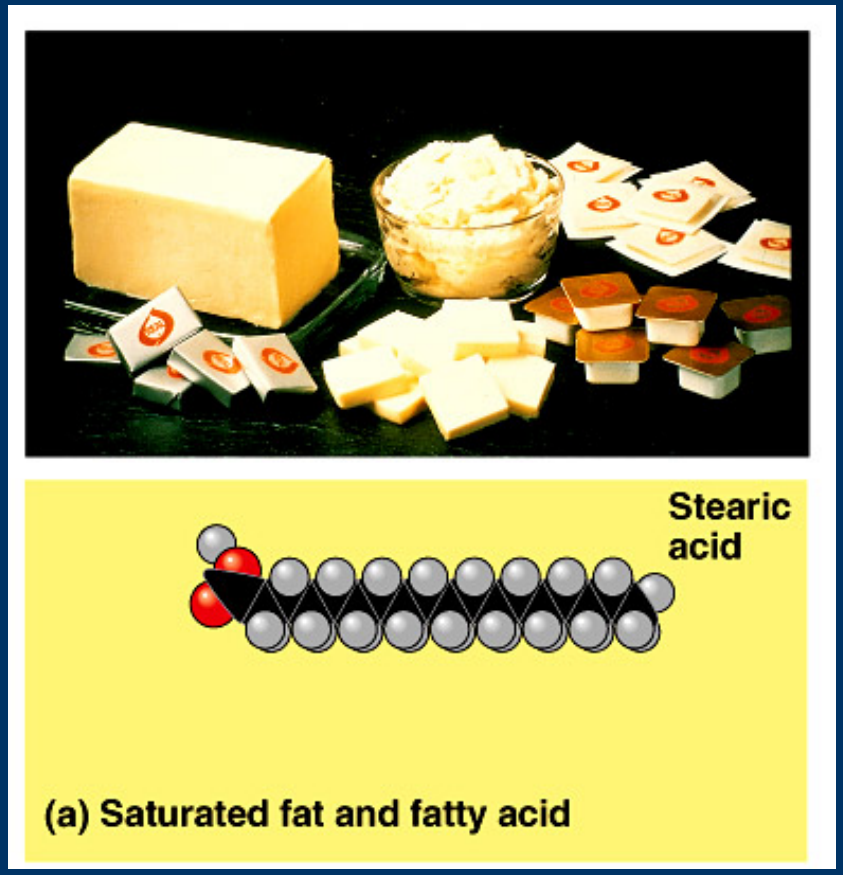
=carboxylic acids with hydrocarbon chains of 4-36 carbons

- the carbon chain can be fully saturated (no double bonds)

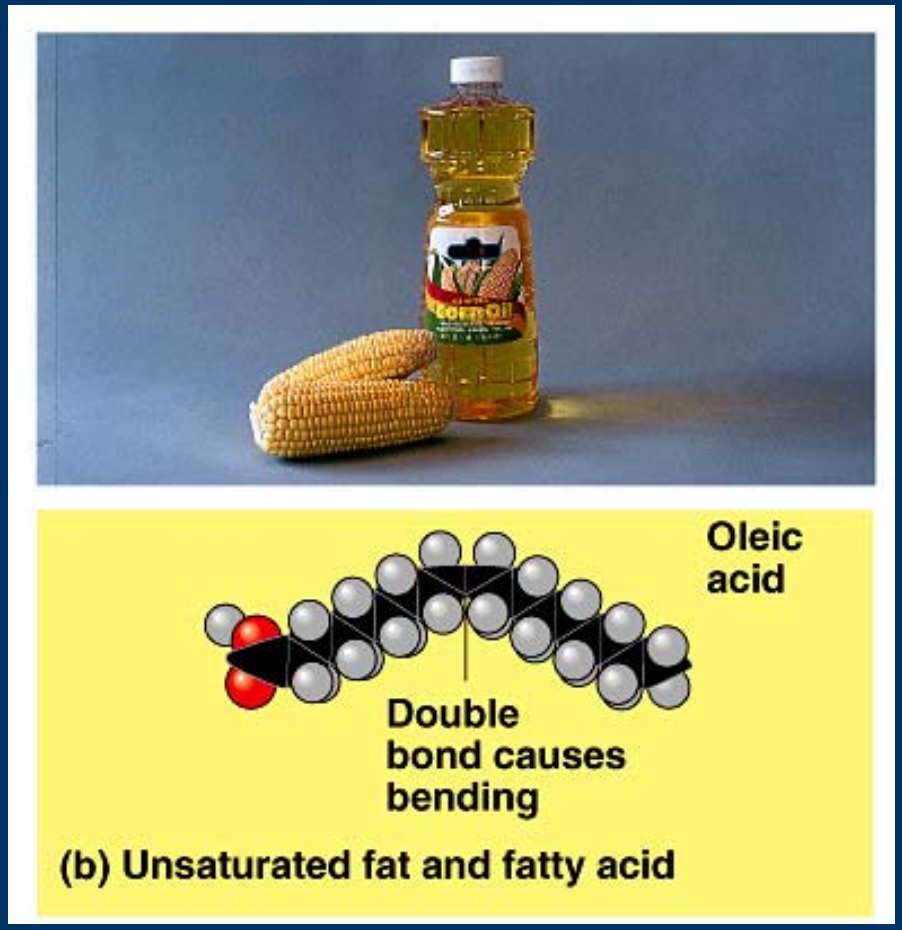


or contain 1 or more double bonds (unsaturated)

-an amphipathic molecule: carboxylic polar "head" and hydrocarbon nonpolar "tail"



Saturated fatty acid (animal) = without double bond, long straight chain, orderly packed, high melting temperature

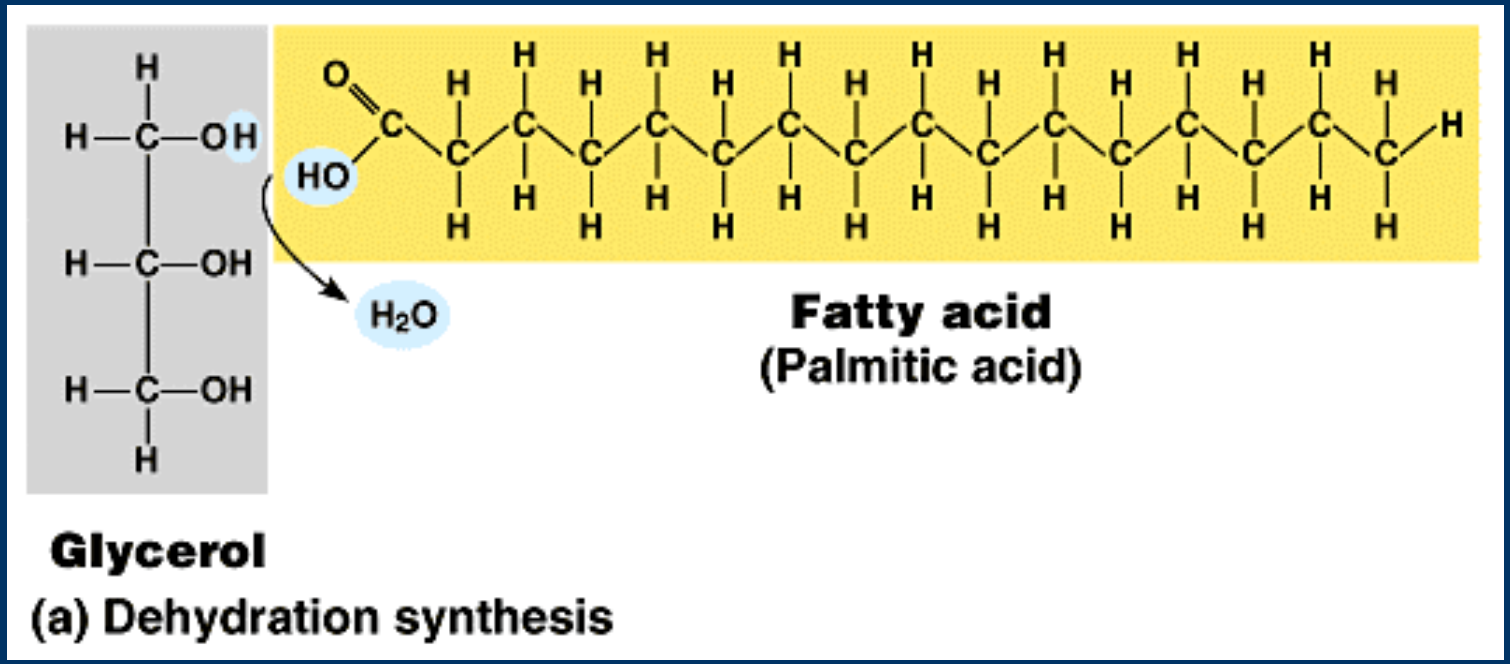


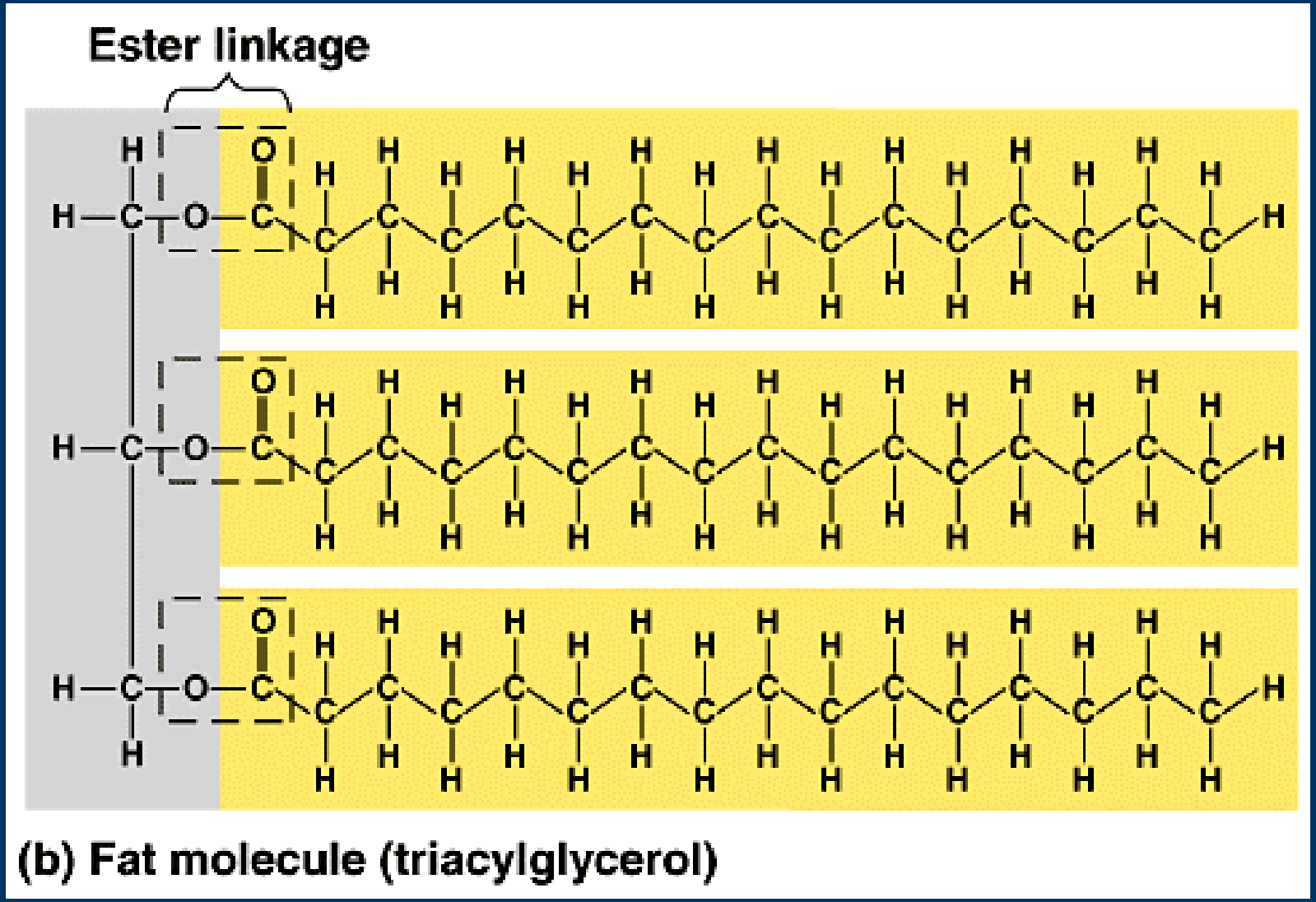
Unsaturated fatty acid (vegetable oil) = contain double bond(s), bend or kink in the molecule, not orderly packed, lower melting temperature

Triglycerides or neutral fats

-storage lipid

-glycerol and 1-3 fatty acids linked together (by ester bond) to form monoacylglycerol, diacylglycerol and triacylglycerol

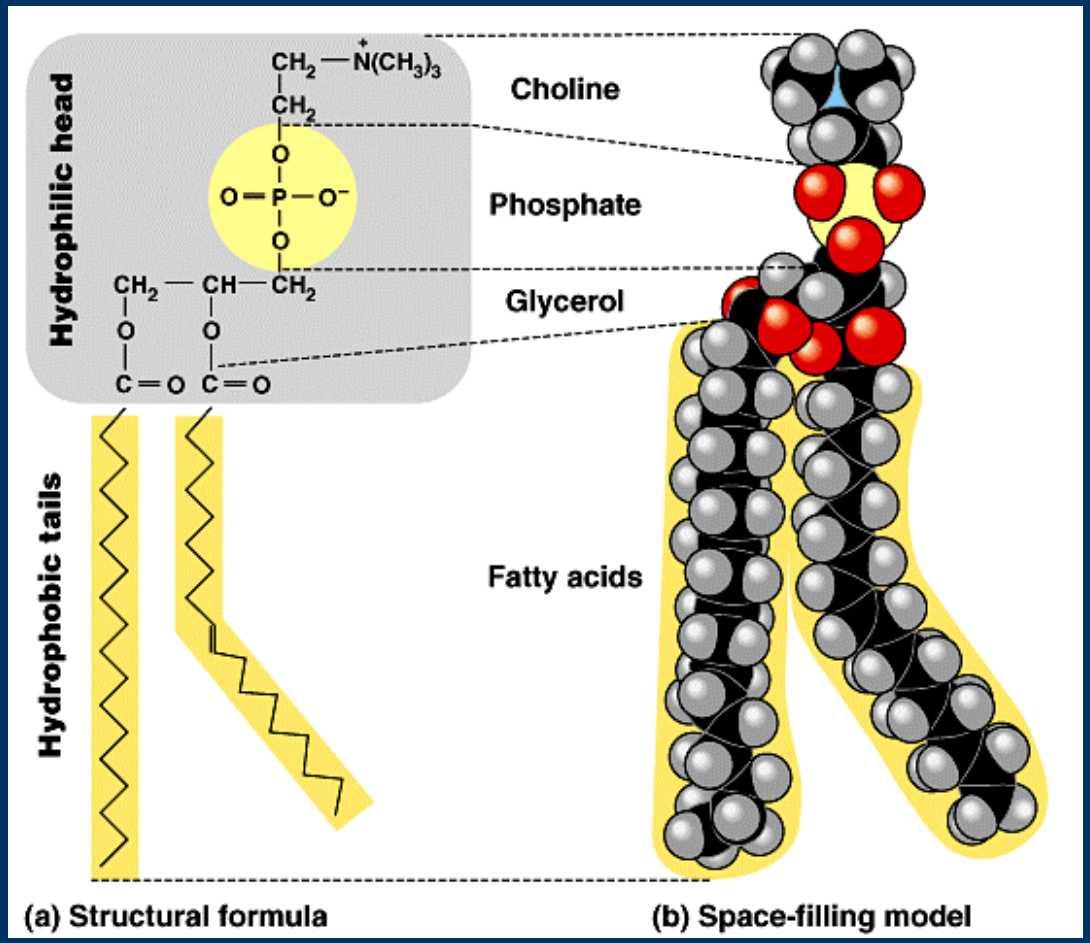




1 molecule of water is lost for each ester linkage

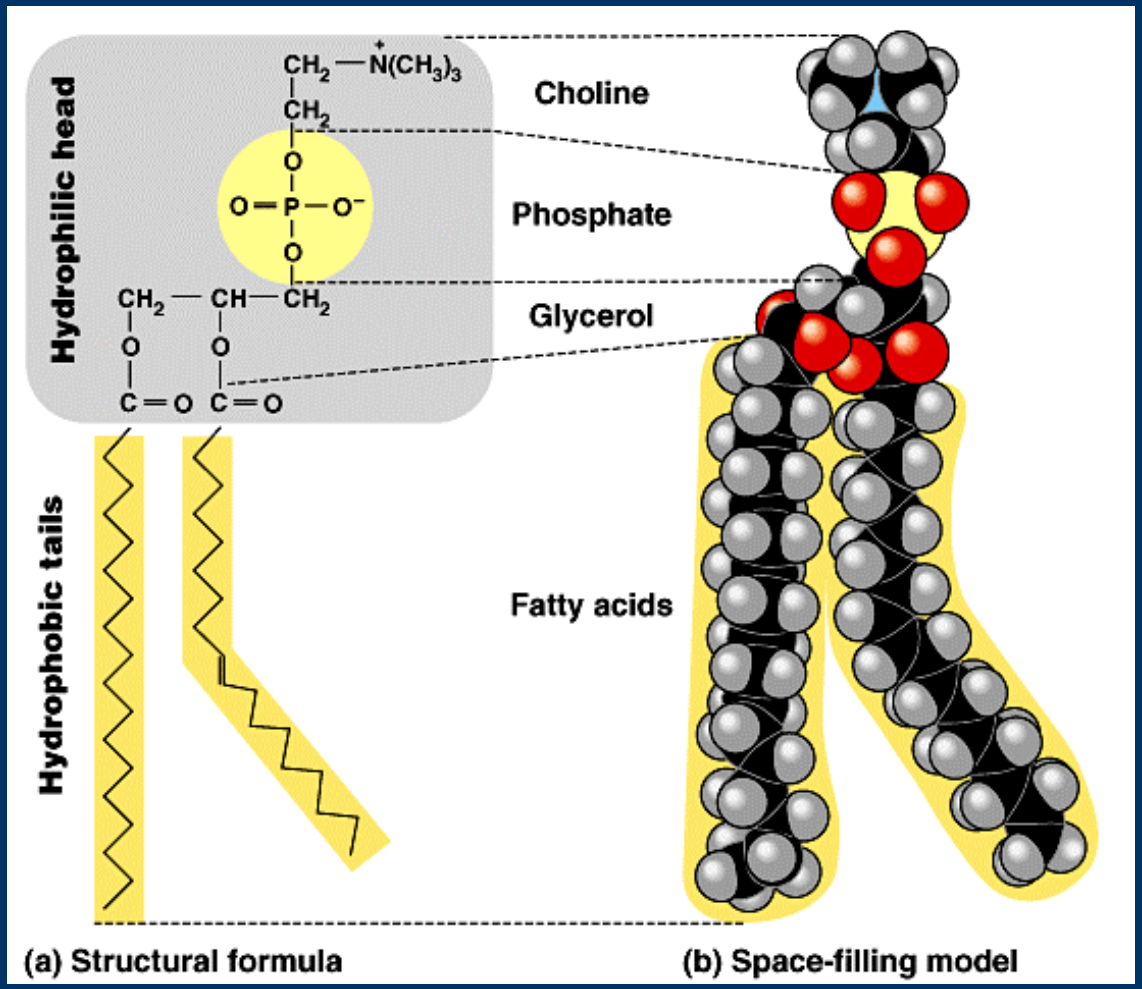
Phospholipids

-major component of cell membrane



-glycerol molecule esterified by 2 fatty acids

-the 3rd hydroxyl group is occupied by a phosphate group



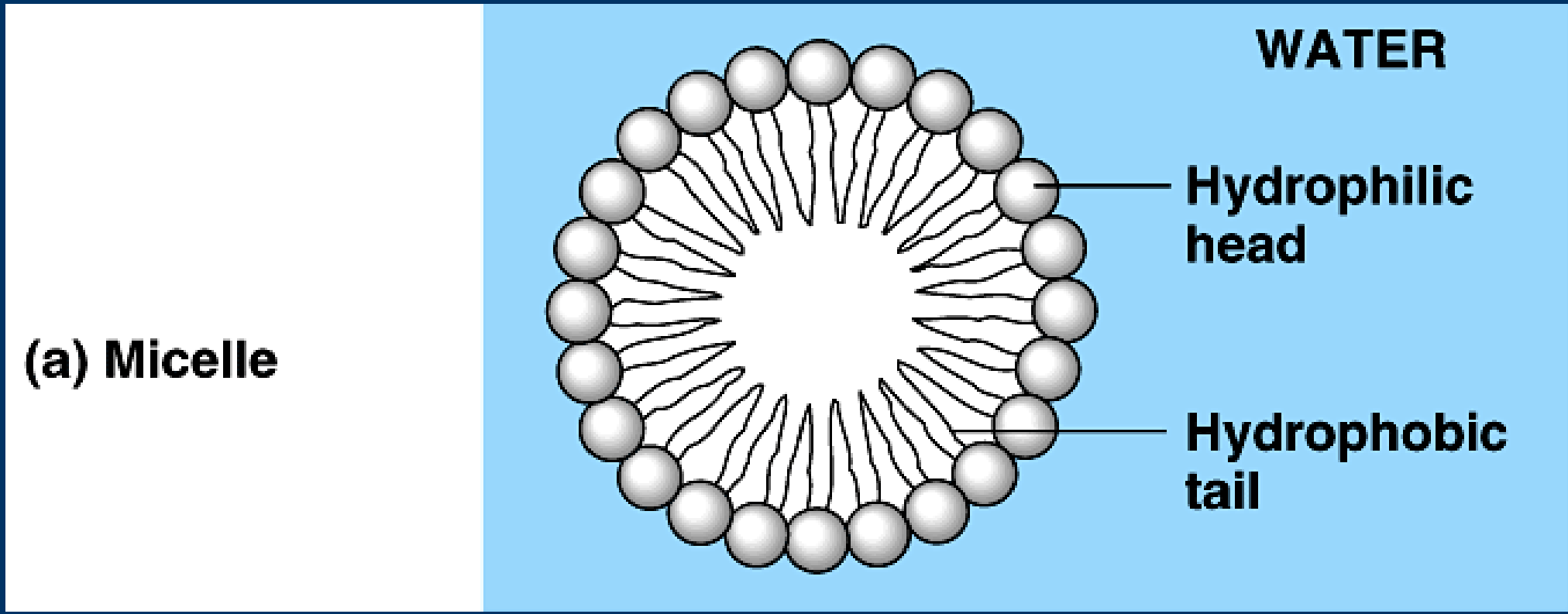
-amphipathic molecule

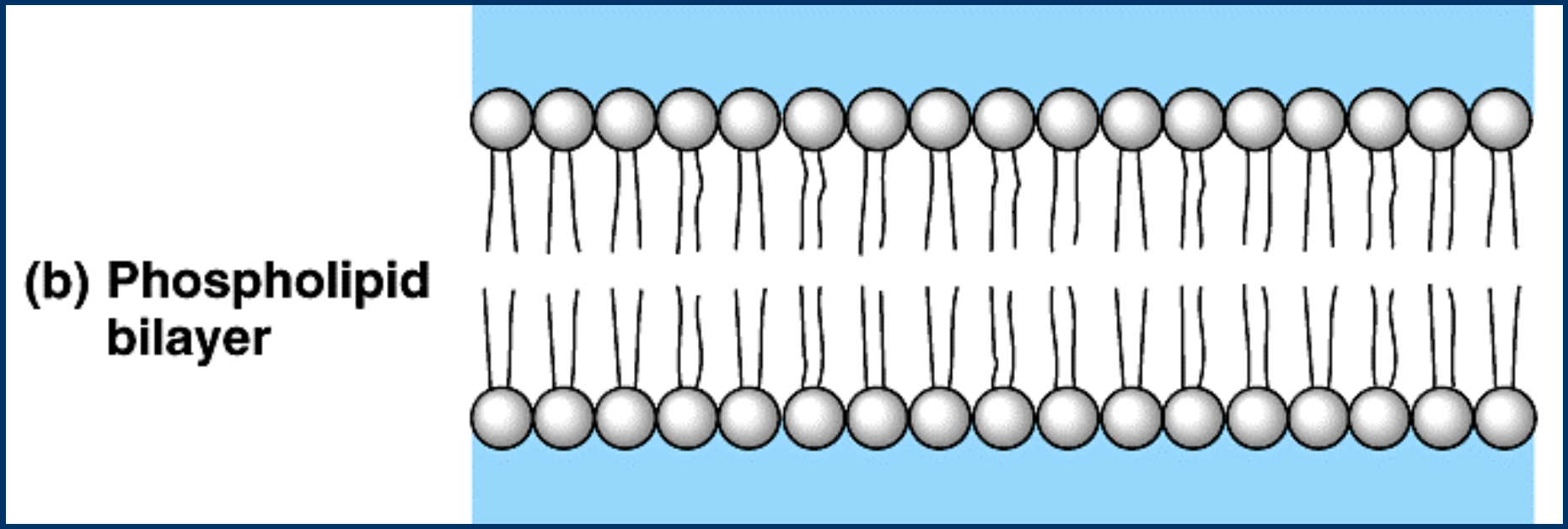
-length and degree of unsaturated fatty acid affect membrane fluidity

Self-Assembly of Phospholipids in Aqueous Environment: a micelle

-the phosphate heads are exposed to water.

-the hydrocarbon tails are restricted to the water-free interior of the micelle.





At the surface of the cell, phospholipids are arranged in a bilayer:

-the hydrophillic heads are on the outside of the bilayer, in contact with the aqueous solution inside and outside of the cells

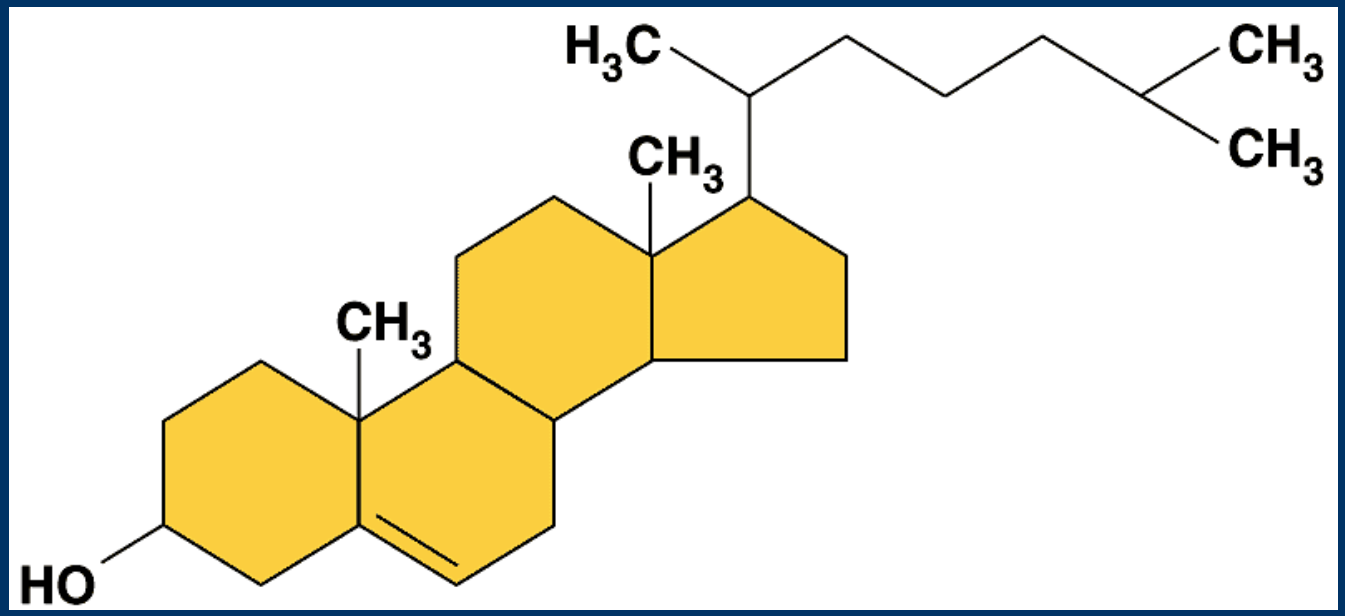
-the hydrophobic tails point toward the interior of the membrane

Sterols

-hydrocarbon compound without fatty acids or glycerol

-contain steroid nucleus: 4 fused rings, three with 6 carbons and one with 5 carbons

Cholesterol



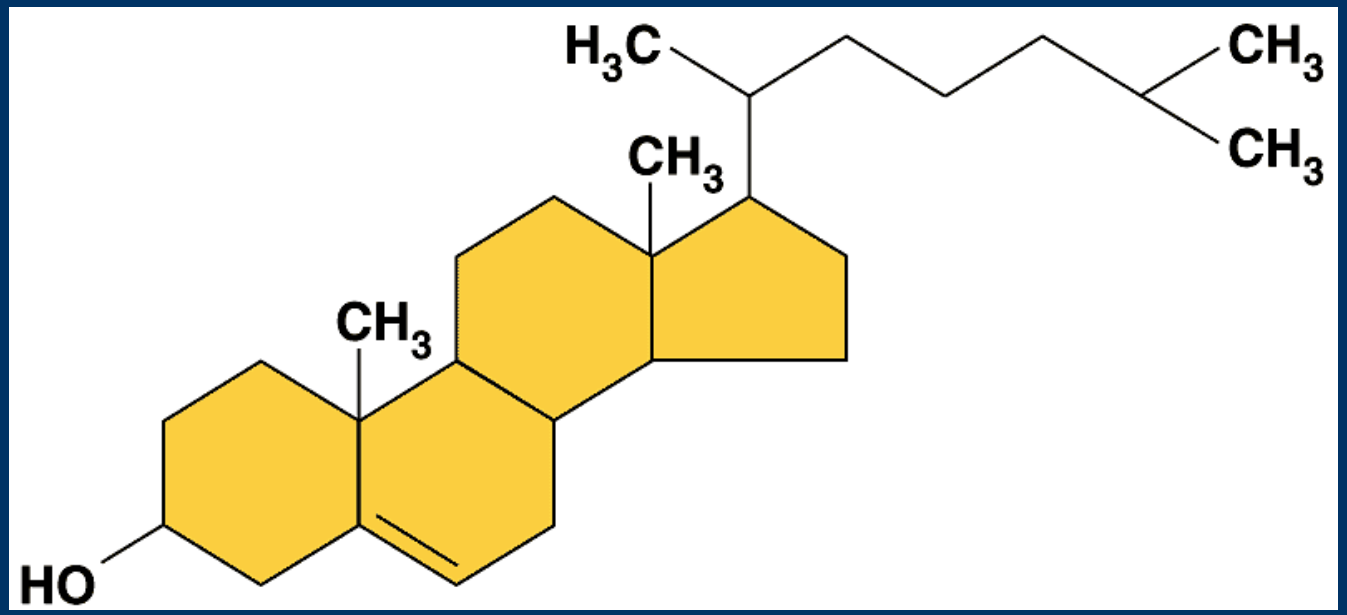
Cholesterol

-major sterol in animal tissues

-amphipathic molecule

(polar -OH head, nonpolar alkyl side chain)

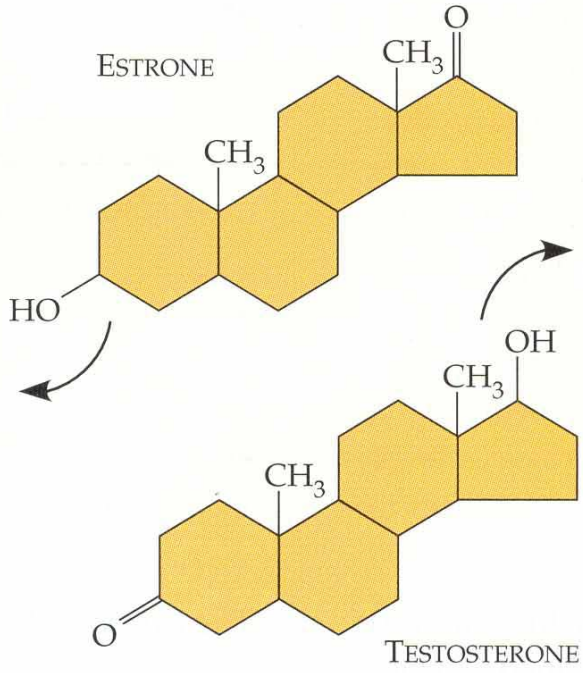
-other steroids including sex hormones are synthesized from cholesterol



Steroid hormone

-biological signals

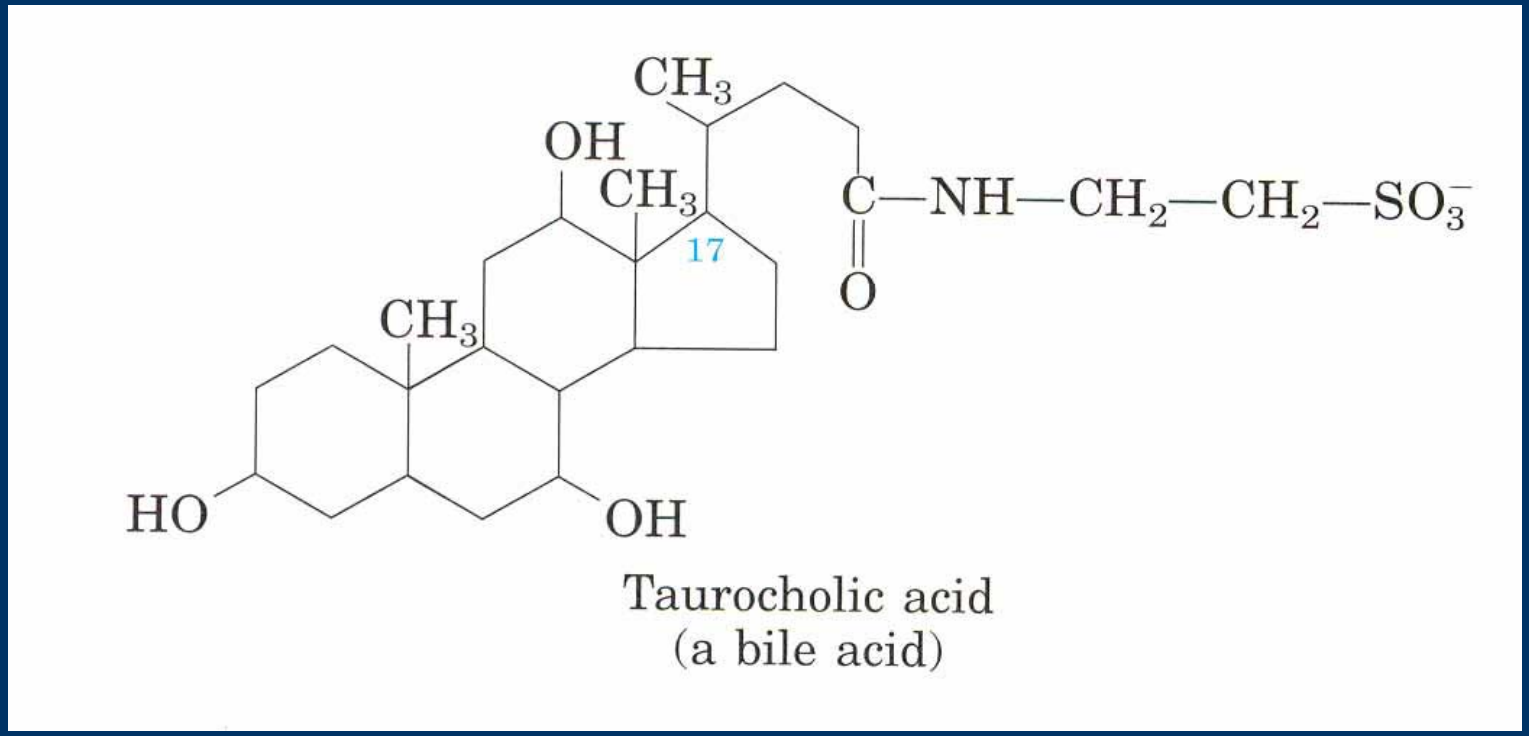
-regulate gene expression



Bile acid

-polar derivative of cholesterol

-act as detergent



Taurocholic acid
(a bile acid)