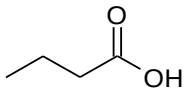
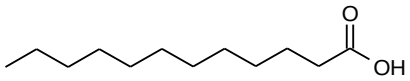
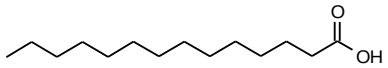
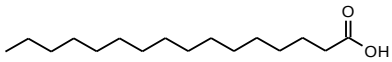
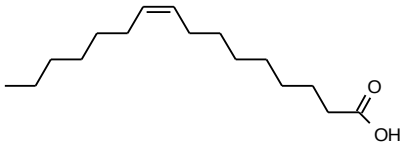
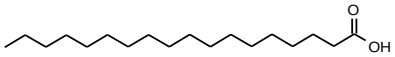
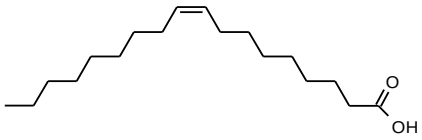
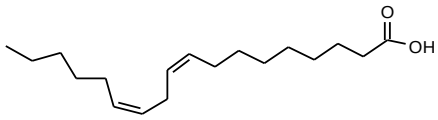
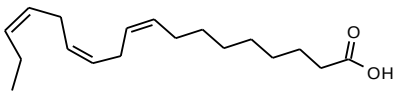
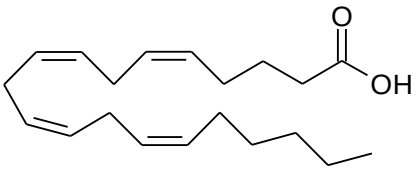
Chapter 28: Lipids

In a slightly different order than in your textbook

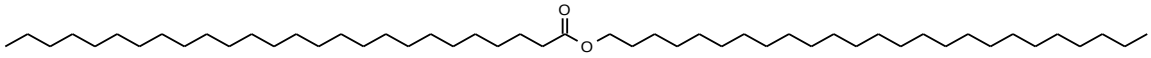
Fatty Acids

common name	shorthand notations #of C : # of C=C #of C, location of C=C	line structure	comments
butyric acid	**4:0**		in butterfat
lauric acid	**12:0**		in coconut oil
myristic acid	**14:0**		in nutmeg oil
palmitic acid	**16:0**		in palm oil
palmitoleic acid	**16:1** **$C_{16}\Delta^{9}$**		in oils and fats
stearic acid	**18:0**		beef tallow and human fat
oleic acid	**18:1** **$C_{18}\Delta^{9}$**		olive oil, lard, and human fat
linoleic acid	**18:2** **$C_{18}\Delta^{9,12}$**		in many vegetable oils and linseed oil

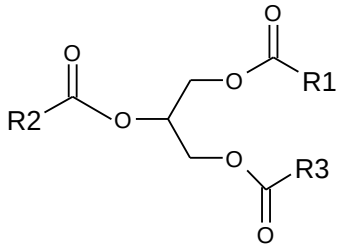
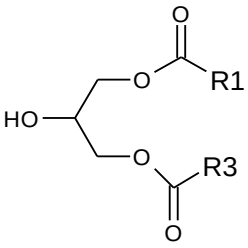
α-linolenic acid	**18:3** **$C_{18}\Delta^{9,12,15}$**		the γ- isomer **$\Delta^{6,9,12}$** is not as essential
arachidonic acid	**20:4** **$C_{20}\Delta^{5,8,11,14}$**		precursor to prostaglandins, prostacyclins, and thromboxanes
eicosapentaenoic acid [EPA]	**20:5** **$C_{20}\Delta^{5,8,11,14,17}$**	try drawing it! all the C=C are *cis*	an (*ω-3*) fatty acid
docosahexaenoic acid [DHA]	**22:6** **$C_{22}\Delta^{4,7,10,13,16,19}$**	try drawing it! all the C=C are *cis*	an (*ω-3*) fatty acid

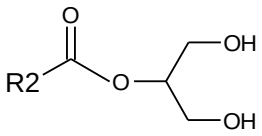
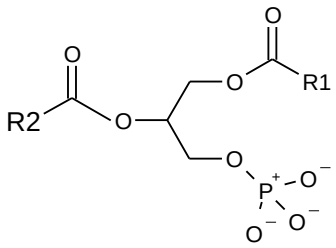
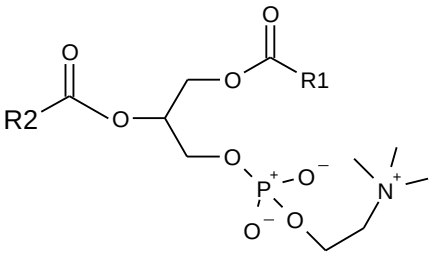
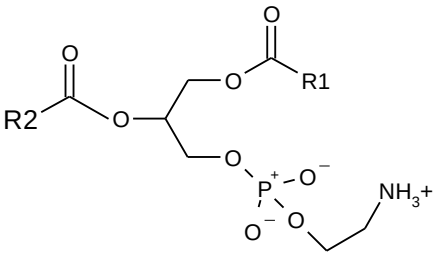
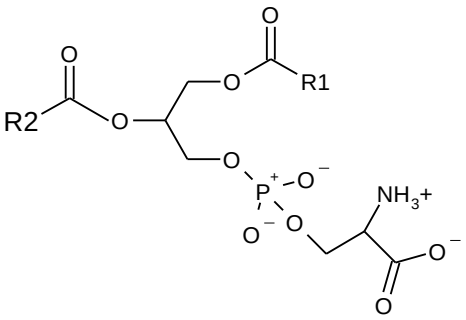
Waxes

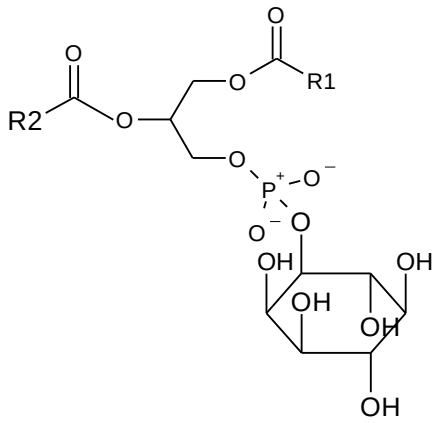
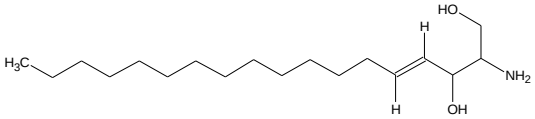
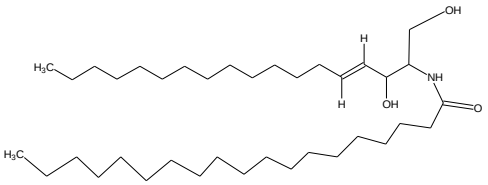
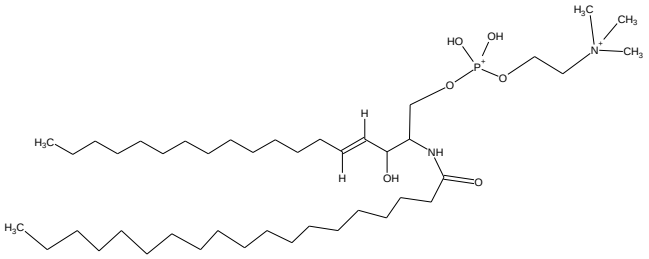
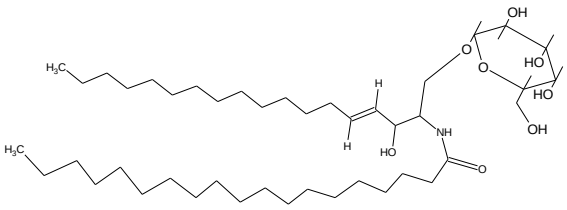
beeswax	is actually a mixture of fatty esters and hydrocarbons. see below for a typical component, where the acid and the alcohol both have 26 carbons; the length of the fatty acid can range from 18? to 36 C and the alcohol from 24 to 36 C	a most useful material! [to us as well as to bees]



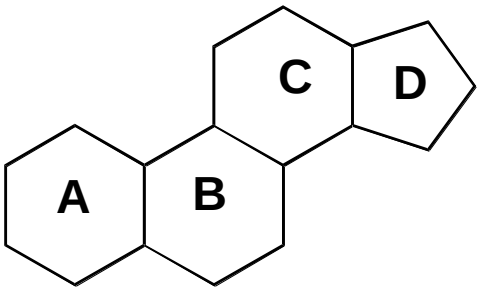
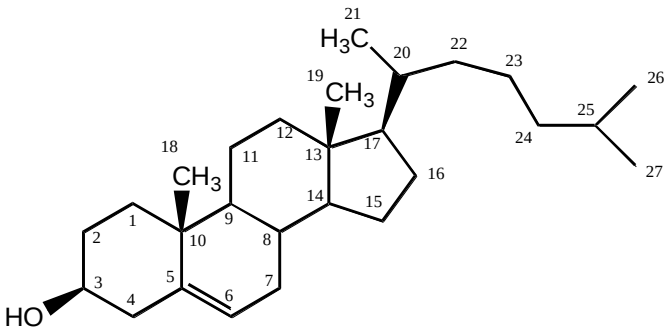
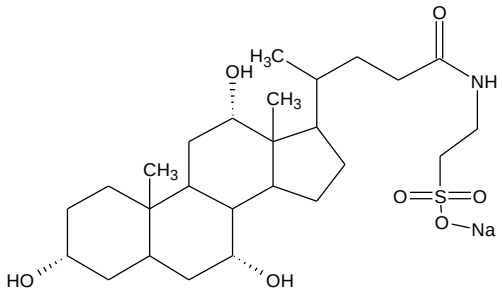
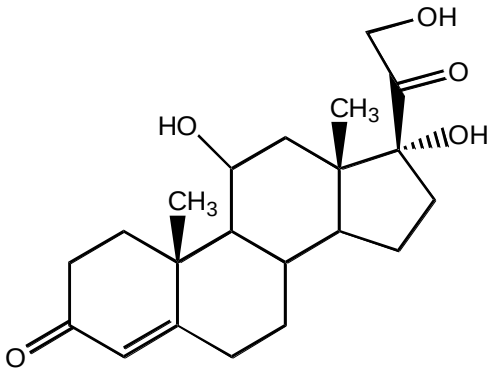
Glycerolipids

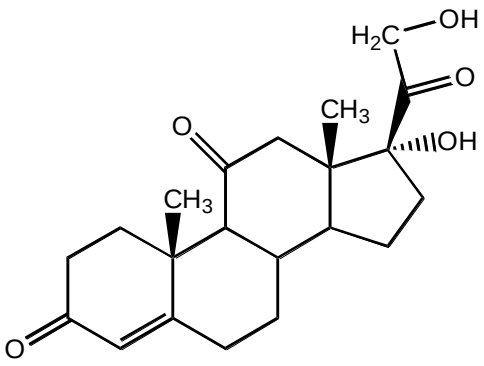
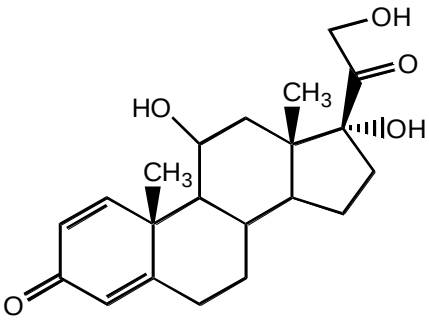
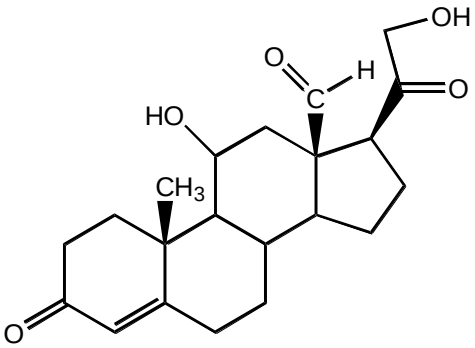
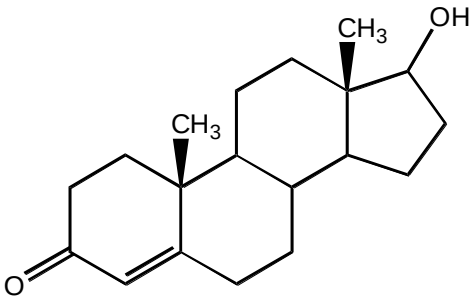
class	general structure	comments
triglyceride		if solid, it's called a fat; if liquid, an oil. Melting point depends on chain length and degree of unsaturation.
diglyceride		formed during fat digestion and used as food additive [emulsifier]

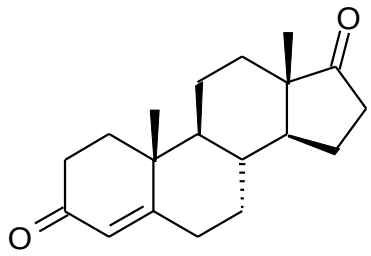
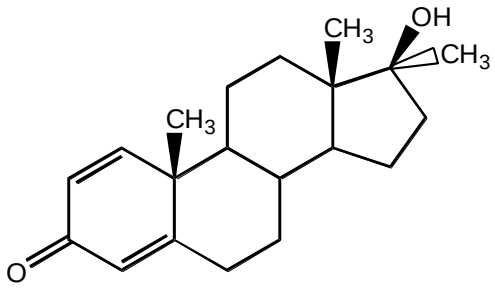
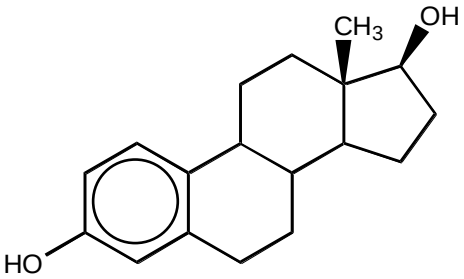
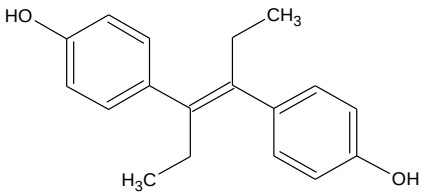
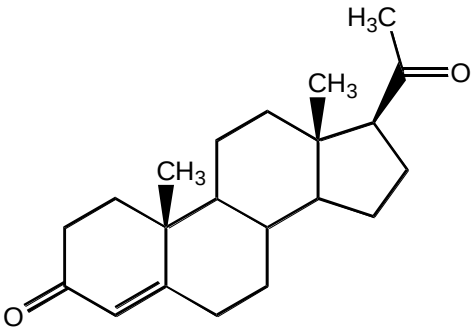
monoglyceride		formed during fat digestion and used as food additive [emulsifier]
phosphatidic acid		building block of glycerophospholipids
lecithin phosphatidyl choline		a key cell membrane component
cephalin phosphatidyl ethanolamine		another common cell membrane component
cephalin phosphatidyl serine		another common cell membrane component

phosphatidyl inositol		a less-common membrane component
Sphingolipids		
sphingosine		the basic building block of sphingolipids, ~ never found free
ceramide N-acyl sphingosine		the usual form from which sphingolipids are assembled
sphingomyelin		the only phosphorus-containing class of sphingolipids
cerebroside		sugar is usually gal, can be glc
ganglioside	Really, really big	variable branched oligosaccharides

Steroids

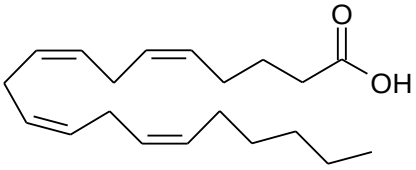
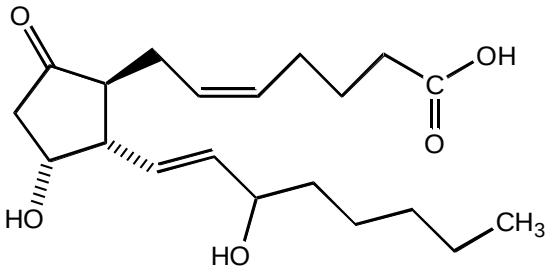
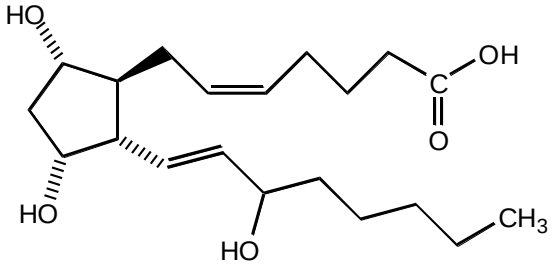
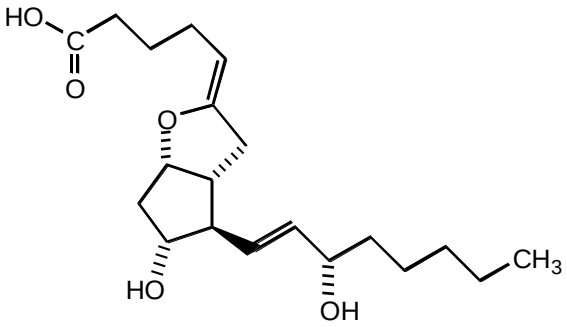
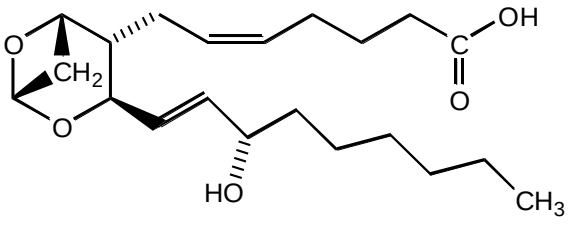
sterane		
cholesterol		
sodium taurocholate		a “bile salt” sysnthesized in the liver from cholesterol and used to emulsify fat during digestion.
cortisol		elevates blood glucose levels, promotes breakdown of muscle protein and subsequent catabolism of amino acids; antiinflammatory, suppresses immune system activity.

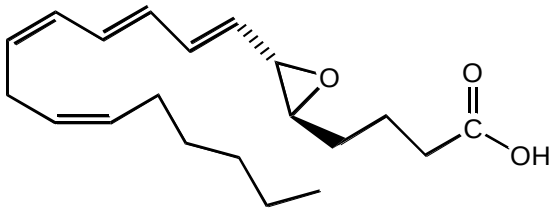
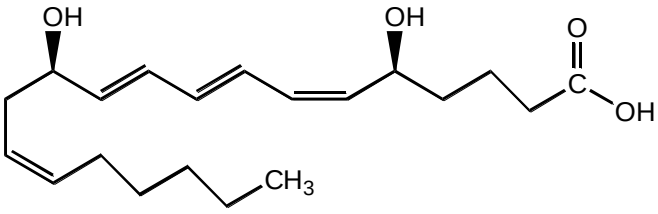
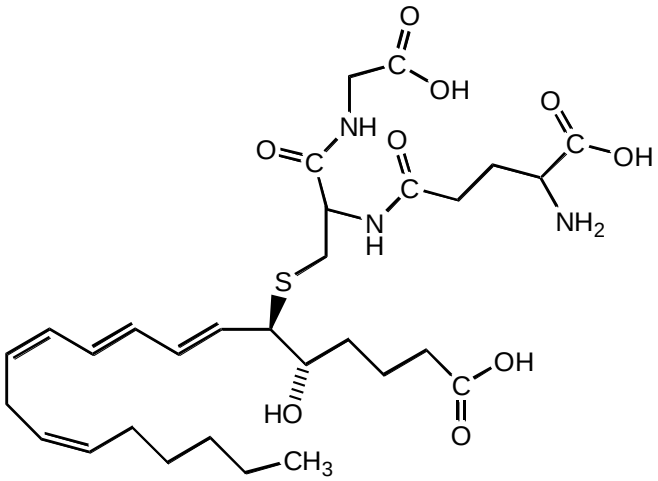
cortisone		semisynthetic antiinflammatory agent
prednisolone		a synthetic antiinflammatory steroid
aldosterone		the main mineralocorticoid; promotes sodium reabsorption and potassium excretion in the kidneys
testosterone		the major androgen; increases muscle mass and induces male secondary sexual characteristics

androstenedione		alleged to be a human pheromone, it's also the stuff Mark McGwire used [baseball's drug policies are a lot laxer than those of other sports]
Dianabol		the most popular synthetic anabolic steroid; widely abused, produces "roid rage" has been said to cause liver cancer
β-estradiol		the major estrogen; prevents osteoporosis and may help protect against cardiovascular conditions.
diethylstilbestrol		synthetic compound with estrogen activity; caused cervical cancer in the daughters of women who took it as a fertility agent in the '50s and '60s; used to fatten beef cattle.
progesterone		the main progestin; prepares uterine lining for implantation

Eicosanoids:

Prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes

arachidonic acid		the precursor to the 1- and 2-series; EPA is the precursor to the 3-series
PGE_2		has tissue-specific effects on smooth muscle
$PGF_{2\alpha}$		has tissue-specific effects on smooth muscle; E and F types *usually* mutually antagonistic
PGI_2 prostacyclin		prostacyclins are produced by cells in the linings of blood vessels and antagonize thromboxane activity
TXA_2 thromboxane		thromboxanes are produced by activated blood platelets and activate other platelets

LTA_4 leukotriene A4		
LTB_4 leukotriene B4		
LTC_4 leukotriene C4, a.k.a. SRS-A		the "slow-reacting substance of anaphylaxis"
Structures drawn with CS ChemDraw® , MDL IsisDraw®, and ACD Labs ChemSketch® by Ron Rinehart		