Section 14.5
Complex Mixtures and Structures

Bill Vining
SUNY Oneonta

Hydrophilic groups:

–OH and –NH groups and charged groups

Examples: CH_3OH, NH3, H-O-O-H

Hydrophobic groups:

Long hydrocarbon groups:

$CH_3CH_2CH_2CH_2CH_2CH_2$
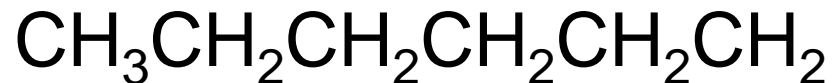
Examples: $CH_3CH_2CH_2CH_2CH_3$

$CH_3CH_2CH_2CH_2Cl$

Proteins

Why do Proteins Fold?

Alpha helix

Beta sheet
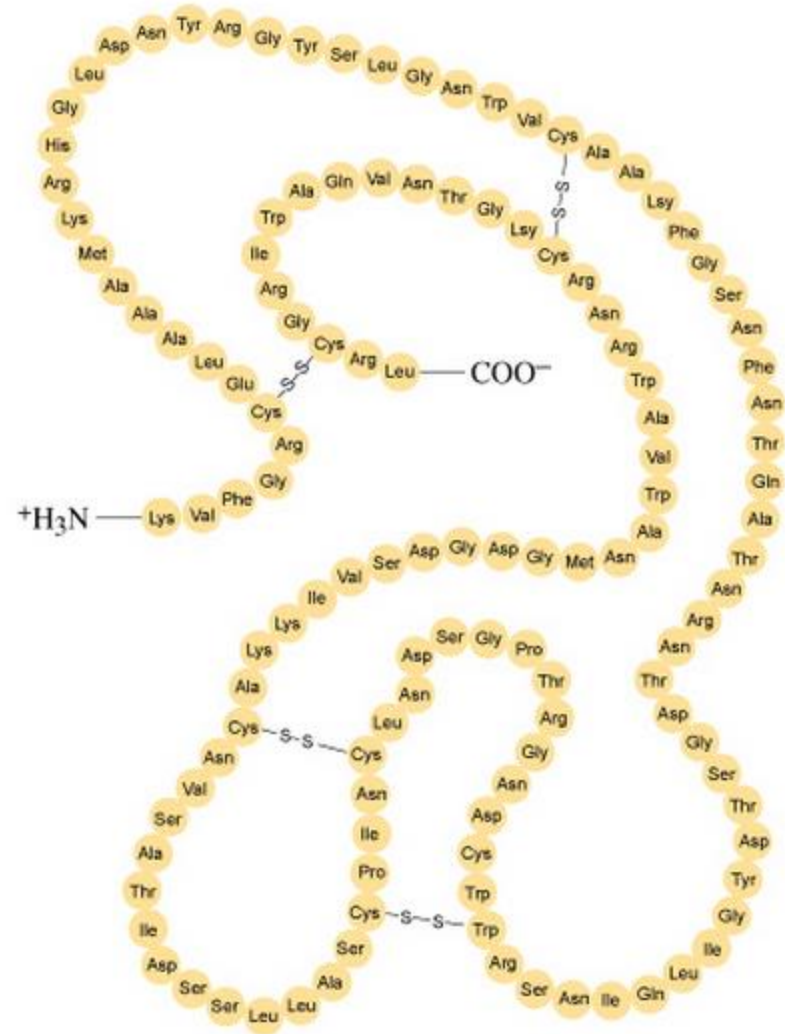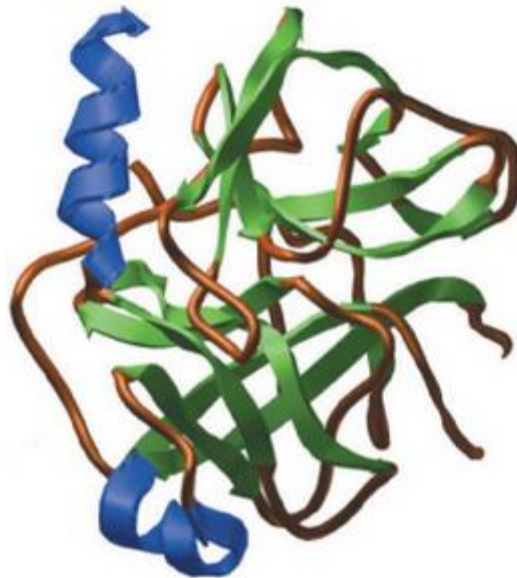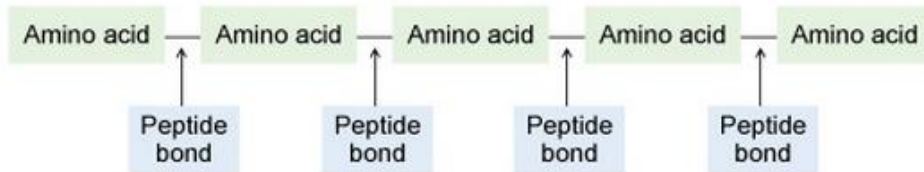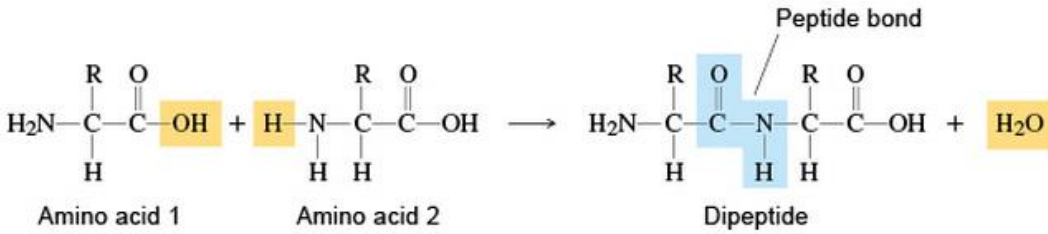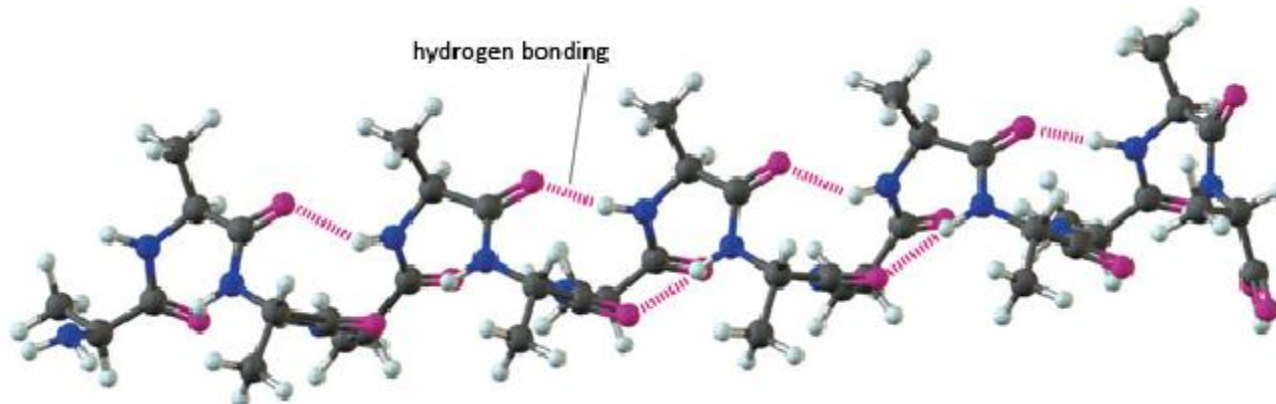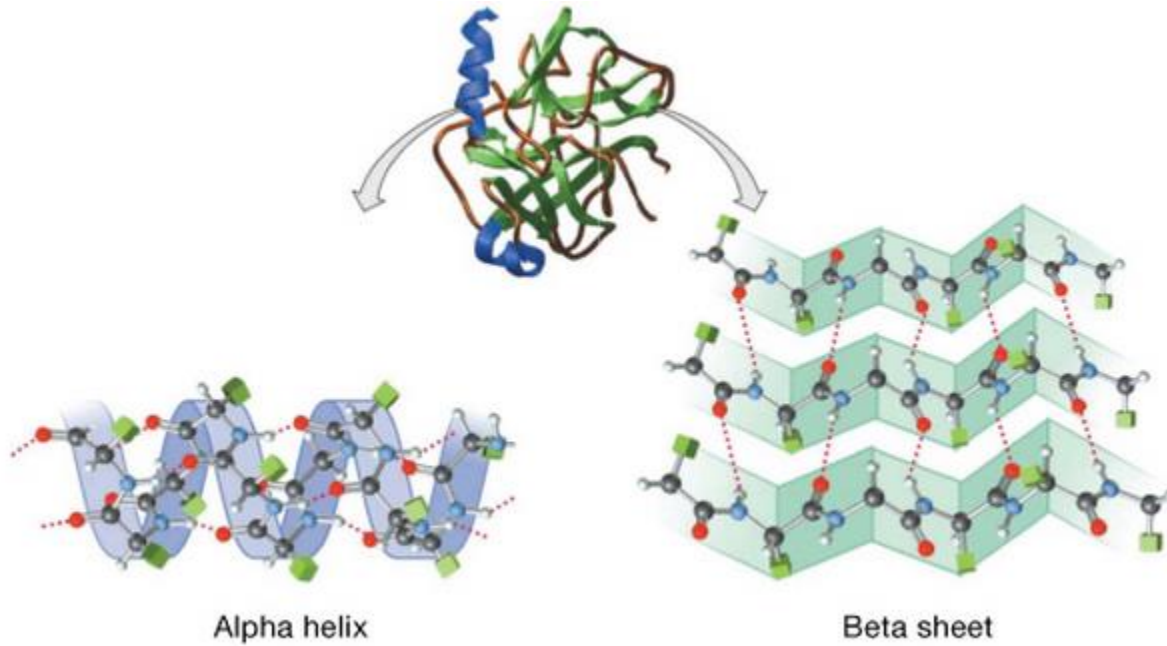
hydrogen bonding

Without lipids, you'd fall apart.

Phospholipid bilayer

A

B

Phospholipid
Molecular structure
Schematic representation

C

D

Lipid Membranes

Lipid bilayer

Intracellular fluid

Extracellular fluid

Exterior of cell

Glycoprotein

Carbohydrate chains

Glycolipid

Cytoplasm

Cholesterol

Integral proteins

Transmembrane channel protein

Peripheral protein
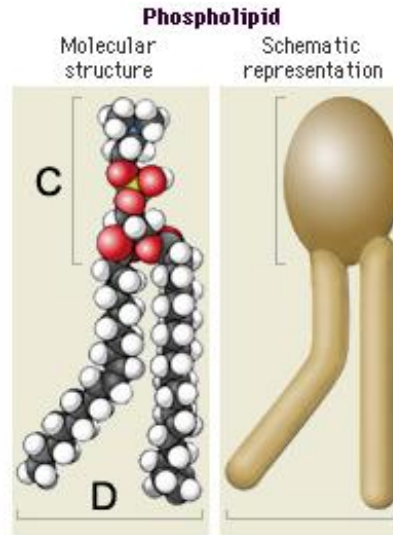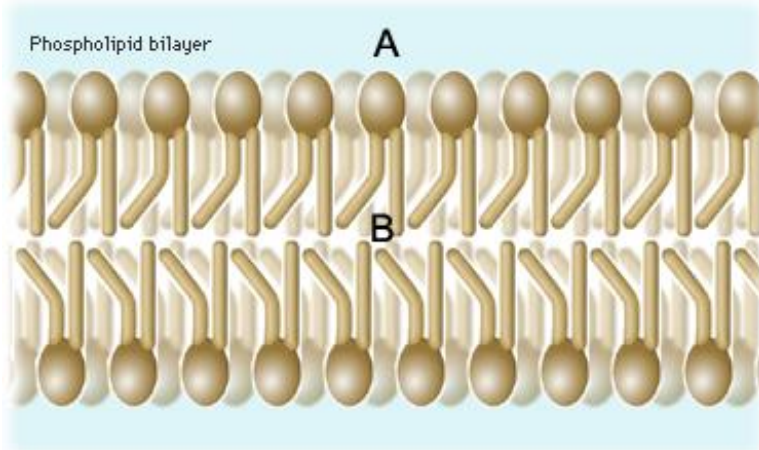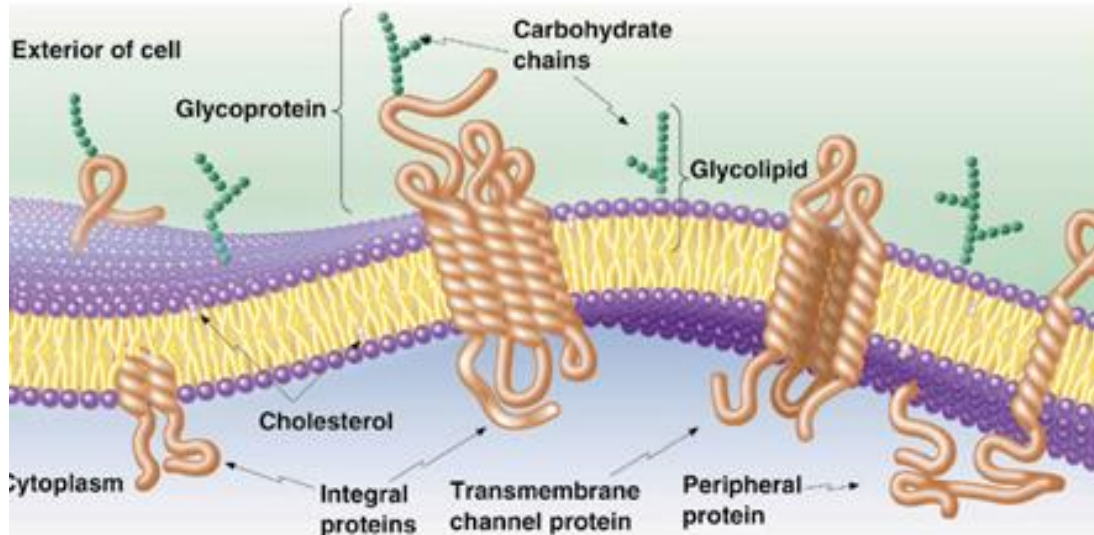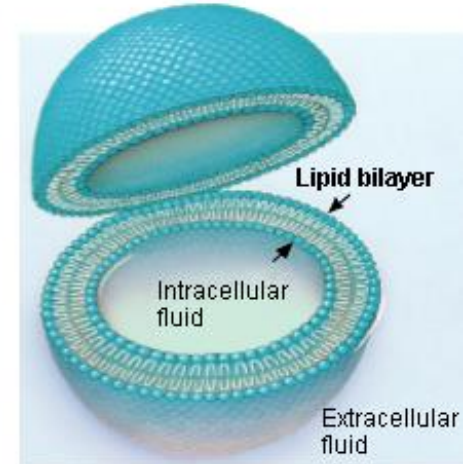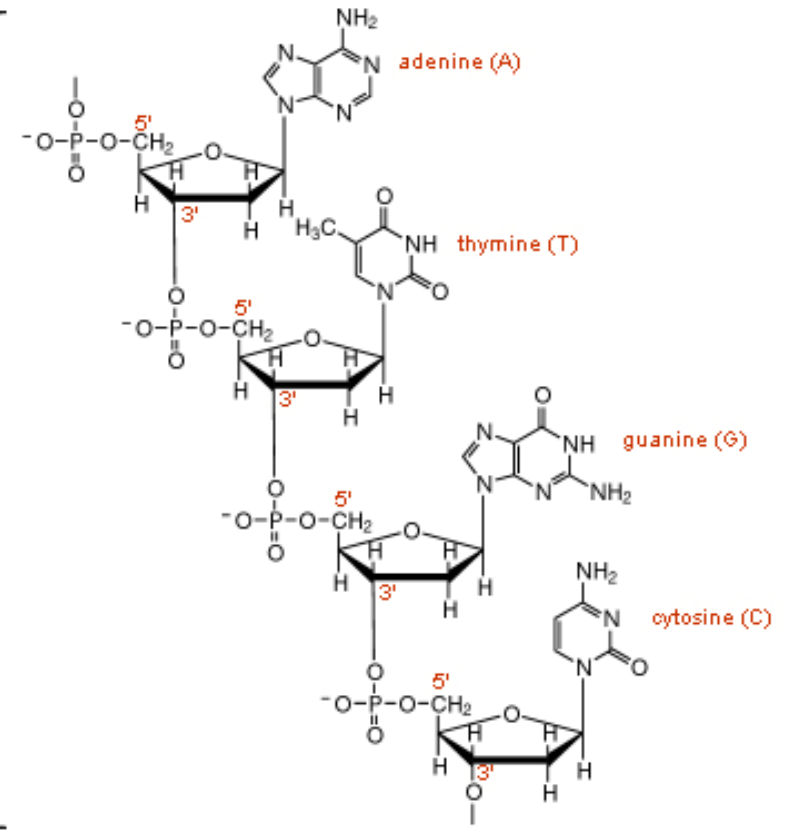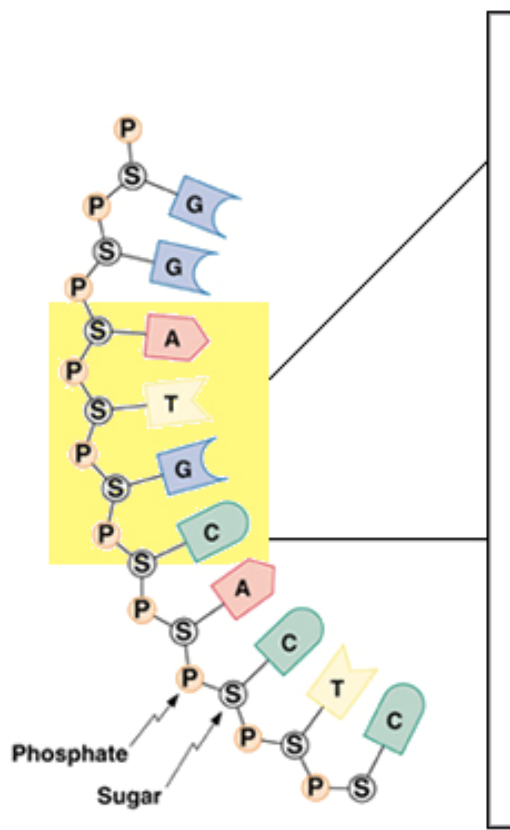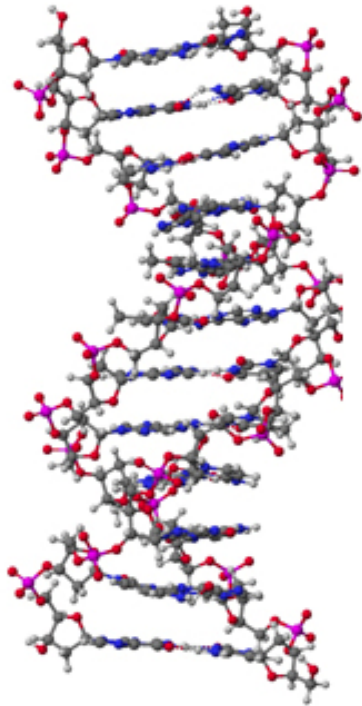
What holds DNA together?
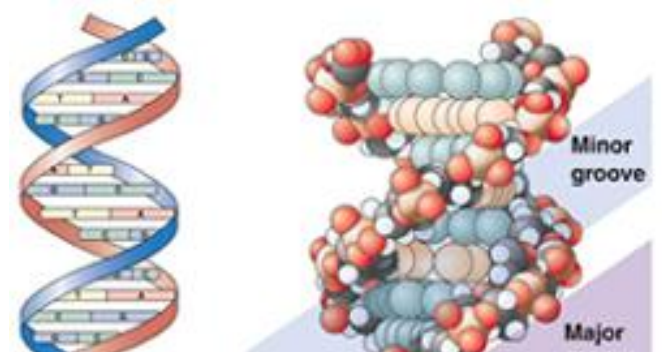
DNA Base Pairs: Hydrogen Bonding
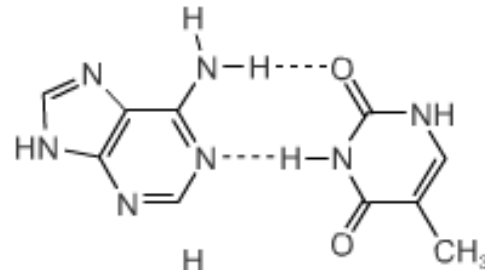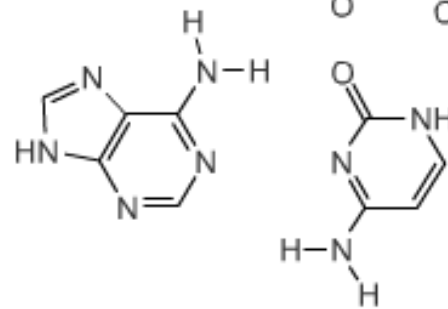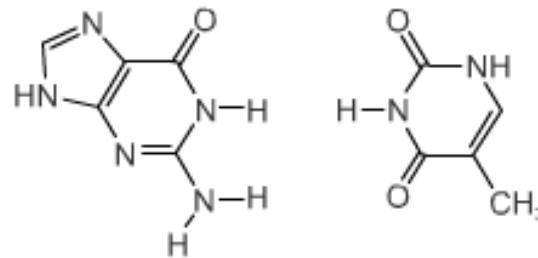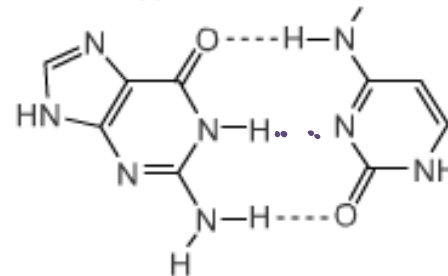
Surfactants:

"Amphiphilic"

Sodium stearate: made by saponification of oils and fats (fat + base = soap)
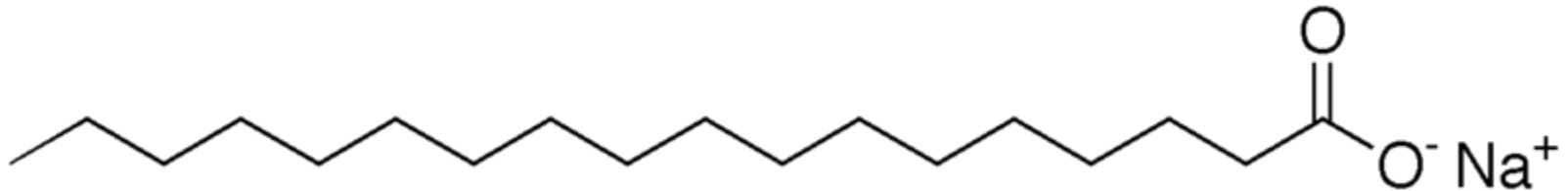
Sodium lauryl sulfate (from coconut and palm oils)
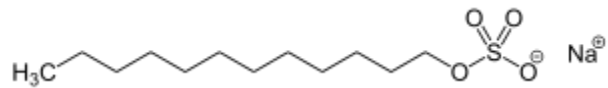
Laundry!

Soap and Detergent

Nonpolar tail — hydrophobic end

Polar head — hydrophilic end
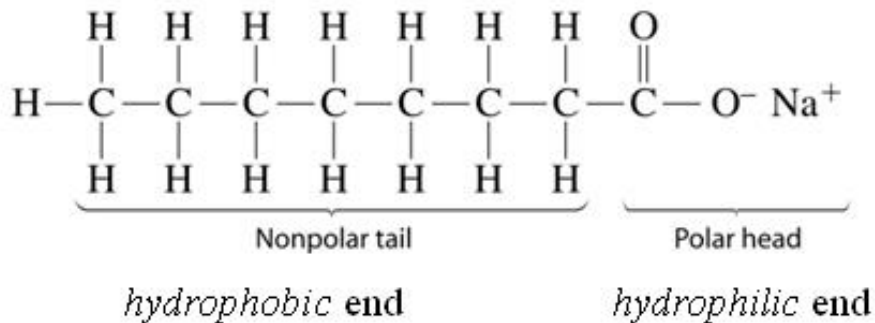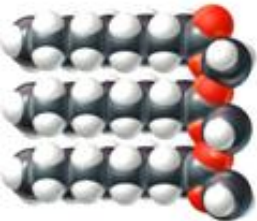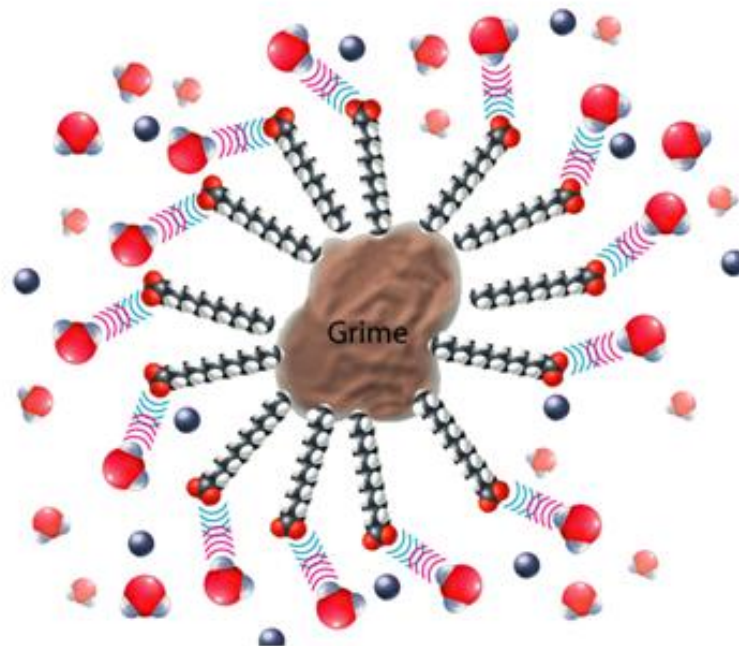
Fat molecule — Treat with NaOH → Three fatty acid soap molecules — Glycerol molecule

Soap Micelle

Grime

Hard Water and Phosphate Solubility

Wrinkling

dampen (H-bond crosslinks broken)

movement, wrinkling (chains move)
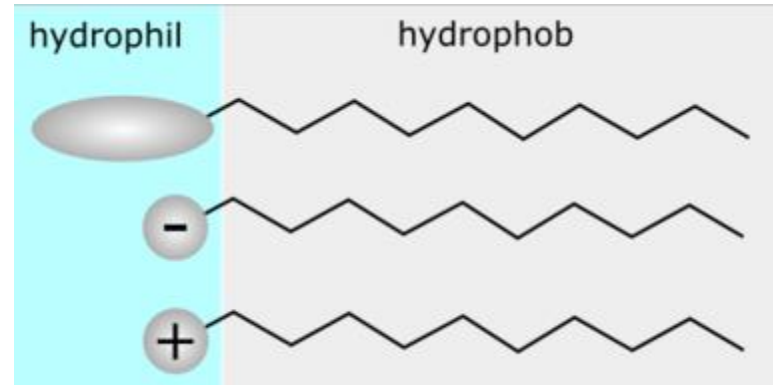
dry (H-bond crosslinds reform)

Cotton

Cellulose polymer

CH_2OH

$n-2$

Permanent
Press
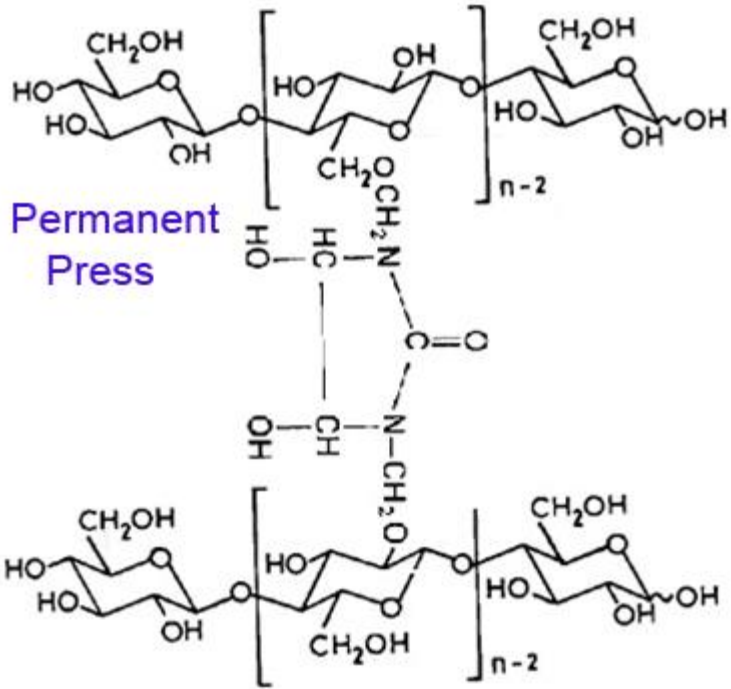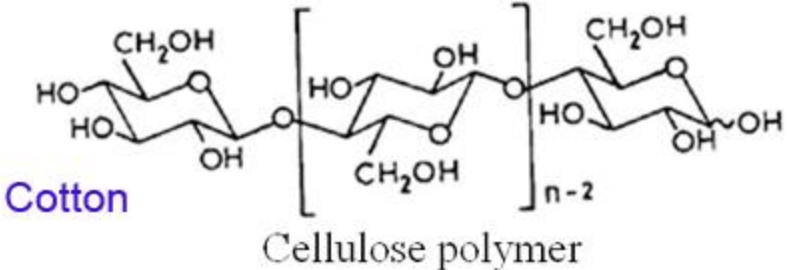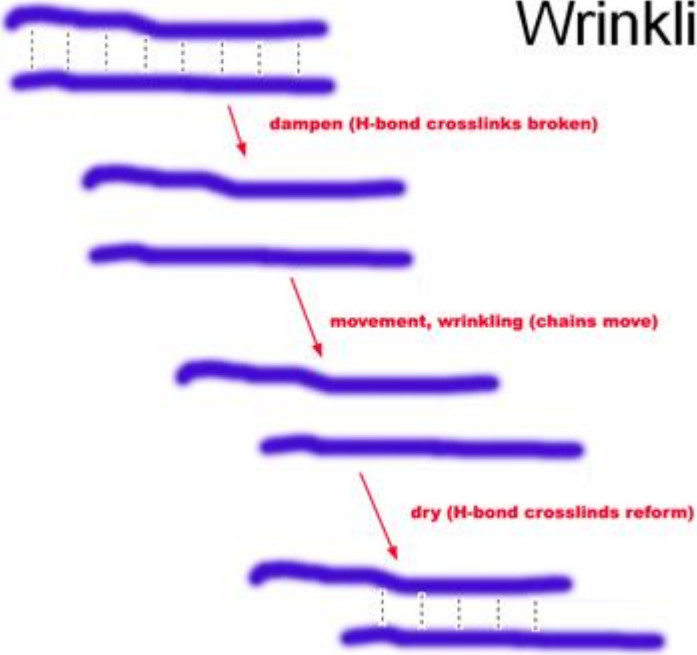
Fabric Softener and Hair Conditioner

Cationic Surfactants:

$(CH_3)_3N^+$ ∿∿∿∿∿∿∿∿∿∿∿∿∿∿∿
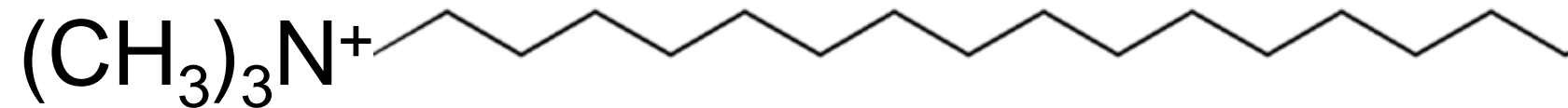
Fabric Softener
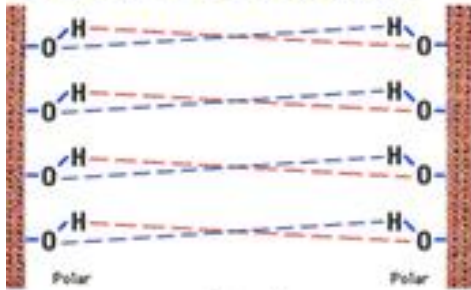
without   with

What effect will softener use have on *absorptivity*?

without   with

Colloids: mixture of different phases that do not separate

Figure 13.5.2: An oil-in-water emulsion
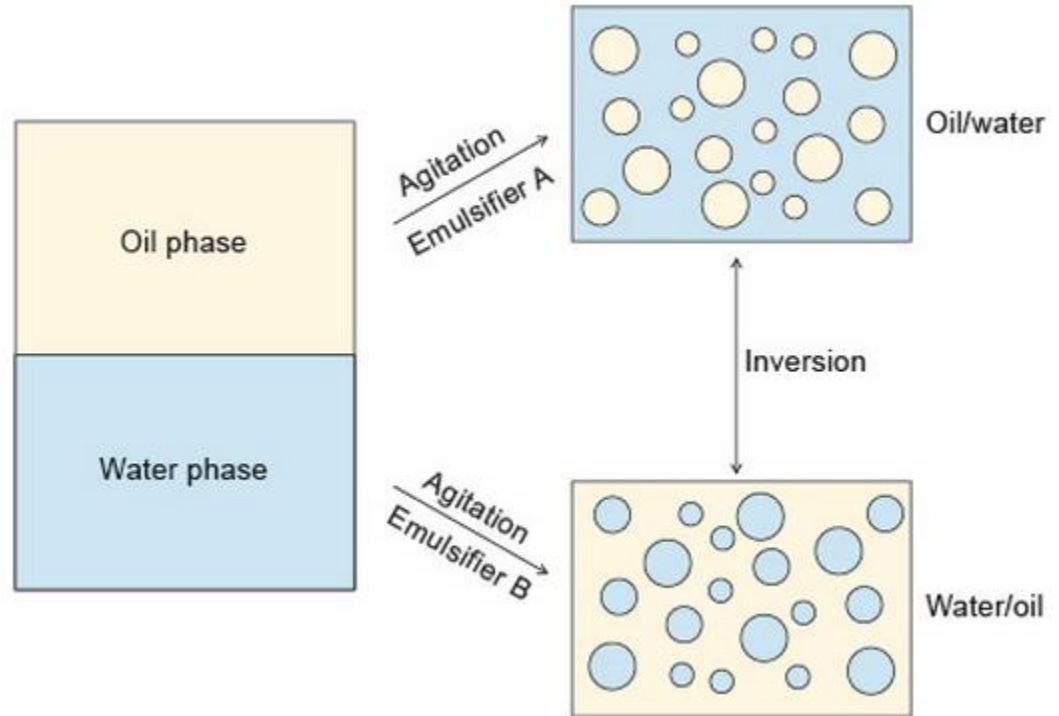
Emulsions: Milk
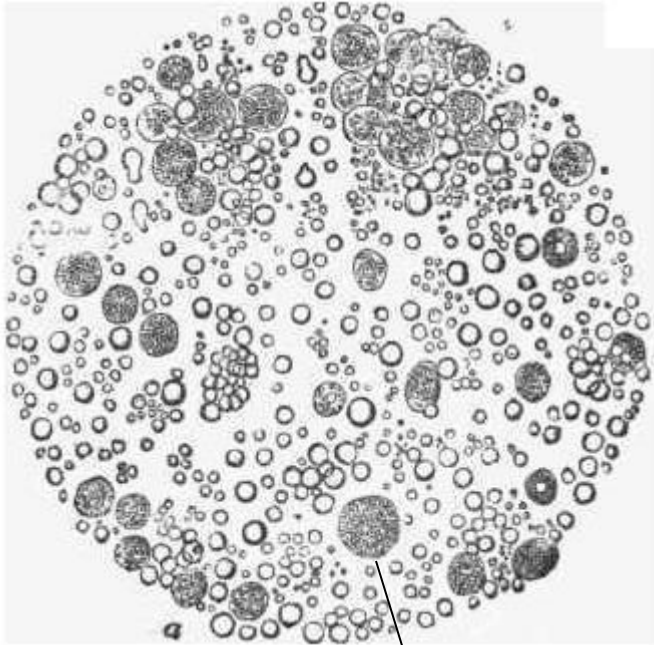
surface proteins

Colloids: mixture of different phases that do not separate

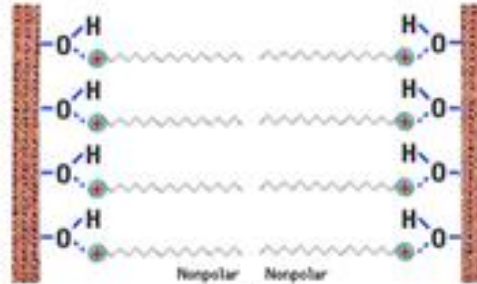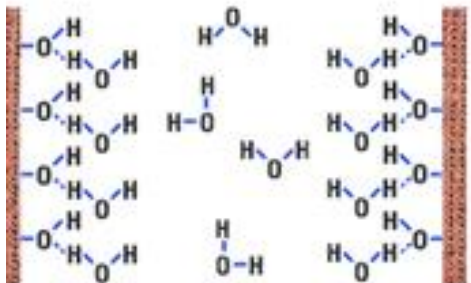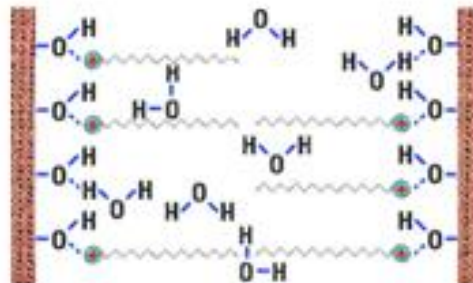| Continuous Phase	Dispersed Phase	Type	Examples
Gas	Liquid	Aerosol	Fog, clouds, aerosol sprays
Gas	Solid	Aerosol	Smoke, airborne viruses, automobile exhaust
Liquid	Gas	Foam	Shaving cream, whipped cream
Liquid	Liquid	Emulsion	Mayonnaise, milk, face cream
Liquid	Solid	Sol	Gold in water, milk of magnesia, mud
Solid	Gas	Foam	Foam rubber, sponge, pumice
Solid	Liquid	Gel	Jelly, cheese, butter
Solid	Solid	Solid sol	Milk glass, many alloys such as steel, some colored gemstones

Alloys: mixtures of metals

Alloy	Composition
Sterling silver	92.5% Ag, 7.5% Cu
18 K "yellow" gold	75% Au, 12.5% Ag, 12.5% Cu
Pewter	91% Sn, 7.5% Sb, 1.5% Cu
Low-alloy steel	98.6% Fe, 1.0% Mn, 0.4% C
Carbon steel	Approximately 99% Fe, 0.2–1.5% C
Stainless steel	72.8% Fe, 17.0% Cr, 7.1% Ni, and approximately 1% each of Al and Mn
Alnico magnets	10% Al, 19% Ni, 12% Co, 6% Cu, remainder Fe
Brass	95–60% Cu, 5–40% Zn
Bronze	90% Cu, 10% Sn

24 K gold = pure gold = not very good for jewelry