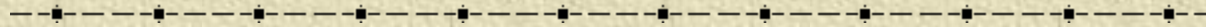
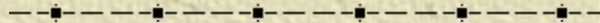




Macromolecules – Lipids



Chapter 5



Lipids

✦ NOT polymers

✦ Include:

- ◆ Fats

- ◆ Phospholipids

- ◆ Steroids

- ◆ Waxes

- ◆ Pigments

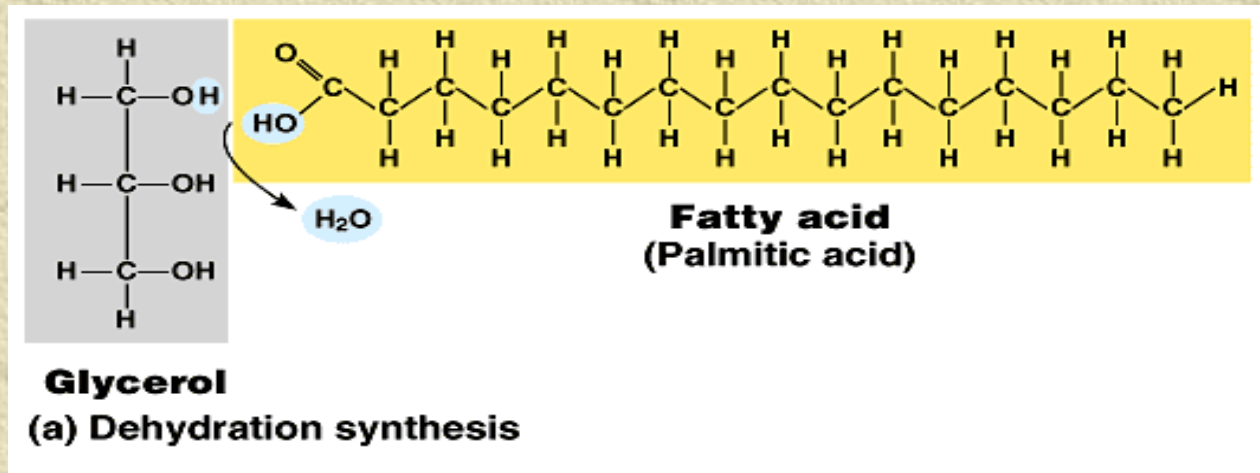
✦ HYDROPHOBIC – due to molecular structure

✦ Composed of H, C, & O – but mostly hydrocarbons

FATS

✦ Glycerol + fatty acid

- ✦ Glycerol = 3C alcohol + 3 (-OH) groups
- ✦ Fatty acid = long chain of H & C (hydrocarbons) with a carboxyl group -COOH

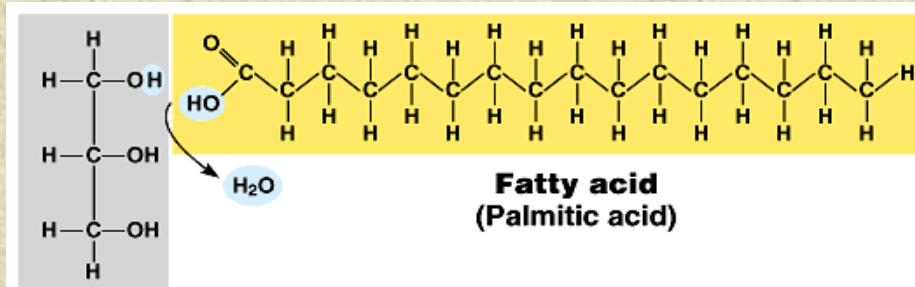


Triacylglycerol

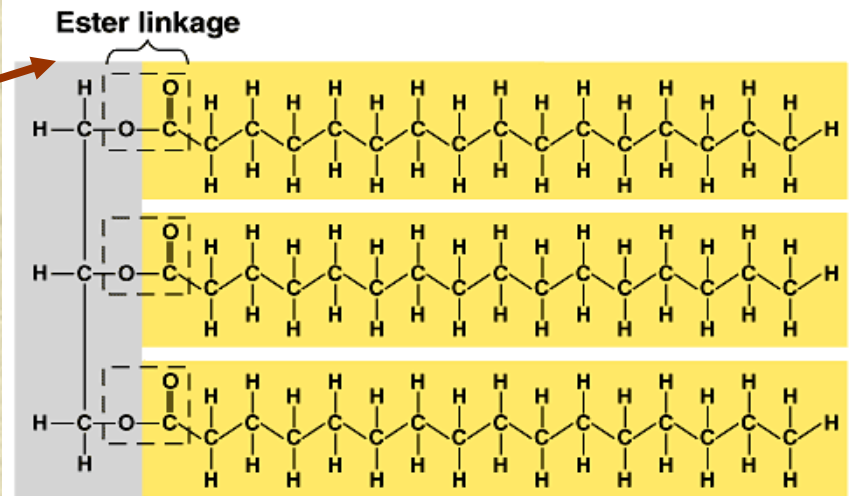
✦ 3 fatty acids + glycerol
→ triacylglycerol

✦ Fatty acids are joined via the (-OH) and (-COOH) through dehydration synthesis = ester linkage

✦ One H₂O molecule is removed for every fatty acid added.



Glycerol
(a) Dehydration synthesis



(b) Fat molecule (triacylglycerol)

Fats - General

✦ Long hydrocarbon (HC) chain:

- ◆ Hydrophobic or Hydrophilic ?
- ◆ Polar or Nonpolar ?

✦ Functions:

- ◆ Energy Storage → 2x the amount available vs. carbs
- ◆ Cushion organs
- ◆ Insulates body

Fat Types

✦ Based on HC tail

✦ **Saturated Fats:**

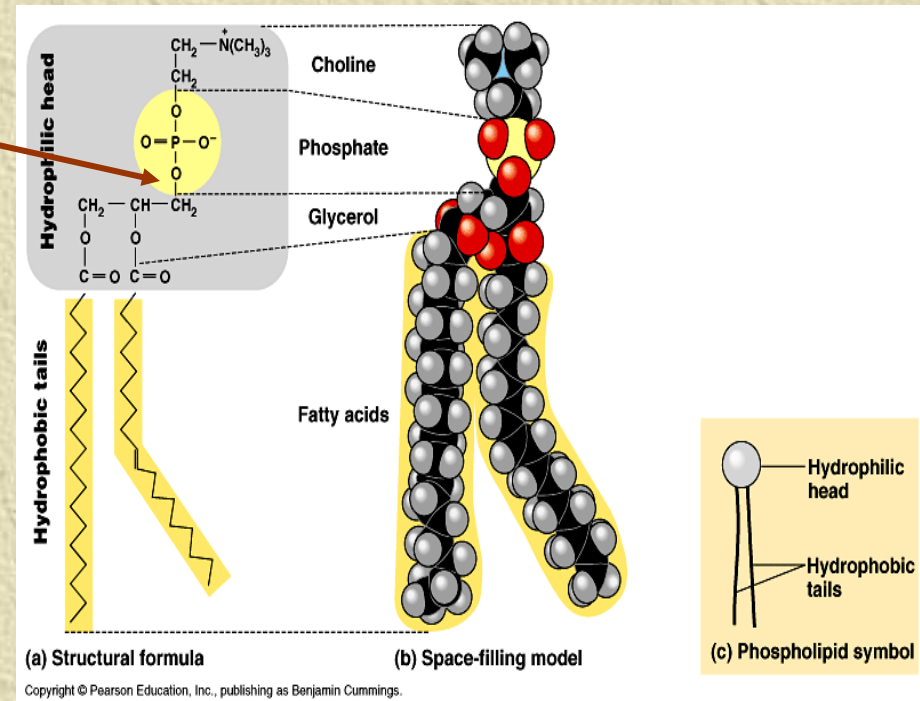
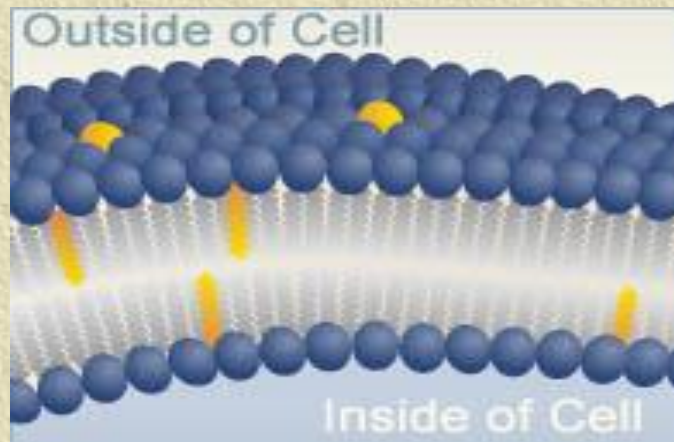
- ✦ All single bonds between C atoms
- ✦ Solid at room temp
- ✦ Most animal fats – lard, butter, etc.
- ✦ Contribute to cardiovascular disease (atherosclerosis – plaques in blood vessel walls)

✦ **Unsaturated Fats:**

- ✦ Has 1 or > double bonds between C atoms – results in a kink in the HC chain
- ✦ Usually liquid at room temp
- ✦ Fats of plants and fish – olive oil, cod oil,
- ✦ Kinks prevent fats from packing close together

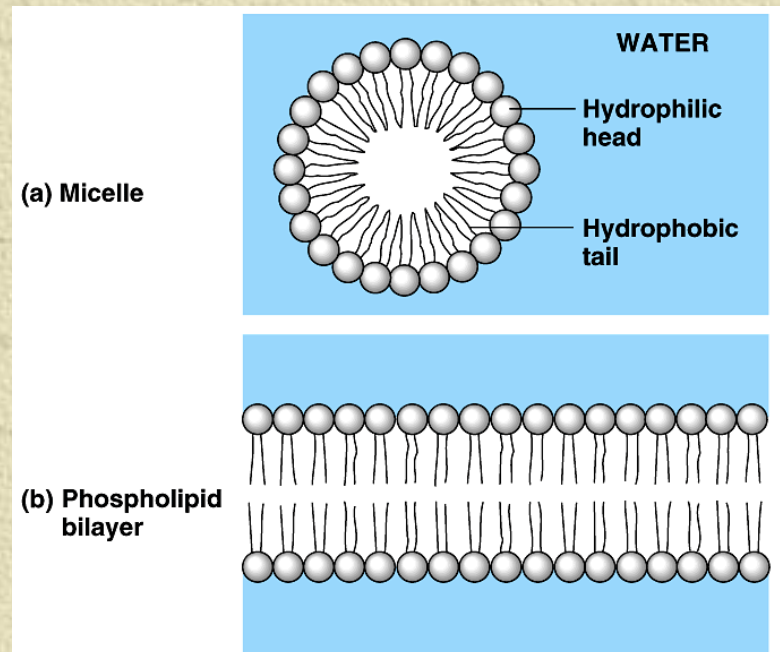
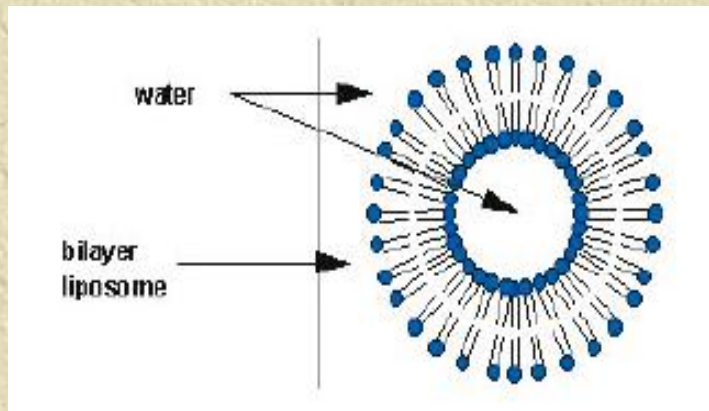
Phospholipids

- ✦ 2 fatty acids + glycerol
- ✦ 3rd (-OH) joined to (PO⁴⁻) group.
- ✦ Make up the boundary of cell and external environment.



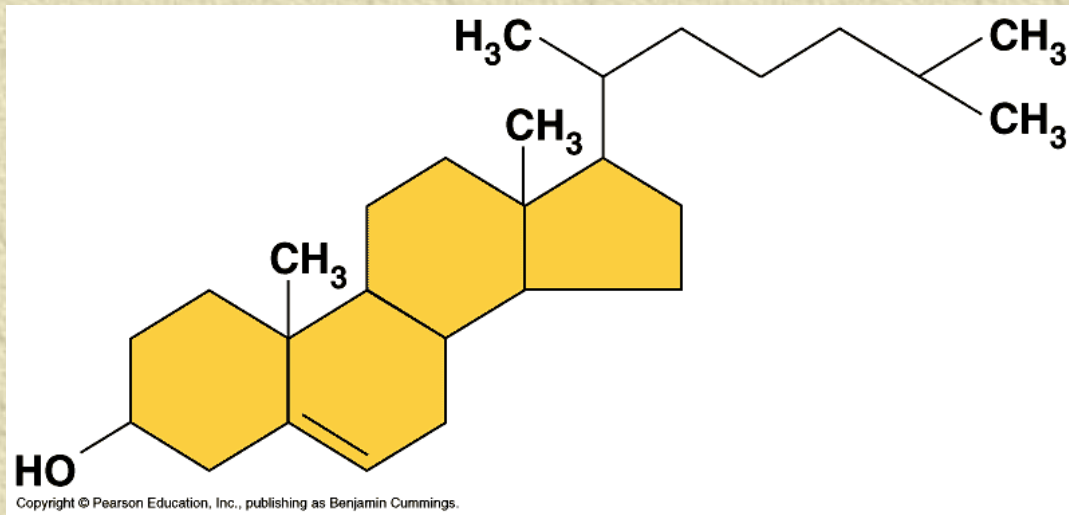
Phospholipids

- ✦ Self assemble into double layers in aqueous solutions that shield hydrophobic tails from water.
 - ✦ ‘Tails’ hydrophobic; ‘heads’ hydrophilic
 - ✦ Micelle - (phospholipid droplet in water)



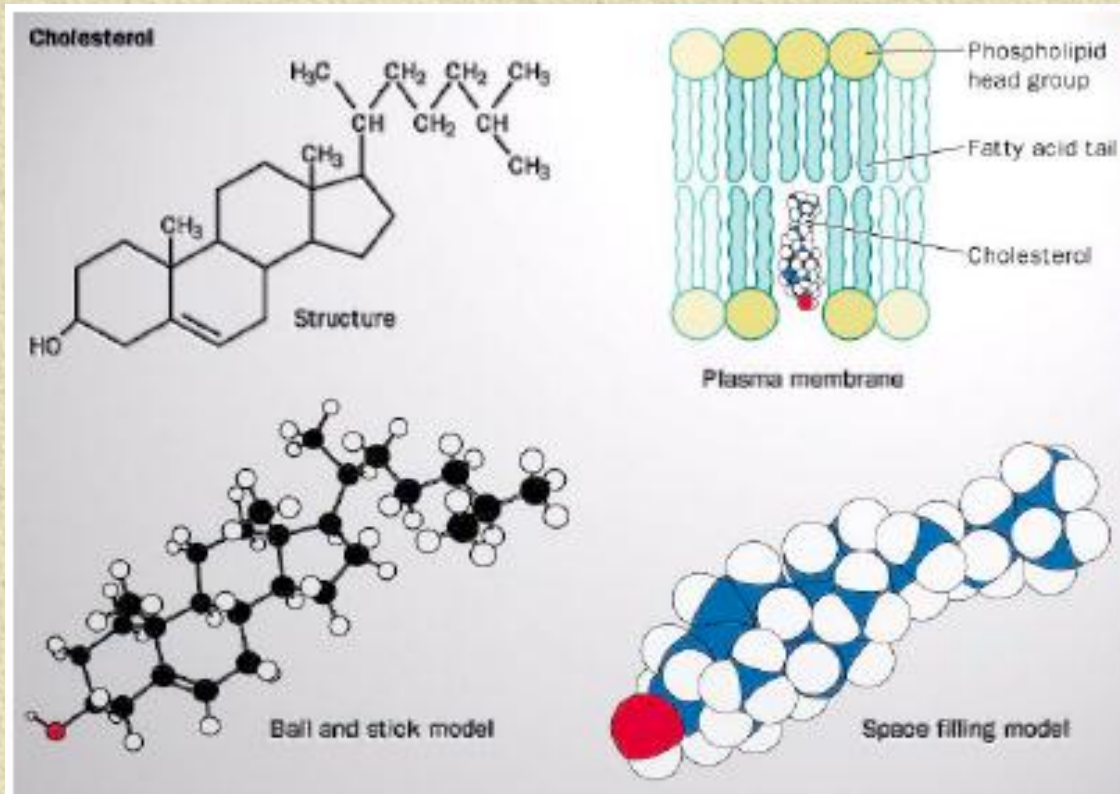
Steroids

- ✦ Lipids composed of carbon skeleton of four fused rings
- ✦ Vary based on functional groups attached to rings



Steroids - Cholesterol

- ✦ Component of animal cell membranes
- ✦ Helps keep membranes fluid and flexible



Steroids - Cholesterol

- ✦ Precursor to sex hormones such as estrogen and testosterone.
- ✦ Cholesterol → sex hormones

