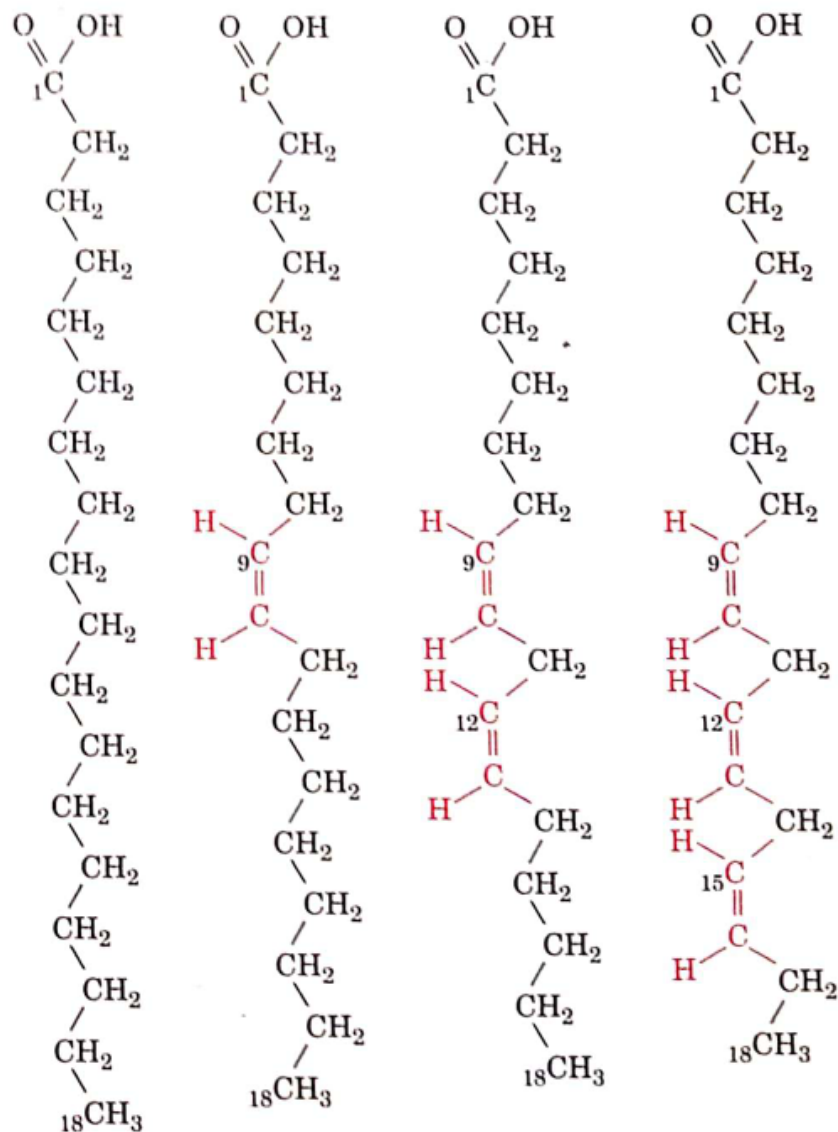


Lipids

Structure



Stearic acid Oleic acid Linoleic acid α-Linolenic acid

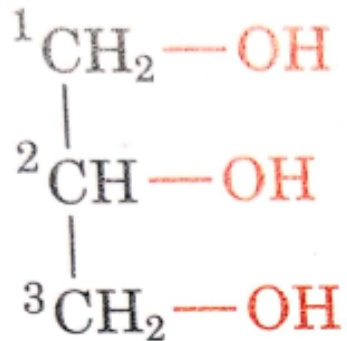
FIGURE 12-1 Structural formulas of some C₁₈ fatty acids. The double bonds all have the cis configuration.

TABLE 12-1 The Common Biological Fatty Acids

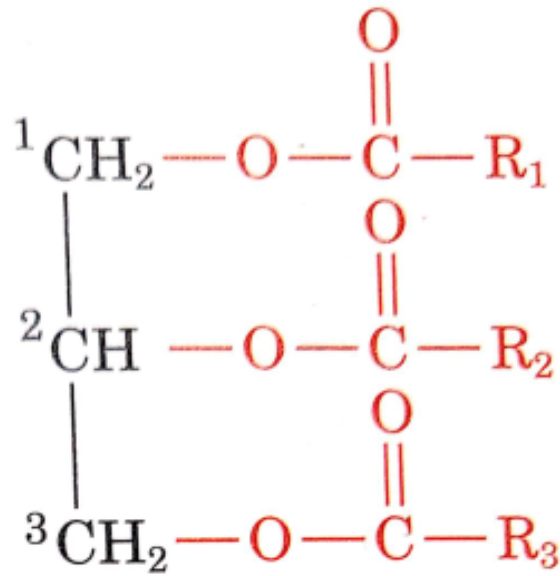
Symbol ^a	Common Name	Systematic Name	Structure	mp (°C)
<i>Saturated fatty acids</i>				
12:0	Lauric acid	Dodecanoic acid	CH ₃ (CH ₂) ₁₀ COOH	44.2
14:0	Myristic acid	Tetradecanoic acid	CH ₃ (CH ₂) ₁₂ COOH	52
16:0	Palmitic acid	Hexadecanoic acid	CH ₃ (CH ₂) ₁₄ COOH	63.1
18:0	Stearic acid	Octadecanoic acid	CH ₃ (CH ₂) ₁₆ COOH	69.6
20:0	Arachidic acid	Eicosanoic acid	CH ₃ (CH ₂) ₁₈ COOH	75.4
22:0	Behenic acid	Docosanoic acid	CH ₃ (CH ₂) ₂₀ COOH	81
24:0	Lignoceric acid	Tetracosanoic acid	CH ₃ (CH ₂) ₂₂ COOH	84.2
<i>Unsaturated fatty acids (all double bonds are cis)</i>				
16:1 _{n-7}	Palmitoleic acid	9-Hexadecenoic acid	CH ₃ (CH ₂) ₅ CH=CH(CH ₂) ₇ COOH	-0.5
18:1 _{n-9}	Oleic acid	9-Octadecenoic acid	CH ₃ (CH ₂) ₇ CH=CH(CH ₂) ₇ COOH	13.4
18:2 _{n-6}	Linoleic acid	9,12-Octadecadienoic acid	CH ₃ (CH ₂) ₄ (CH=CHCH ₂) ₂ (CH ₂) ₆ COOH	-9
18:3 _{n-3}	α-Linolenic acid	9,12,15-Octadecatrienoic acid	CH ₃ CH ₂ (CH=CHCH ₂) ₃ (CH ₂) ₆ COOH	-17
18:3 _{n-6}	γ-Linolenic acid	6,9,12-Octadecatrienoic acid	CH ₃ (CH ₂) ₄ (CH=CHCH ₂) ₃ (CH ₂) ₃ COOH	
20:4 _{n-4}	Arachidonic acid	5,8,11,14-Eicosatetraenoic acid	CH ₃ (CH ₂) ₄ (CH=CHCH ₂) ₄ (CH ₂) ₂ COOH	-49.5
20:5 _{n-3}	EPA	5,8,11,14,17-Eicosapentaenoic acid	CH ₃ CH ₂ (CH=CHCH ₂) ₅ (CH ₂) ₂ COOH	-54
22:6 _{n-3}	DHA	4,7,10,13,16,19-Docosahexenoic acid	CH ₃ CH ₂ (CH=CHCH ₂) ₆ CH ₂ COOH	
24:1 _{n-9}	Nervonic acid	15-Tetracosenoic acid	CH ₃ (CH ₂) ₇ CH=CH(CH ₂) ₁₃ COOH	39

^aNumber of carbon atoms : number of double bonds. For unsaturated fatty acids, *n* is the number of carbon atoms, *n*-*x* is the double-bonded carbon atom, and *x* is the number of that carbon atom counting from the methyl terminal (ω) end of the chain.

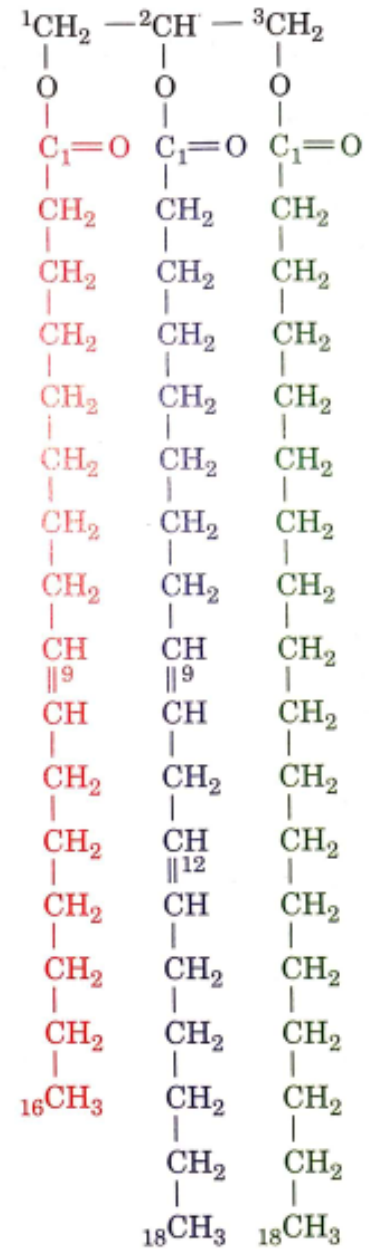
Source: Dawson, R.M.C., Elliott, D.C., Elliott, W.H., and Jones, K.M., *Data for Biochemical Research* (3rd ed.), Chapter 8, Clarendon Press (1986).



Glycerol

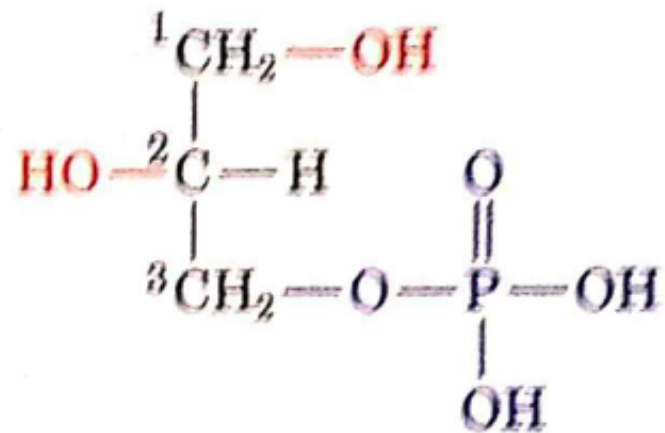


Triacylglycerol



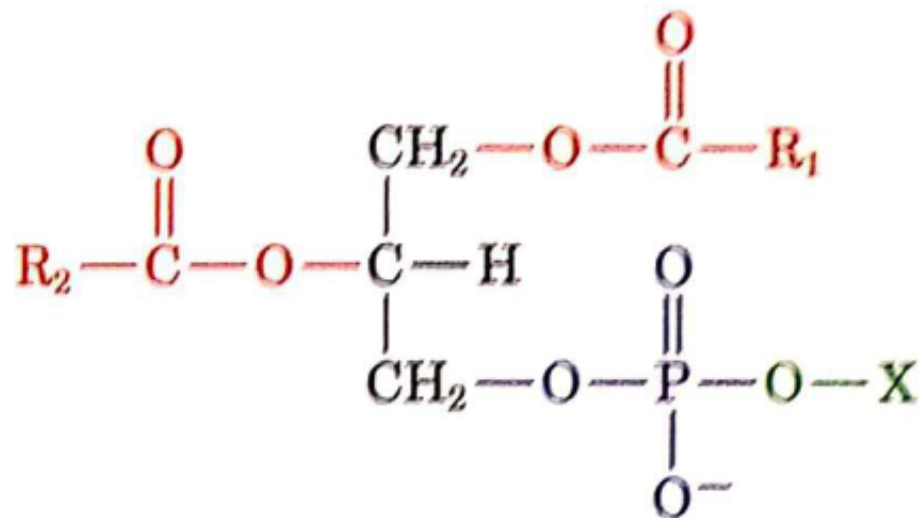
1-Palmitoleoyl-2-linoleoyl-3-stearoyl-glycerol

(a)



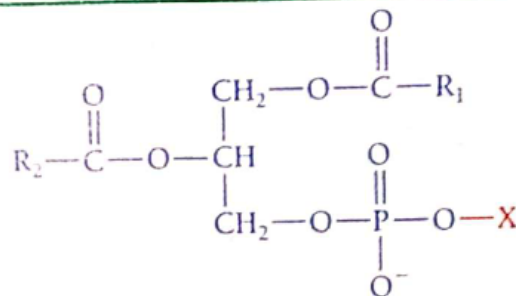
***sn*-Glycerol-3-phosphate**

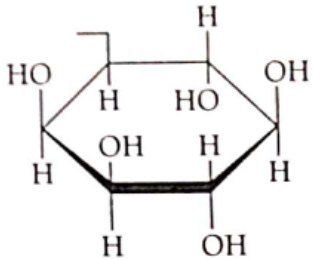
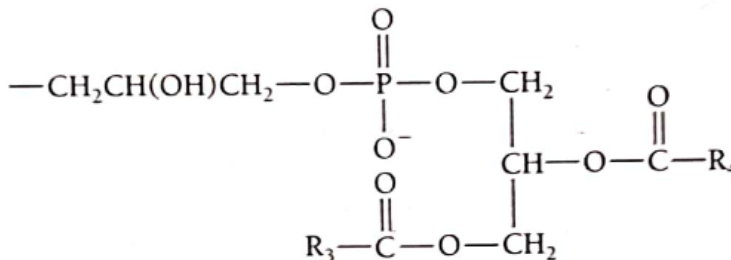
(b)

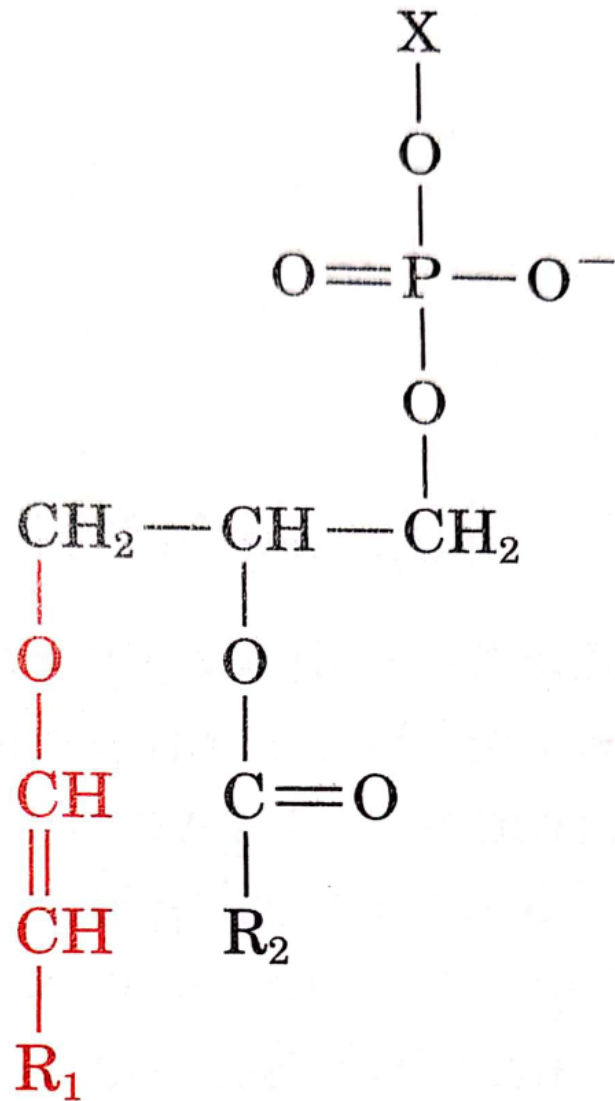


Glycerophospholipid

TABLE 12-2 The Common Classes of Glycerophospholipids

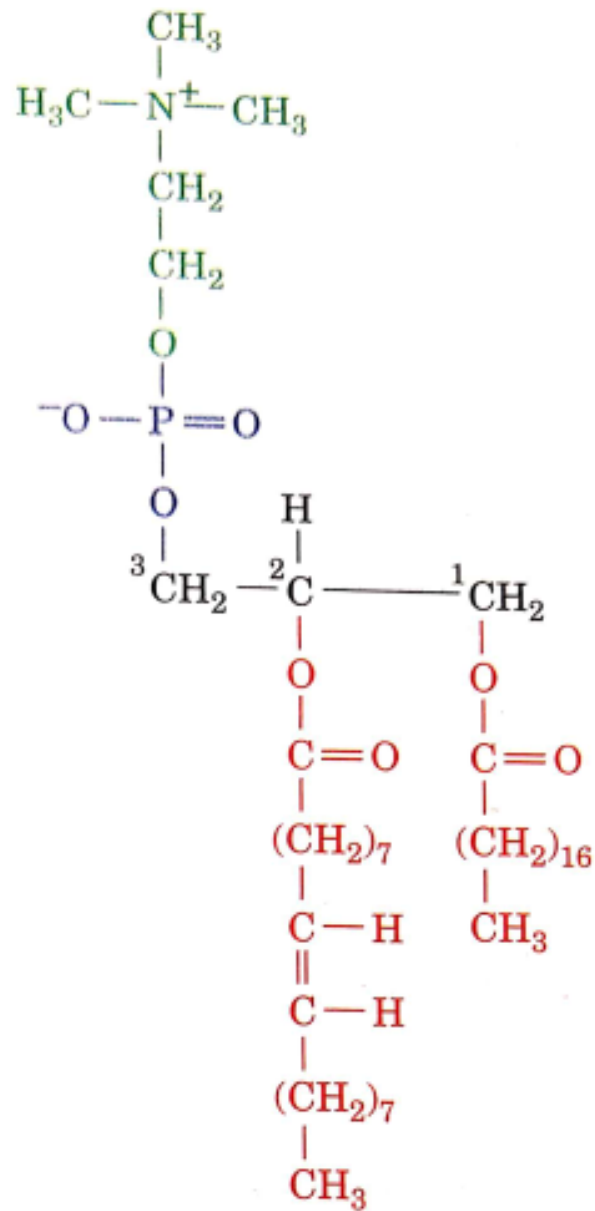


Name of X—OH	Formula of—X	Name of Phospholipid
Water	—H	Phosphatidic acid
Ethanolamine	—CH ₂ CH ₂ NH ₃ ⁺	Phosphatidylethanolamine
Choline	—CH ₂ CH ₂ N(CH ₃) ₃ ⁺	Phosphatidylcholine (lecithin)
Serine	—CH ₂ CH(NH ₃ ⁺)COO ⁻	Phosphatidylserine
<i>myo</i> -Inositol		Phosphatidylinositol
Glycerol	—CH ₂ CH(OH)CH ₂ OH	Phosphatidylglycerol
Phosphatidylglycerol		Diphosphatidylglycerol (cardiolipin)

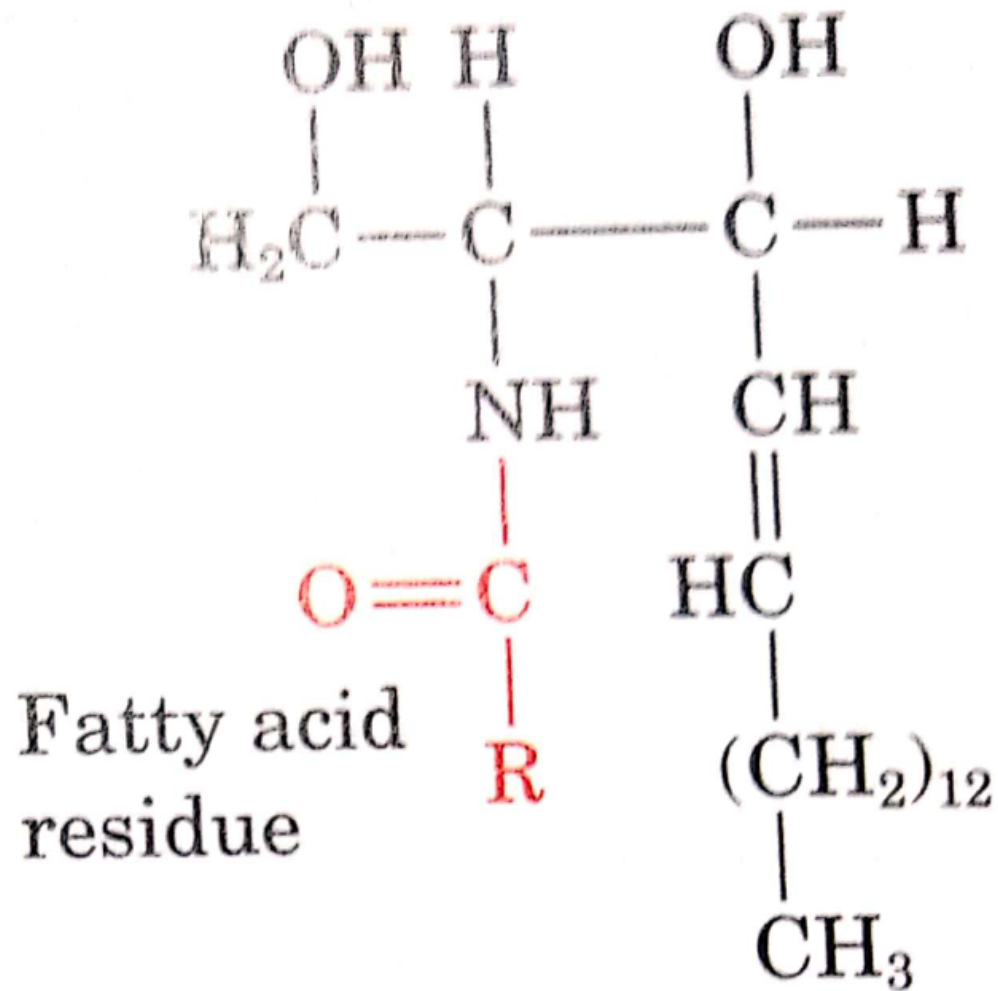


A plasmalogen

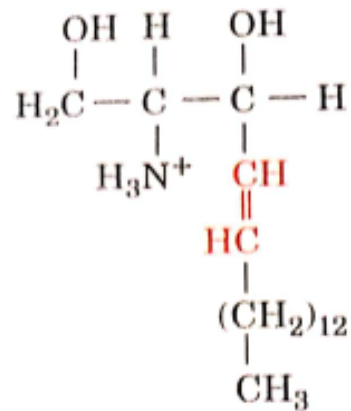
(a)



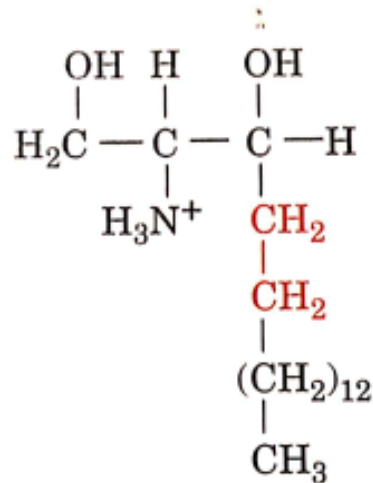
1-Stearoyl-2-oleoyl-3-phosphatidylcholine



A ceramide



Sphingosine

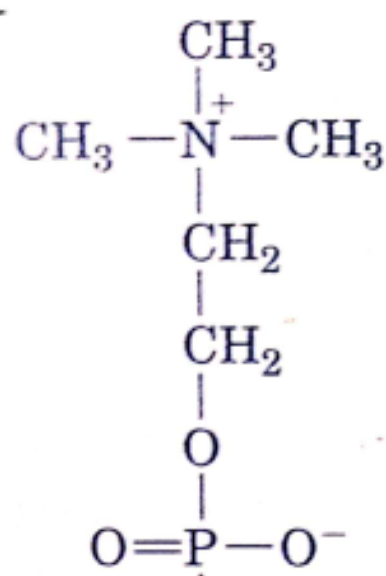


Dihydrosphingosine

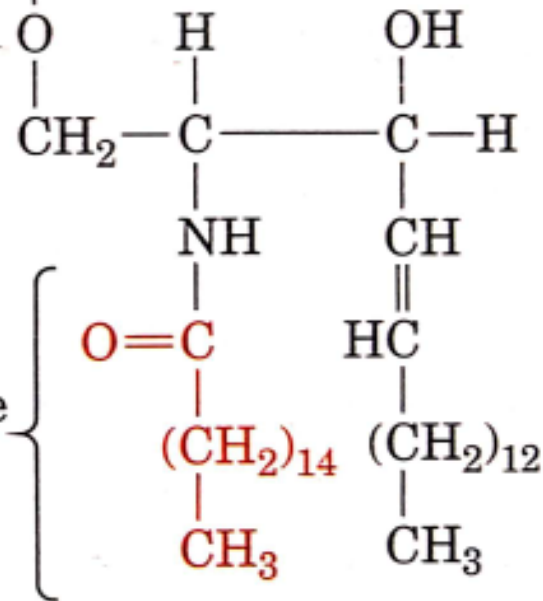
FIGURE 12-5 Molecular formulas of sphingosine and dihydrosphingosine. The chiral centers at C2 and C3 of sphingosine and dihydrosphingosine have the configurations shown in Fischer projection. The double bond in sphingosine has the trans configuration.

(a)

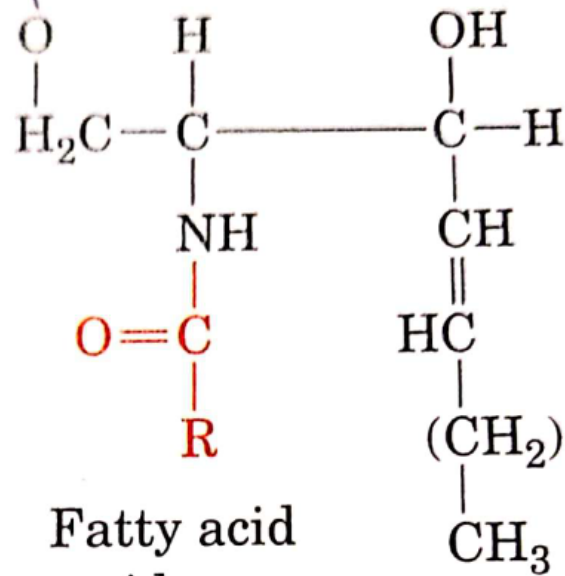
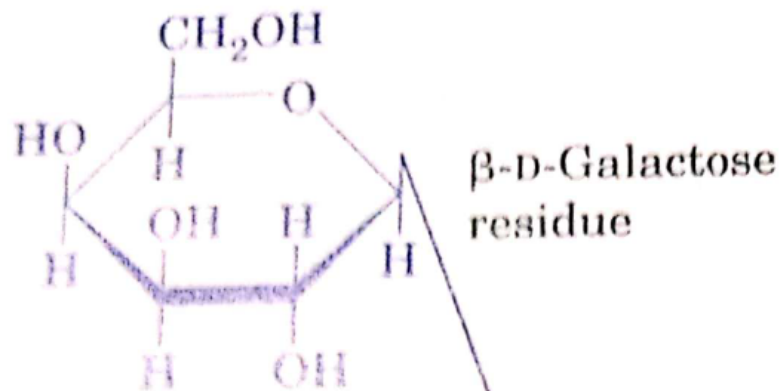
Phosphocholine
head group



Palmitate
residue



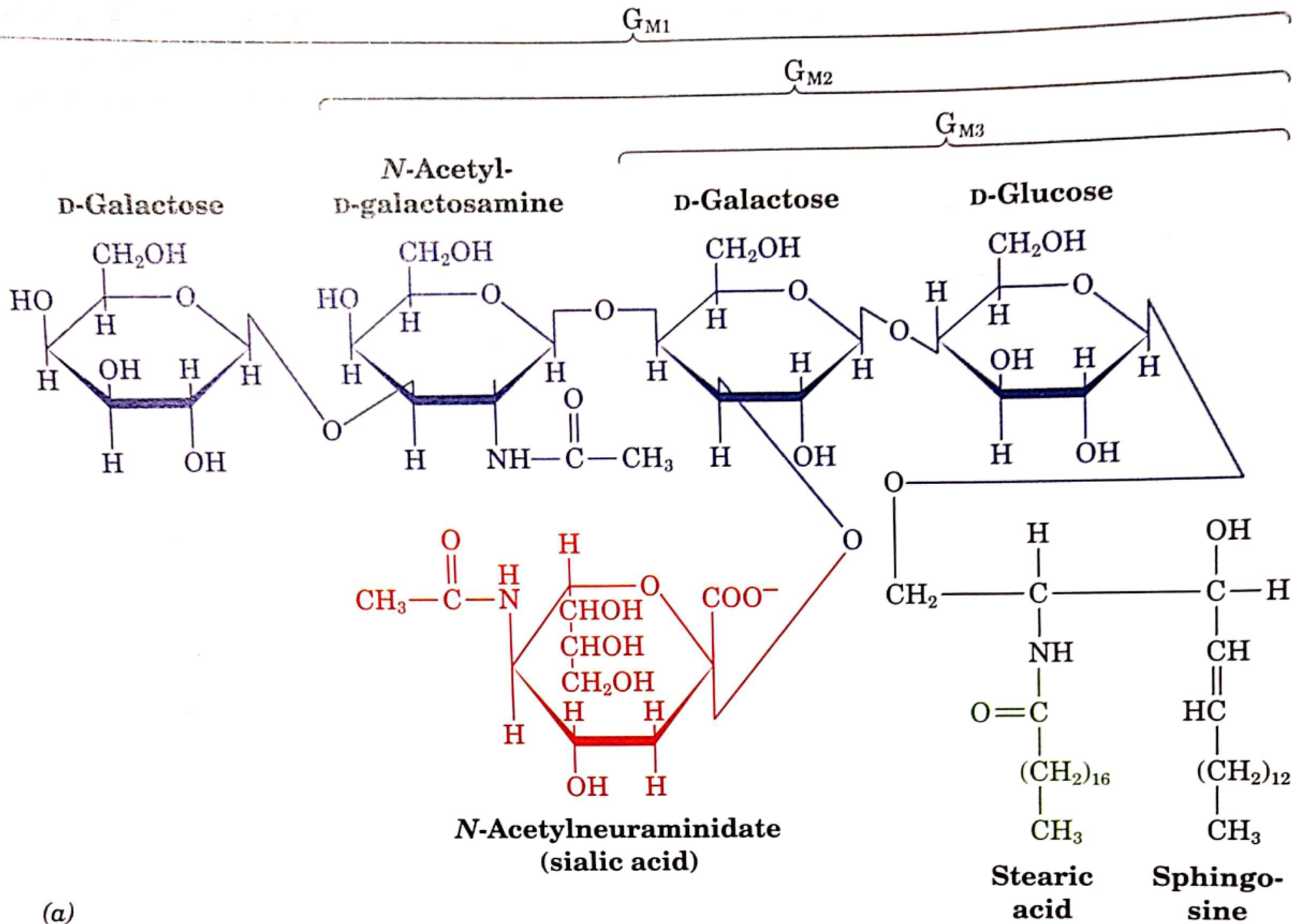
A sphingomyelin



Fatty acid residue

Sphingosine

A galactocerebroside



(a)