

**M U N I**  
**S C I**

# **C5730 Biochemie - seminář**

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Mgr. Lukáš Faltinek

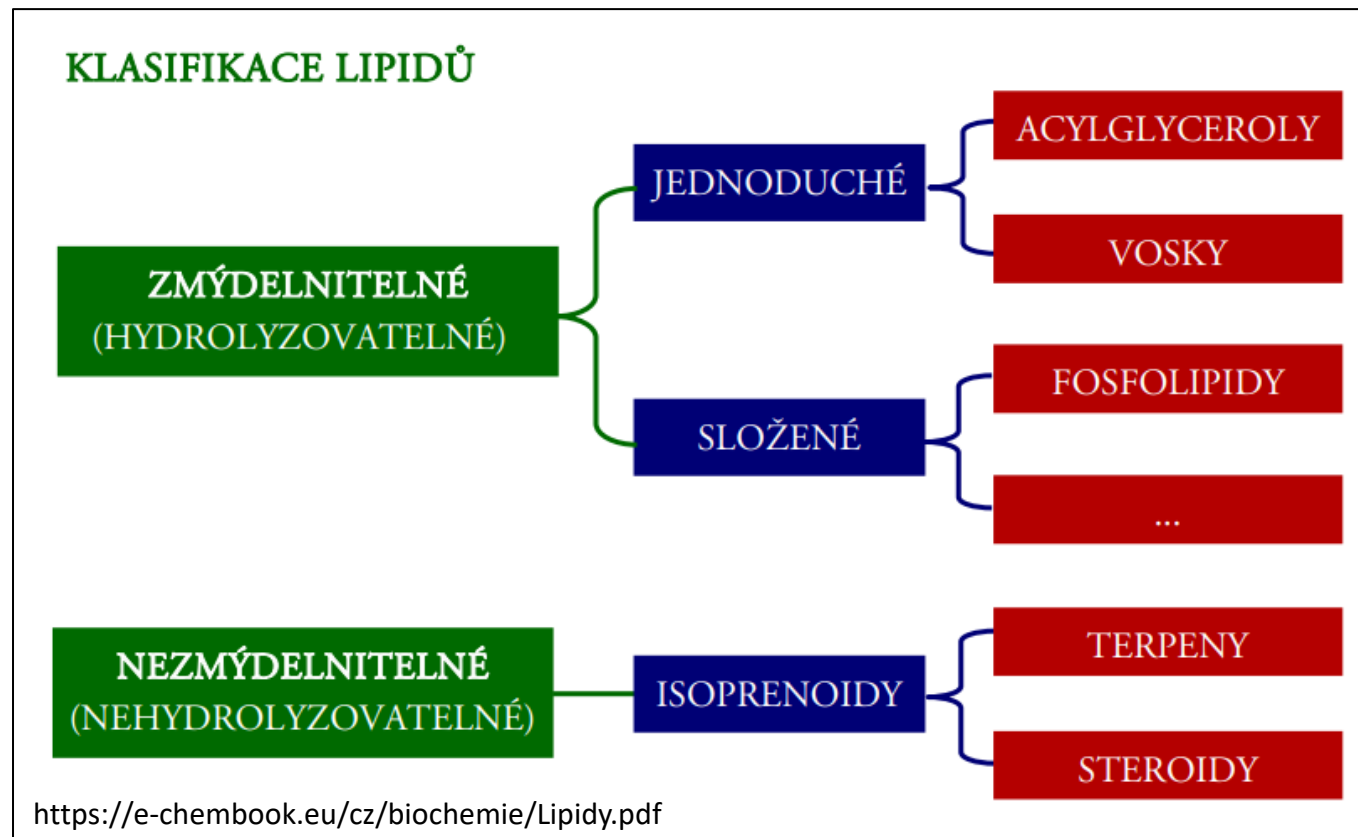
podzim 2023

**M U N I**  
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# Lipidy

# Charakteristika

- z chemického hlediska převážně **estery vyšších mastných kyselin a alkoholů**
- rozmanitá skupina látek: tuky, oleje, vosky, některé vitaminy a hormony



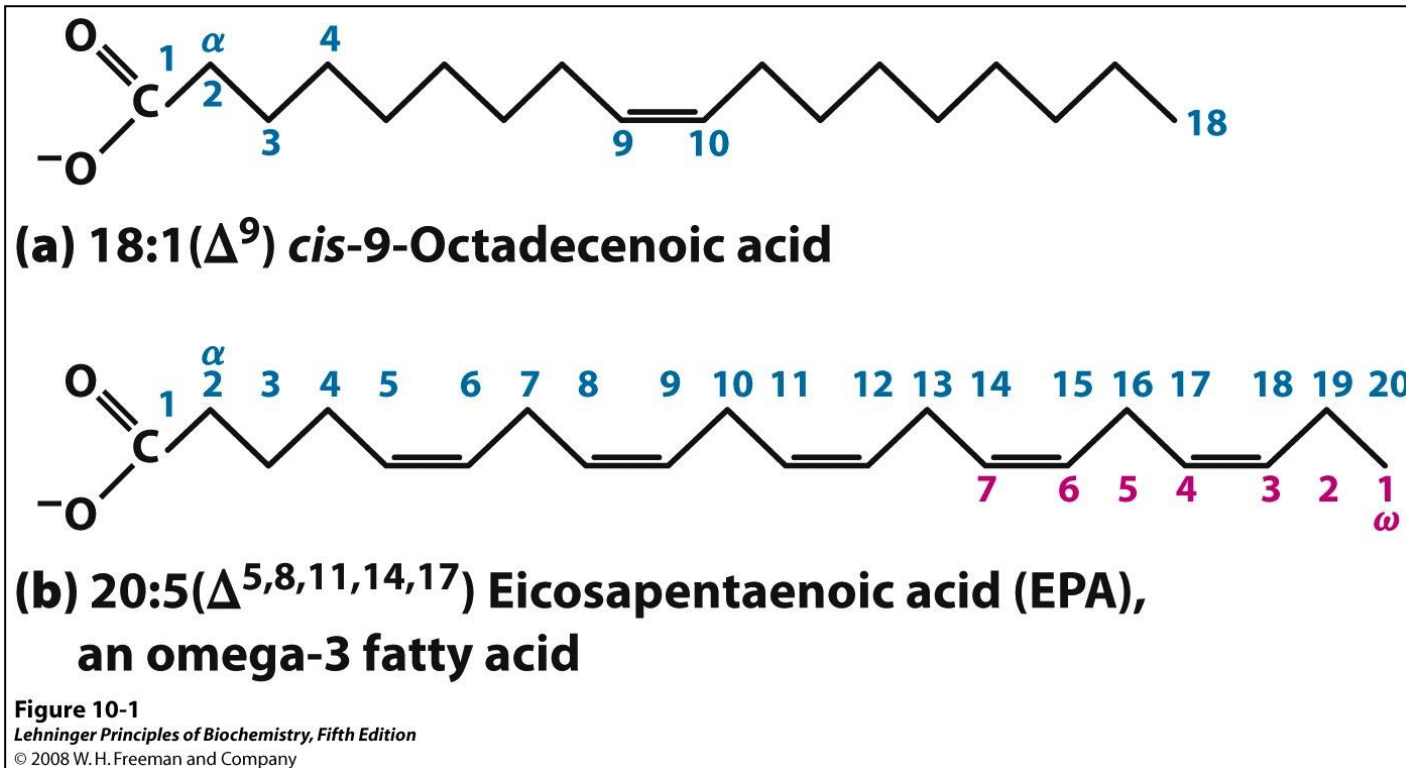
# Vyšší mastné kyseliny

- jednosytné karboxylové kyseliny obsahující zpravidla 4 až 26 uhlíků
- nasycené: bez C=C vazeb                      X                      nenasycené: s C=C vazbami

Zkrácený zápis MK

CN:M;X

Uhlík                      Počet uhlíků                      Počet dvojných vazeb                      Poloha dvojných vazeb



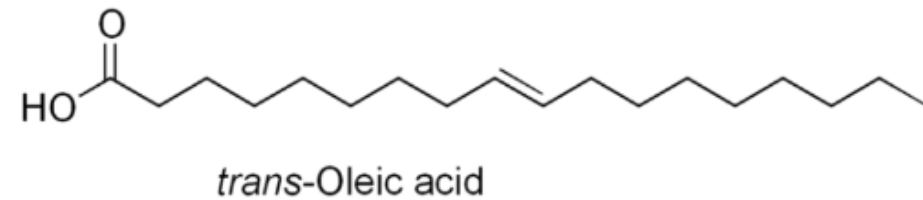
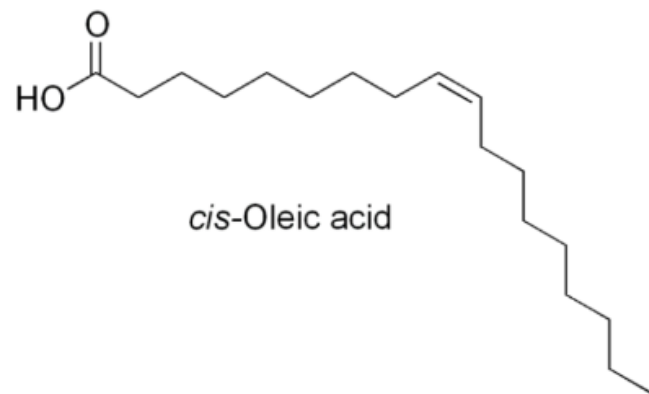
# Nasyčené mastné kyseliny

Počet uhlíků	Triviální název	Systematický název
4	máselná	butanová
6	kapronová	hexanová
8	kaprylová	oktanová
10	kaprinová	dekanová
12	laurová	dodekanová
14	myristová	tetradekanová
16	palmitová	hexadekanová
18	stearová	oktadekanová
20	arachová	eikosanová
22	behenová	dokosanová
24	lignocerová	tetrakosanová
26	cerotová	hexakosanová

# Nenasycené mastné kyseliny

Počet uhlíků a dvojných vazeb	Triviální název	Omega série	Poloha dvojných vazeb (všechny cis, s 1 výjimkou)
C16:1	Palmitolejová	$\omega$ 7	$\Delta^9$
C18:1	<b>Olejová</b>	$\omega$ 9	$\Delta^9$
C18:1	Elaidová	$\omega$ 9	$\Delta^9$ (trans)
C24:1	Nervonová	$\omega$ 9	$\Delta^{15}$
C18:2	<b>Linolová</b>	$\omega$ 6	$\Delta^{9, 12}$
C18:3	<b><math>\alpha</math>-linolenová</b>	$\omega$ 3	$\Delta^{9, 12, 15}$
C18:3	$\gamma$ -linolenová	$\omega$ 6	$\Delta^{6, 9, 12}$
C20:4	<b>Arachidonová</b>	$\omega$ 6	$\Delta^{5, 8, 11, 14}$

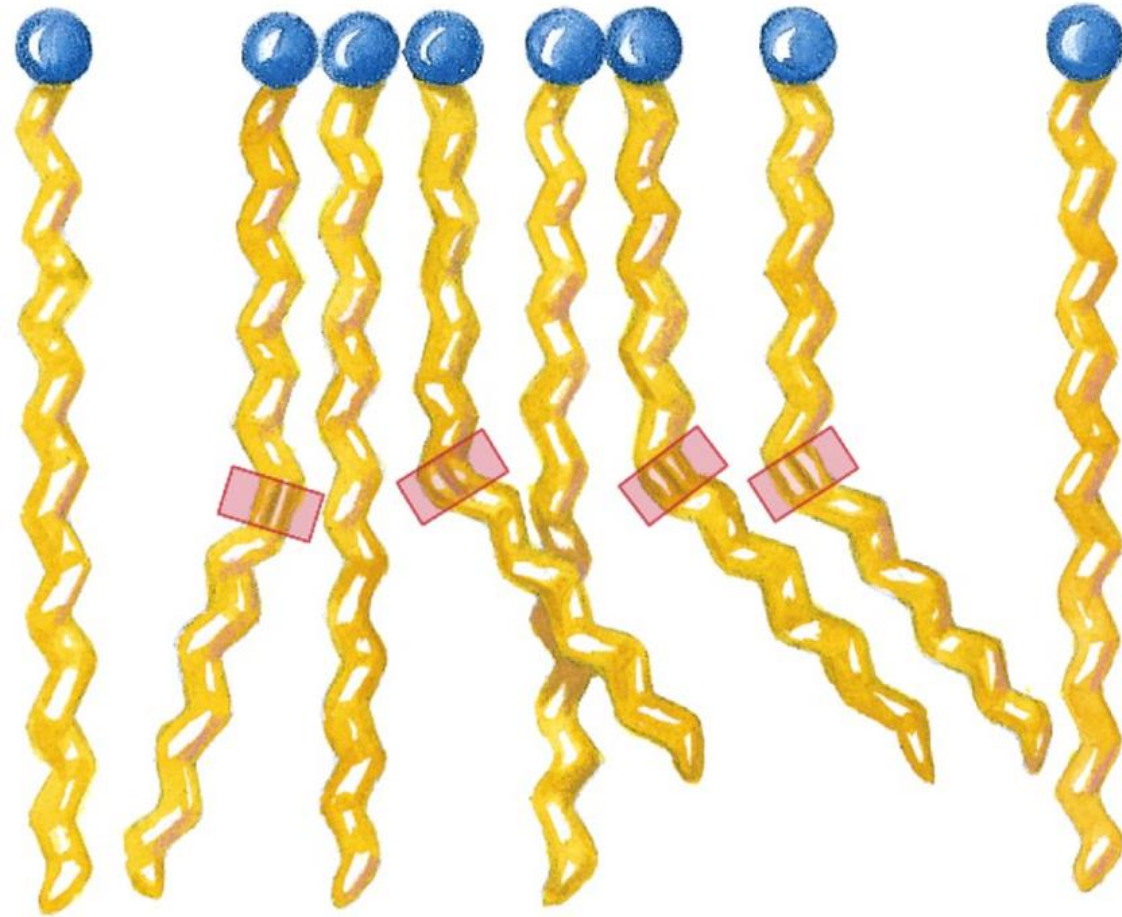
MATOUŠ, Bohuslav, et al. *Základy lékařské chemie a biochemie*.



Směs nasycených MK



Směs nasycených a nenasycených MK



Které uskupení bude mít vyšší teplotu tání?

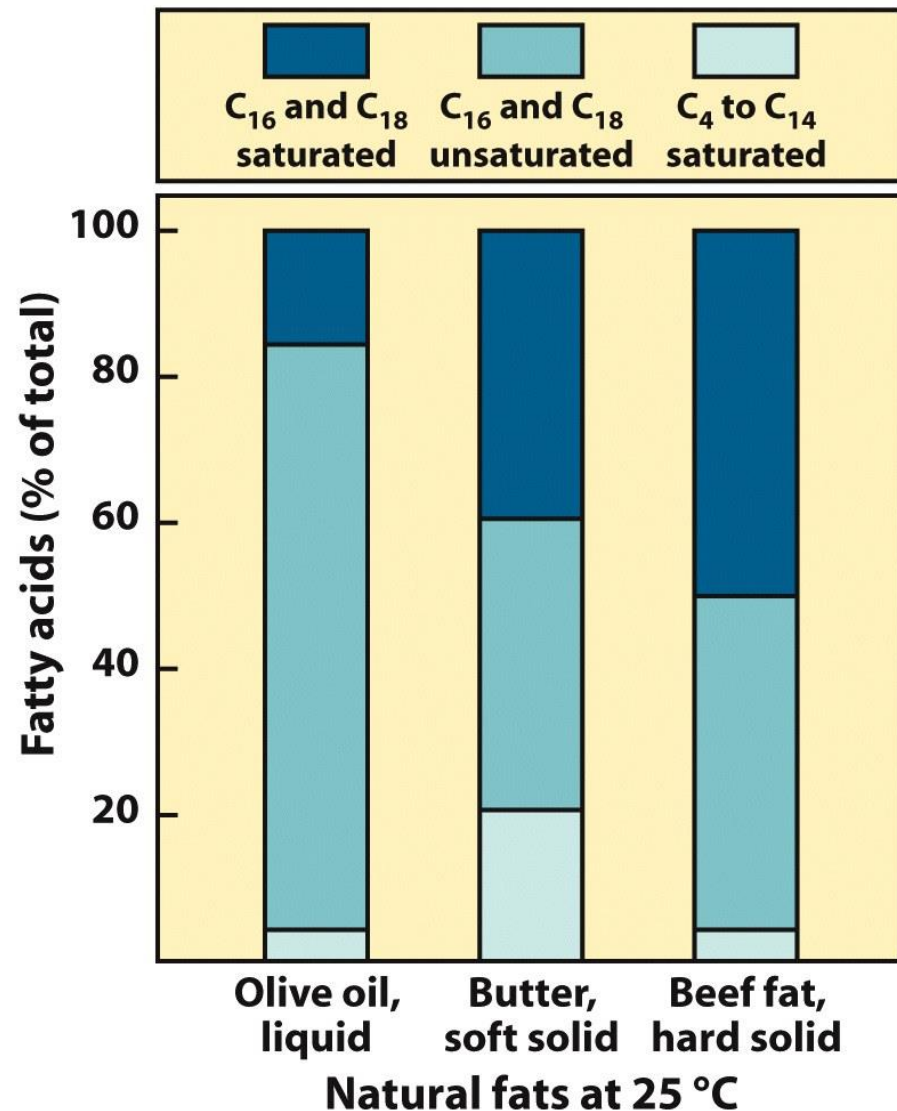
**Figure 10-2cd**  
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- teplota tání roste s délkou řetězce MK
- hlavním faktorem je však (ne)nasyčenost řetězců MK

Carbon skeleton	Melting point (°C)
12:0	44.2
14:0	53.9
16:0	63.1
18:0	69.6
20:0	76.5
24:0	86.0

Carbon skeleton	Melting point (°C)
16:1( $\Delta^9$ )	1 to -0.5
18:1( $\Delta^9$ )	13.4
18:2( $\Delta^{9,12}$ )	1-5
18:3( $\Delta^{9,12,15}$ )	-11
20:4( $\Delta^{5,8,11,14}$ )	-49.5

**Table 10-1**  
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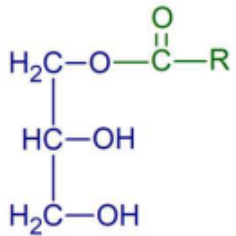


**Figure 10-5**  
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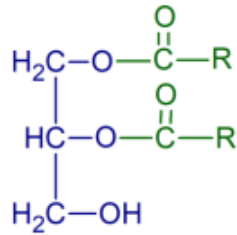


# Acylglyceroly

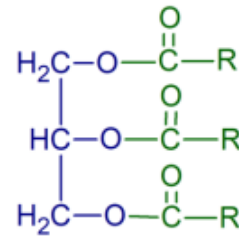
➤ estery MK a glycerolu



monoacylglycerol



diacylglycerol



triacylglycerol

# Vosky

➤ estery MK a vyšších jednosytných alkoholů

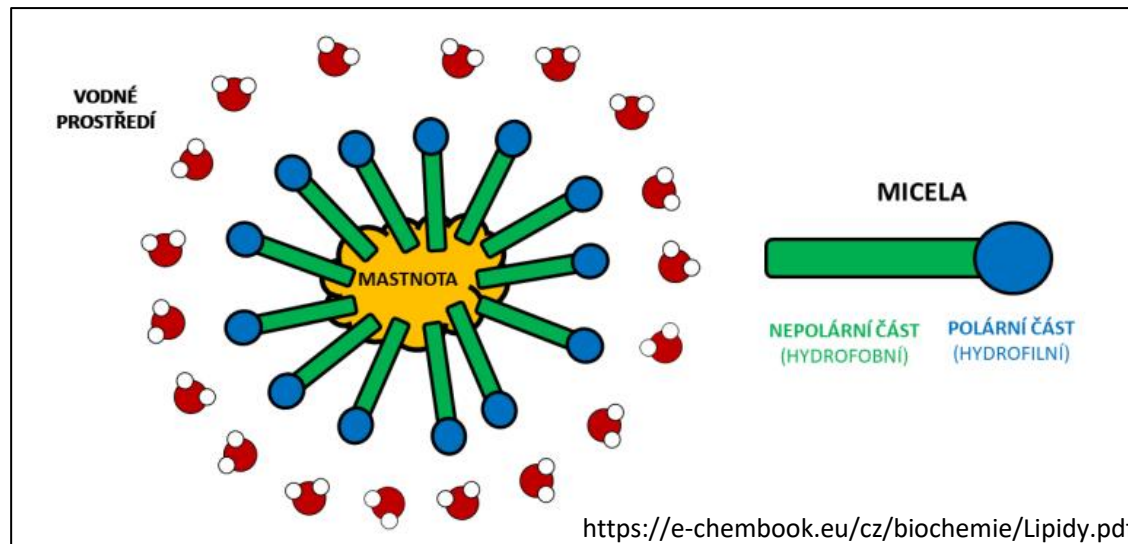
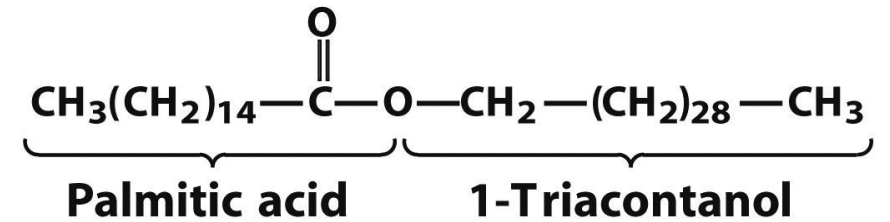
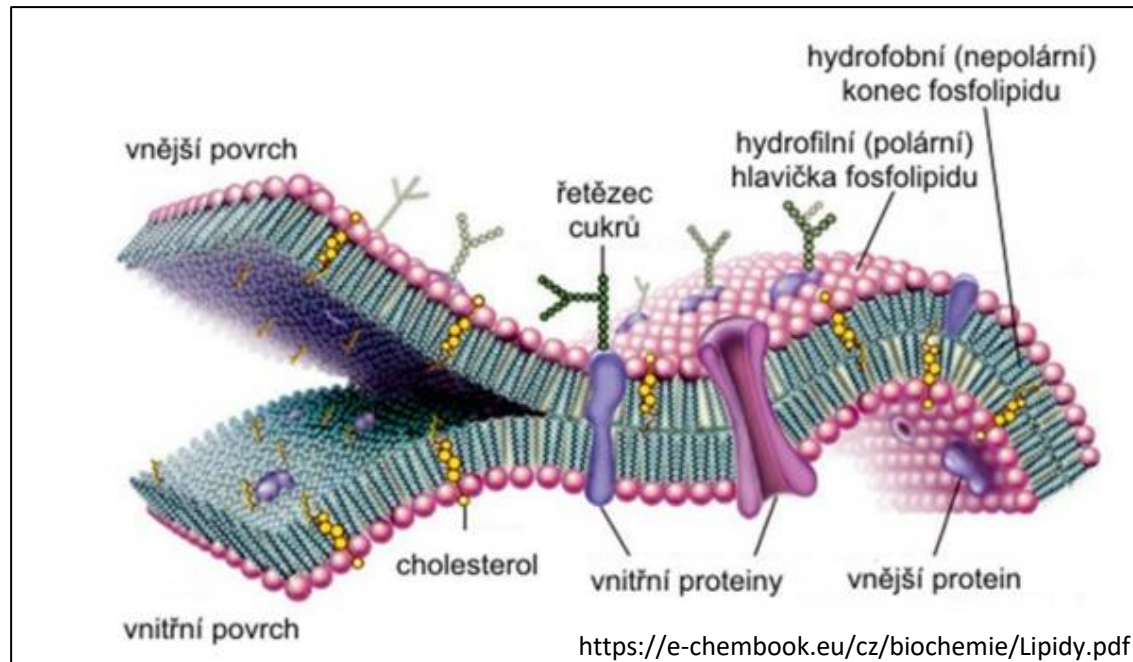
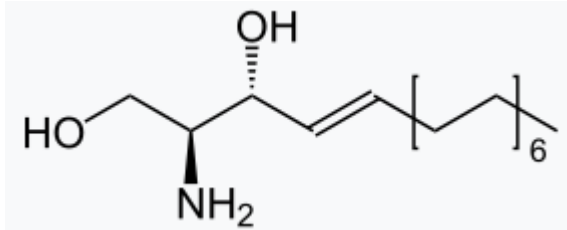
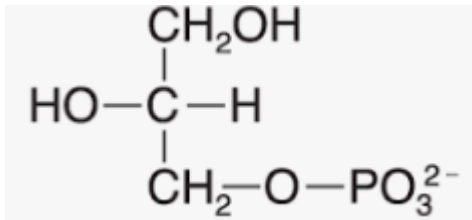


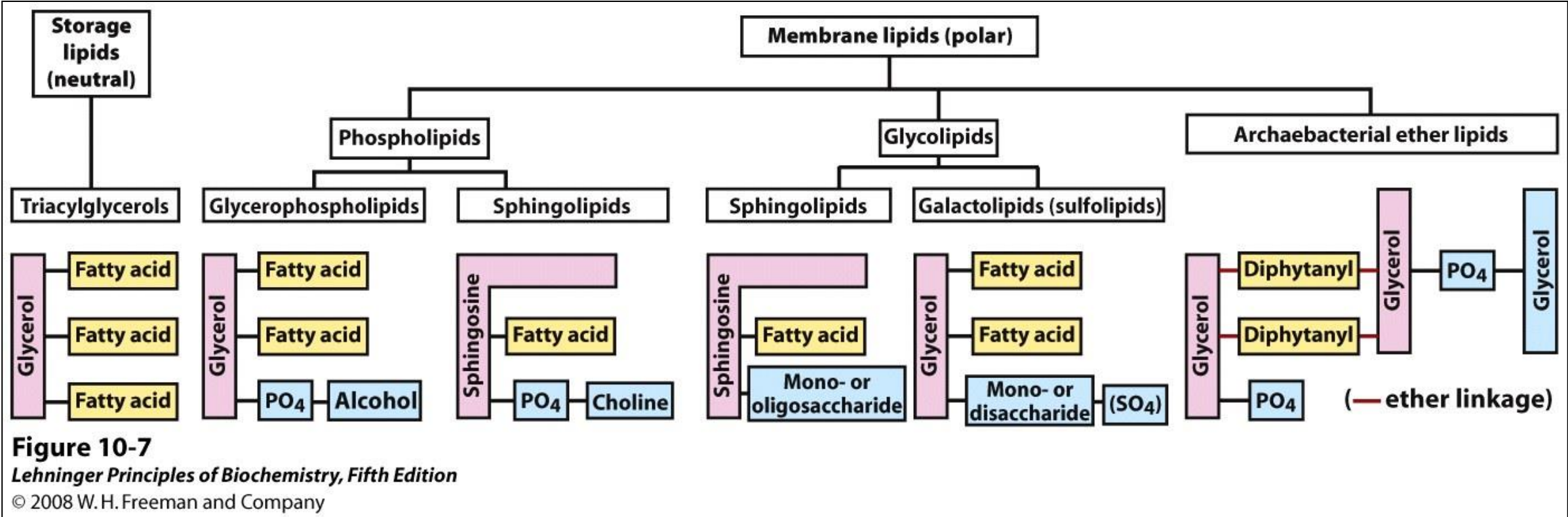
Figure 10-6  
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# Složené lipidy

- **fosfolipidy:** další složkou je kyselina fosforečná
- **sfingolipidy:** další složkou je aminoalkohol sfingosin
- **glykolipidy:** další složkou je sacharid



# Rozdělení lipidů



**Figure 10-7**  
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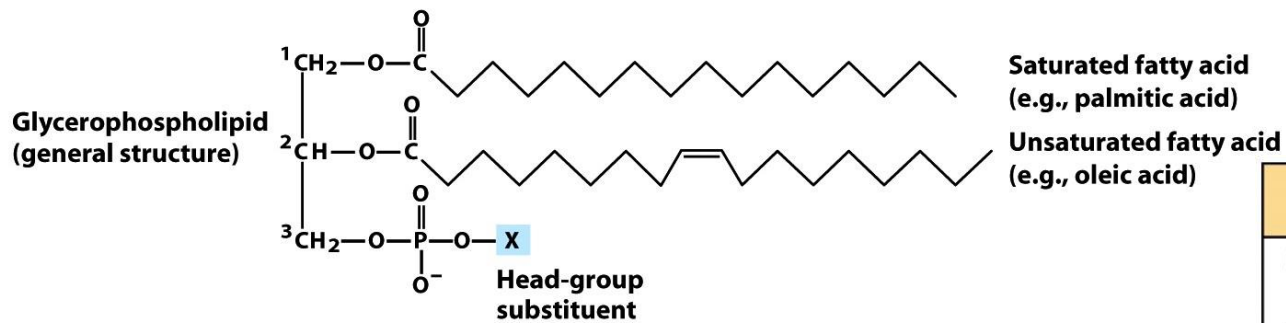


Figure 10-9 part 1  
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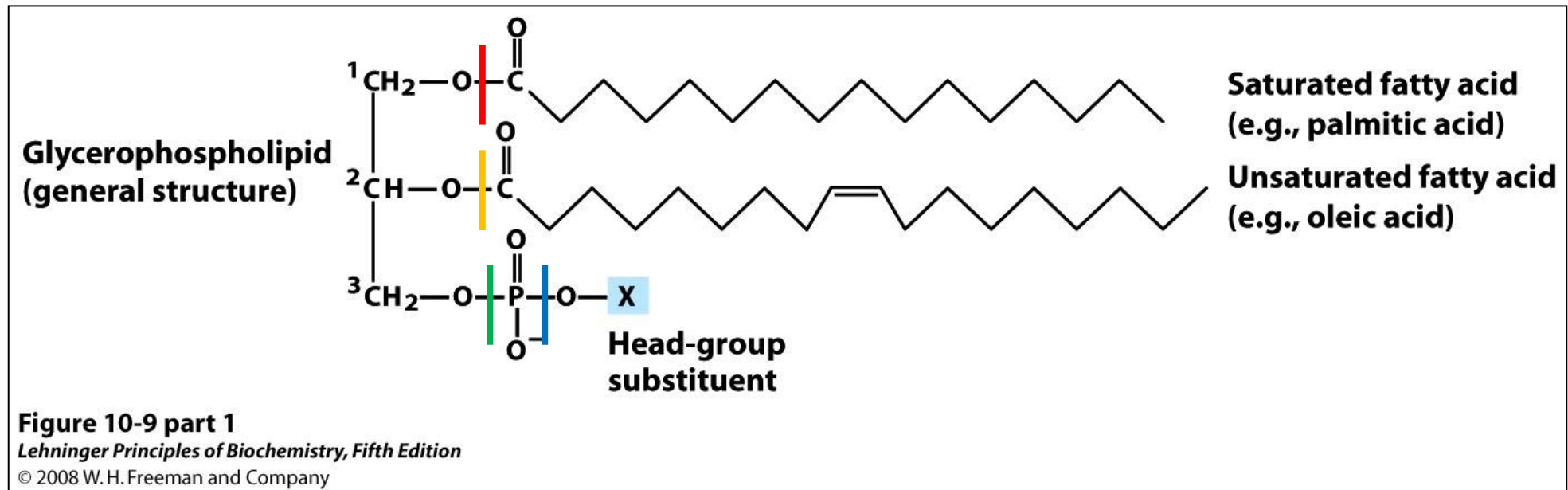
## Některé významné glycerofosfolipidy

Name of glycerophospholipid	Name of X	Formula of X	Net charge (at pH 7)
Phosphatidic acid	—	— H	- 1
Phosphatidylethanolamine	Ethanolamine	— CH <sub>2</sub> —CH <sub>2</sub> —NH <sub>3</sub> <sup>+</sup>	0
Phosphatidylcholine	Choline	— CH <sub>2</sub> —CH <sub>2</sub> —N <sup>+</sup> (CH <sub>3</sub> ) <sub>3</sub>	0
Phosphatidylserine	Serine	— CH <sub>2</sub> —CH <sup>+</sup> (NH <sub>3</sub> )   COO <sup>-</sup>	- 1
Phosphatidylglycerol	Glycerol	— CH <sub>2</sub> —CH(OH)—CH <sub>2</sub> —OH	- 1
Phosphatidylinositol 4,5-bisphosphate	<i>myo</i> -Inositol 4,5-bisphosphate		- 4
Cardiolipin	Phosphatidylglycerol	— CH <sub>2</sub> —   CHOH—   CH <sub>2</sub> —O—P(=O)(O <sup>-</sup> )—O—CH <sub>2</sub> —   CH—O—C(=O)—R <sup>1</sup>   CH <sub>2</sub> —O—C(=O)—R <sup>2</sup>	- 2

Figure 10-9 part 2  
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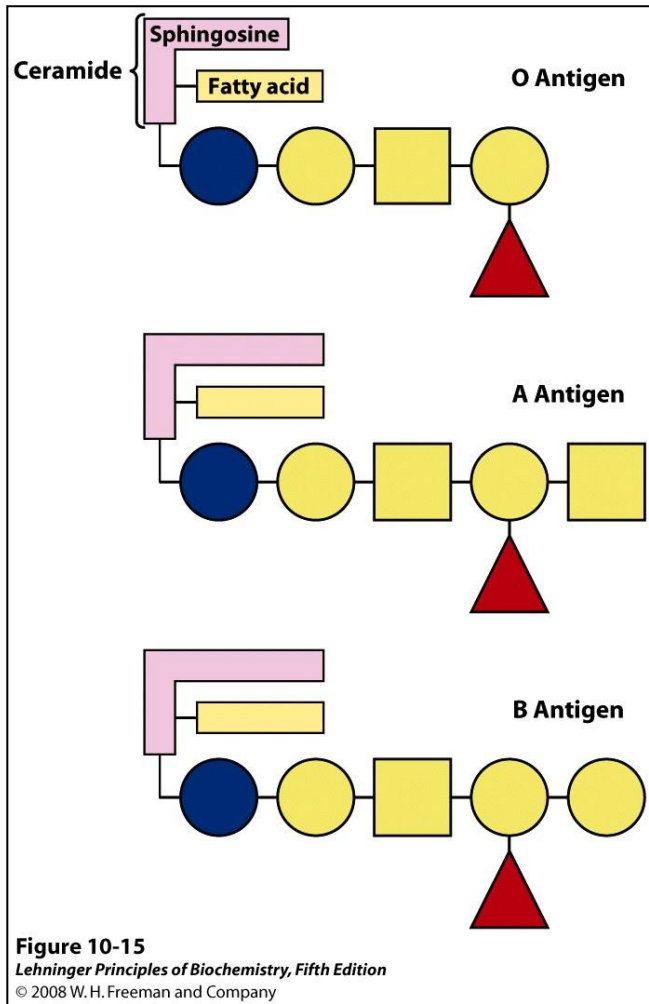
# Enzymatic hydrolysis of glycerophospholipids

effect of phospholipase: A1, A2, C, D

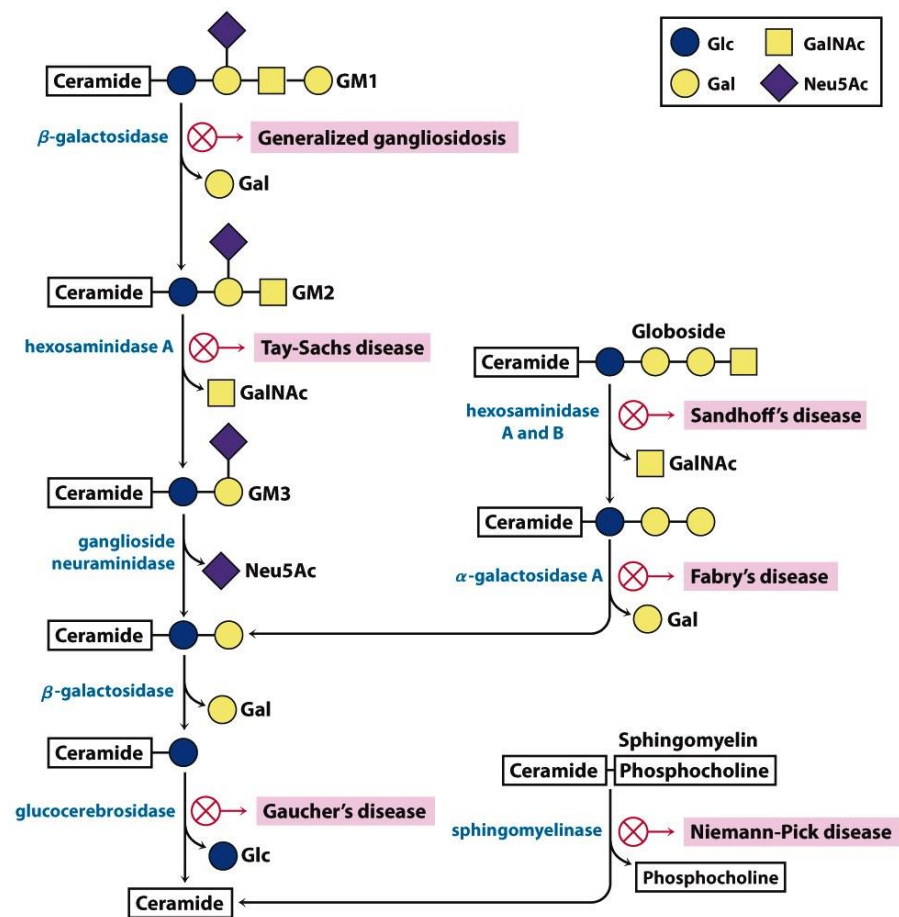


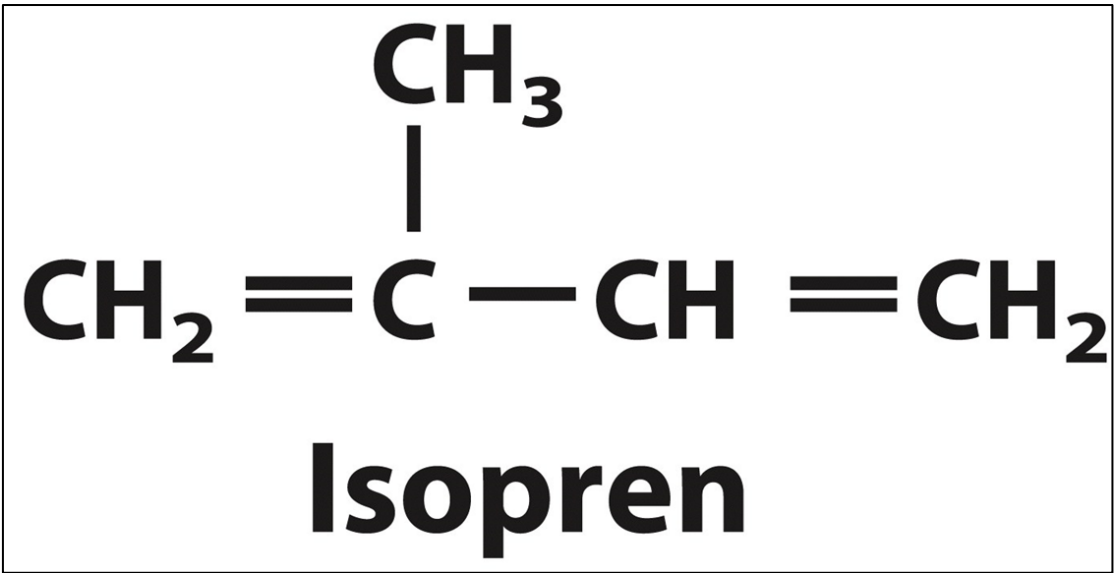
# Významné sfingolipidy (glykolipidy)

antigeny krevních skupin AB0

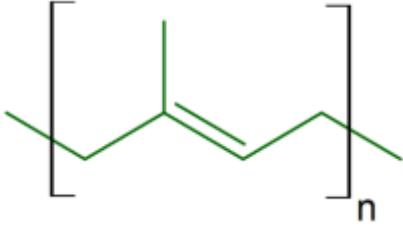
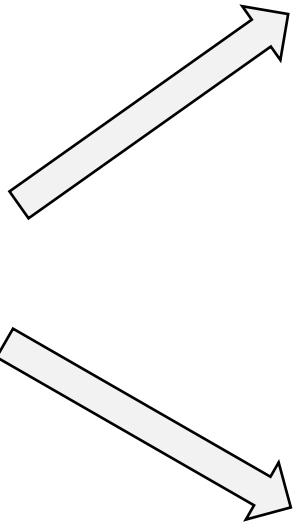


gangliosidy

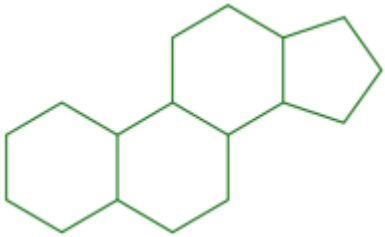




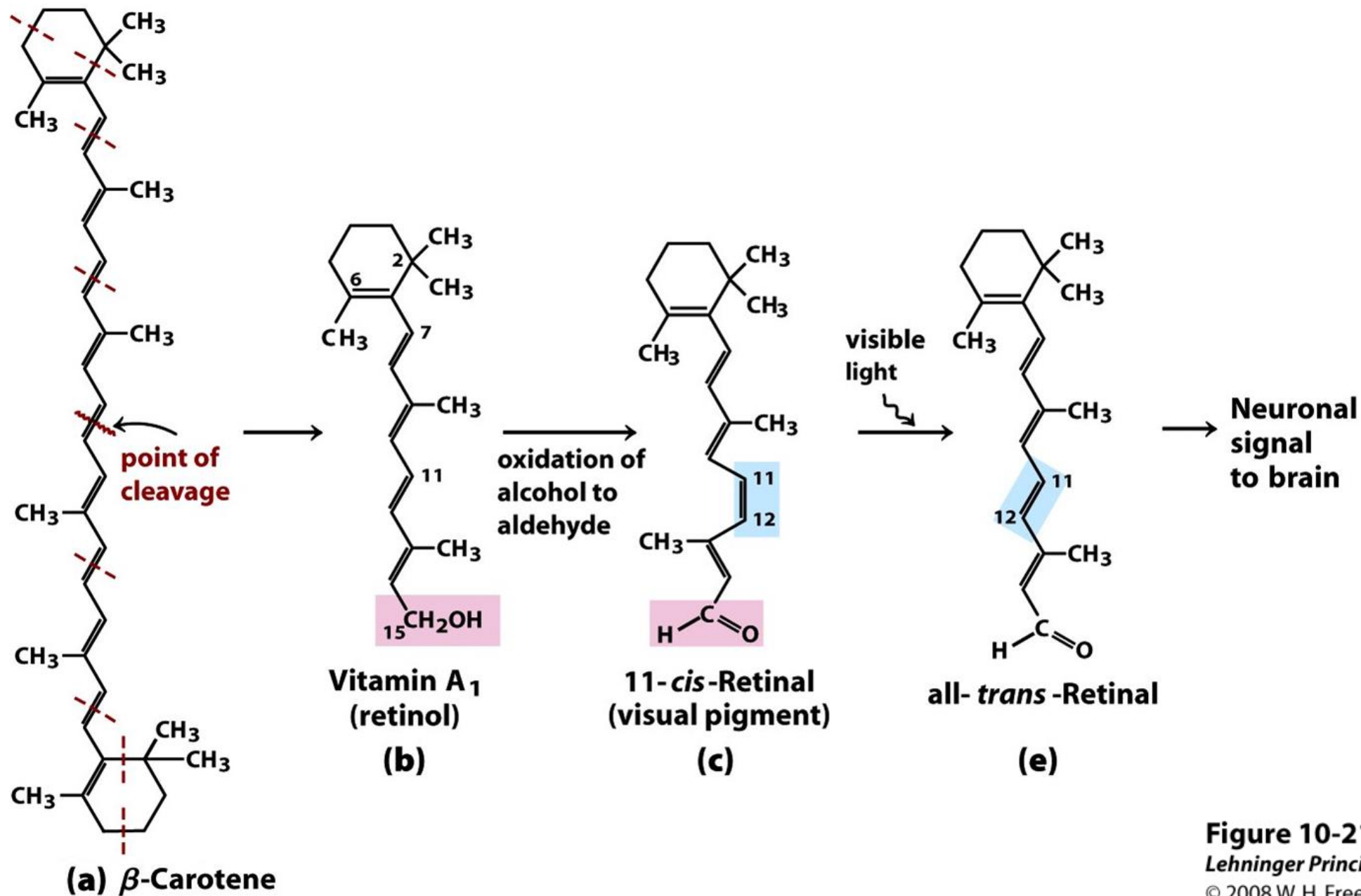
ISOPRENOIDY



Terpeny



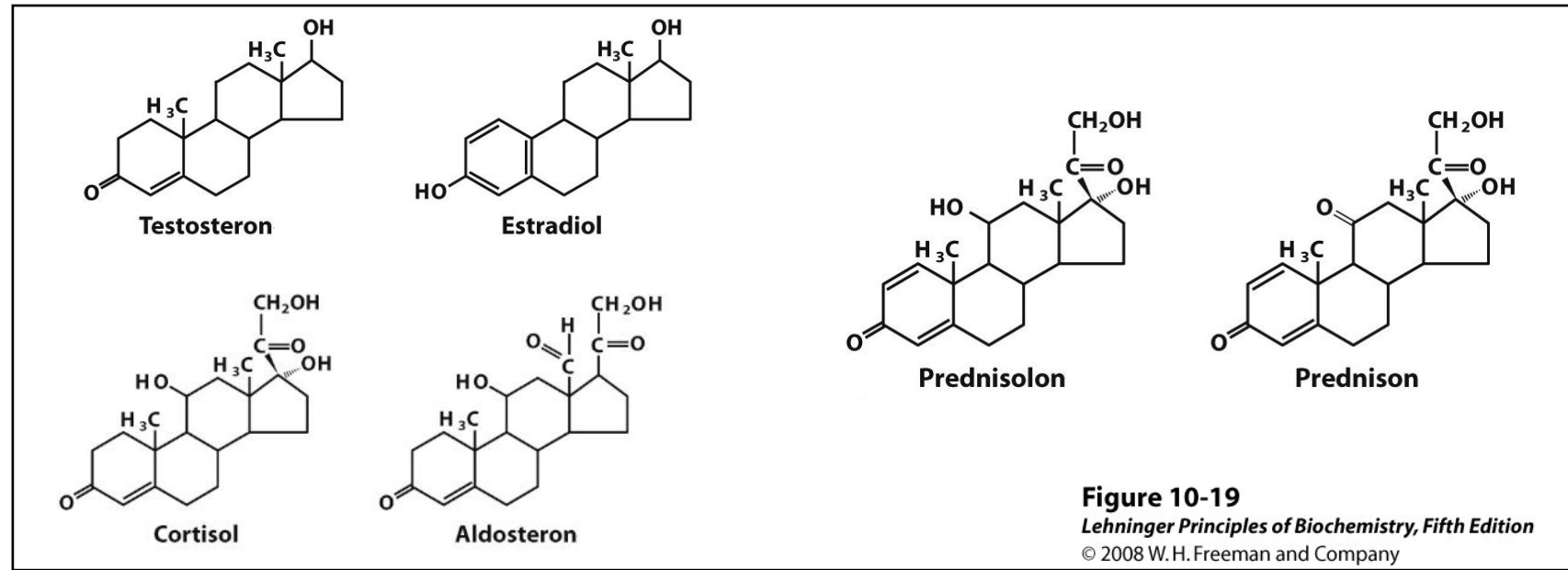
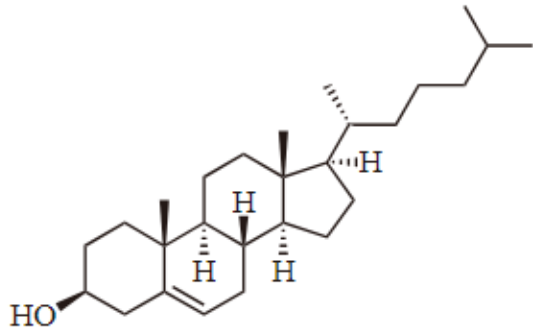
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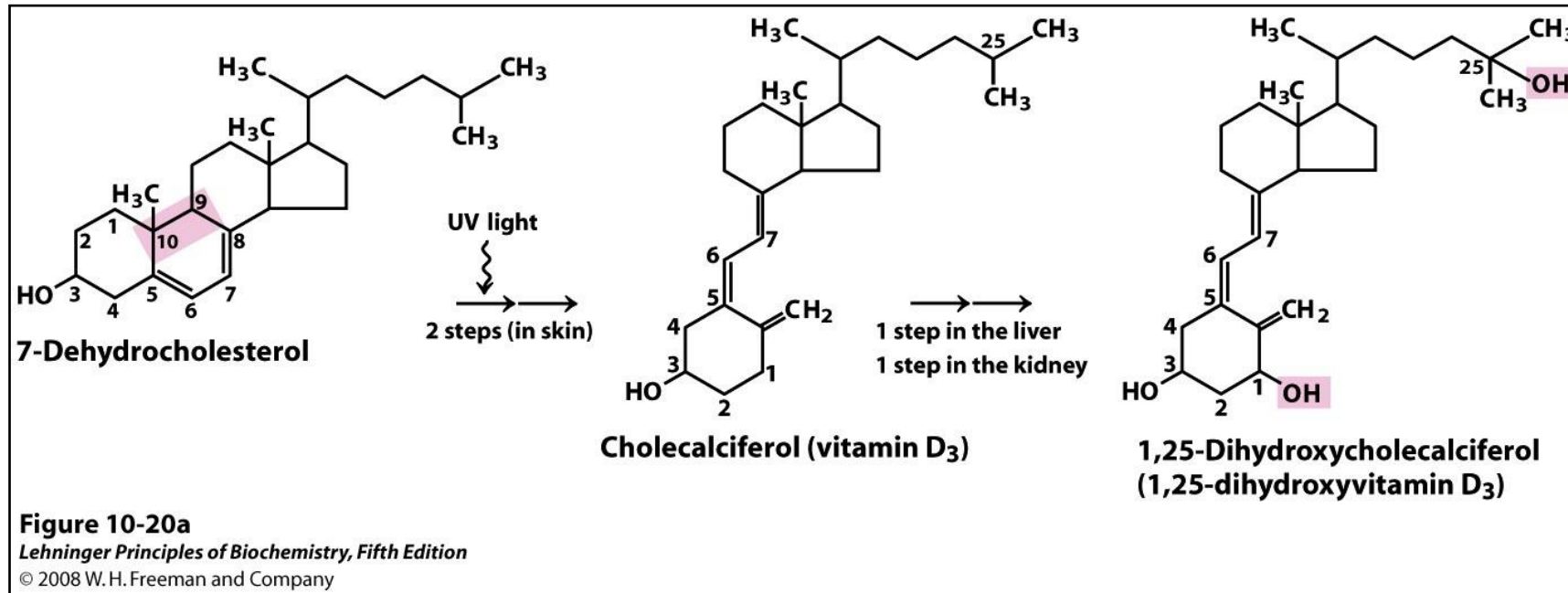
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# Cholesterol



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**Figure 10-20a**  
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