Chem 352 – Lecture 6
Part I: Lipids

Question for the Day: Why do phospholipids, when placed in water, spontaneously assemble to form membranes?

1

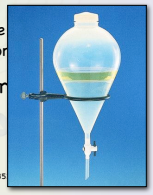
Introduction to Lipids

- Lipids are defined by a physical property instead of a chemical one.
  - Lipids are the non-polar components of a cell which can be extracted with organic solvents
  - While all lipids contain a large non-polar moiety, not all are entirely non-polar.
- Lipids come in many different flavors (structures and functions)

2-1

Introduction to Lipids

- Lipids are defined by a physical property instead of a chemical one.
  - Lipids are the non-polar components of a cell which can be extracted with organic solvents
  - While all lipids contain a large
    moiety, not all are entirely nor
- Lipids come in many differ
  (structures and functions)



2-2

Introduction to Lipids

- Lipids are defined by a physical property instead of a chemical one.
  - Lipids are the non-polar components of a cell which can be extracted with organic solvents
  - While all lipids contain a large non-polar moiety, not all are entirely non-polar.
- Lipids come in many different flavors (structures and functions)

2-3

Introduction to Lipids

- Lipids are defined by a physical property instead of a chemical one.
  - Lipids are the non-polar components of a cell which can be extracted with organic solvents
  - While all lipids contain a large non-polar
    moiety not all are entirely non-polar.
- nany different flavors
  functions)

Dictionary

moi·e·ty | ˈmoiətē | noun or
each of two parts into which a thing is or can be divided.

Wikipedia

Moiety
Moiety may refer to:
- Moiety (chemistry), a part or functional group of a molecule

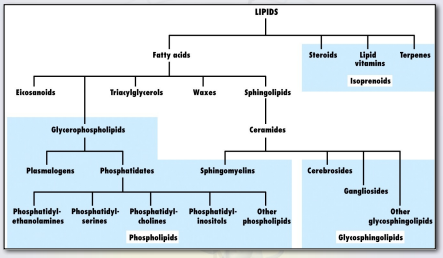
2-4

Introduction to Lipids

- Lipids are defined by a physical property instead of a chemical one.
  - Lipids are the non-polar components of a cell which can be extracted with organic solvents
  - While all lipids contain a large non-polar moiety, not all are entirely non-polar.
- Lipids come in many different flavors (structures and functions)

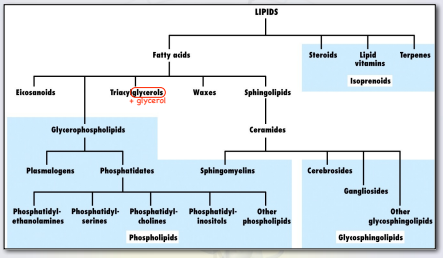
2-5

Introduction to Lipids



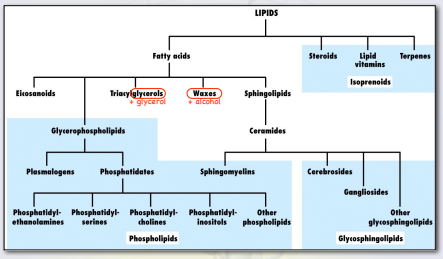
3-1

Introduction to Lipids



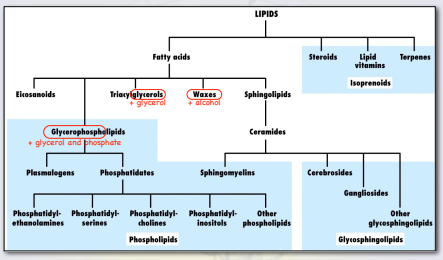
3-2

Introduction to Lipids

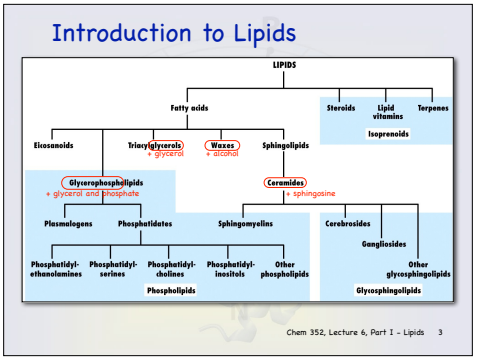


3-3

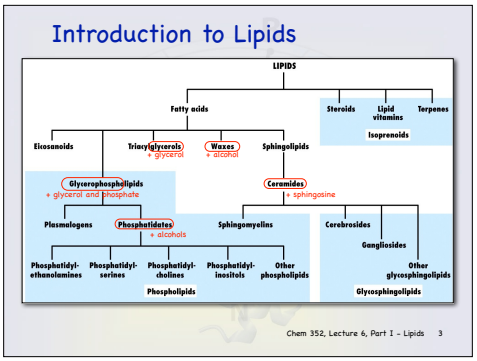
Introduction to Lipids



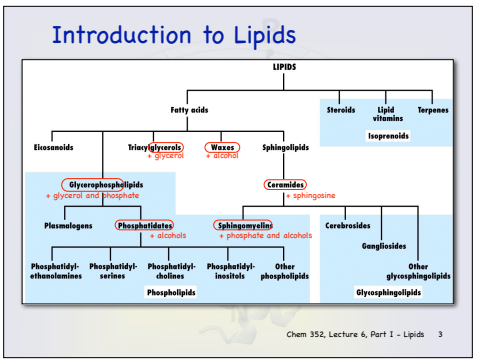
3-4


Introduction to Lipids
LIPIDS
Fatty acids
Steroids
Lipid vitamins
Terpenes
Isoprenoids
Eicosanoids
Triacylglycerols
+ glycerol
Waxes
+ alcohol
Sphingolipids
Glycerophospholipids
+ glycerol and phosphate
Ceramides
+ sphingosine
Plasmalogens
Phosphatidates
Sphingomyelins
Cerebrosides
Gangliosides
Phosphatidyl-ethanolamines
Phosphatidyl-serines
Phosphatidyl-cholines
Phosphatidyl-inositols
Other phospholipids
Other glycosphingolipids
Phospholipids
Glycosphingolipids
Chem 352, Lecture 6, Part I - Lipids 3

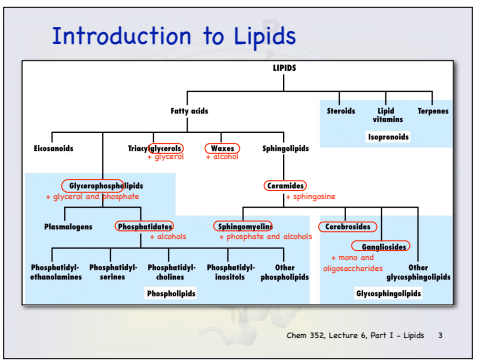
3-5


Introduction to Lipids
LIPIDS
Fatty acids
Steroids
Lipid vitamins
Terpenes
Isoprenoids
Eicosanoids
Triacylglycerols
+ glycerol
Waxes
+ alcohol
Sphingolipids
Glycerophospholipids
+ glycerol and phosphate
Ceramides
+ sphingosine
Plasmalogens
Phosphatidates
+ alcohols
Sphingomyelins
Cerebrosides
Gangliosides
Phosphatidyl-ethanolamines
Phosphatidyl-serines
Phosphatidyl-cholines
Phosphatidyl-inositols
Other phospholipids
Other glycosphingolipids
Phospholipids
Glycosphingolipids
Chem 352, Lecture 6, Part I - Lipids 3

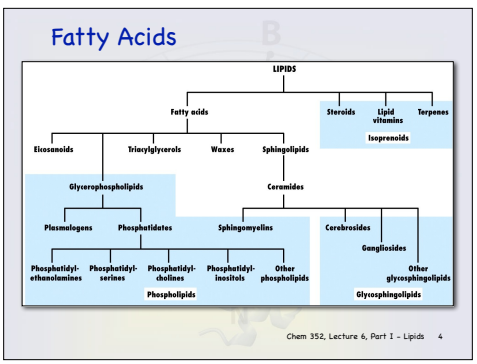
3-6


Introduction to Lipids
LIPIDS
Fatty acids
Steroids
Lipid vitamins
Terpenes
Isoprenoids
Eicosanoids
Triacylglycerols
+ glycerol
Waxes
+ alcohol
Sphingolipids
Glycerophospholipids
+ glycerol and phosphate
Ceramides
+ sphingosine
Plasmalogens
Phosphatidates
+ alcohols
Sphingomyelins
Cerebrosides
Gangliosides
Phosphatidyl-ethanolamines
Phosphatidyl-serines
Phosphatidyl-cholines
Phosphatidyl-inositols
Other phospholipids
Other glycosphingolipids
Phospholipids
Glycosphingolipids
Chem 352, Lecture 6, Part I - Lipids 3

3-7


Introduction to Lipids
LIPIDS
Fatty acids
Steroids
Lipid vitamins
Terpenes
Isoprenoids
Eicosanoids
Triacylglycerols
+ glycerol
Waxes
+ alcohol
Sphingolipids
Glycerophospholipids
+ glycerol and phosphate
Ceramides
+ sphingosine
Plasmalogens
Phosphatidates
+ alcohols
Sphingomyelins
+ phosphate and alcohols
Cerebrosides
Gangliosides
Phosphatidyl-ethanolamines
Phosphatidyl-serines
Phosphatidyl-cholines
Phosphatidyl-inositols
Other phospholipids
Other glycosphingolipids
Phospholipids
Glycosphingolipids
Chem 352, Lecture 6, Part I - Lipids 3

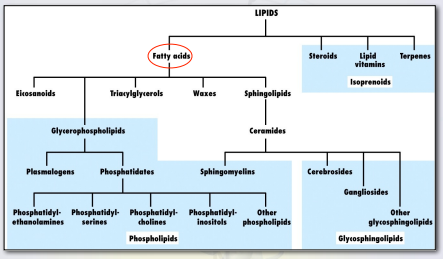
3-8


Introduction to Lipids
LIPIDS
Fatty acids
Steroids
Lipid vitamins
Terpenes
Isoprenoids
Eicosanoids
Triacylglycerols
+ glycerol
Waxes
+ alcohol
Sphingolipids
Glycerophospholipids
+ glycerol and phosphate
Ceramides
+ sphingosine
Plasmalogens
Phosphatidates
+ alcohols
Sphingomyelins
+ phosphate and alcohols
Cerebrosides
Gangliosides
+ mono and oligosaccharides
Phosphatidyl-ethanolamines
Phosphatidyl-serines
Phosphatidyl-cholines
Phosphatidyl-inositols
Other phospholipids
Other glycosphingolipids
Phospholipids
Glycosphingolipids
Chem 352, Lecture 6, Part I - Lipids 3

4-1

Fatty Acids
LIPIDS
Fatty acids
Steroids
Lipid vitamins
Terpenes
Isoprenoids
Eicosanoids
Triacylglycerols
Waxes
Sphingolipids
Glycerophospholipids
Ceramides
Plasmalogens
Phosphatidates
Sphingomyelins
Cerebrosides
Gangliosides
Phosphatidyl-ethanolamines
Phosphatidyl-serines
Phosphatidyl-cholines
Phosphatidyl-inositols
Other phospholipids
Other glycosphingolipids
Phospholipids
Glycosphingolipids
Chem 352, Lecture 6, Part I - Lipids 4

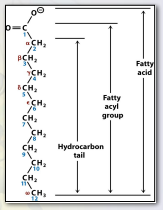
Fatty Acids



4-2

Fatty Acids

- Fatty acids contain
  - A carboxylic acid group
  - A long aliphatic chain

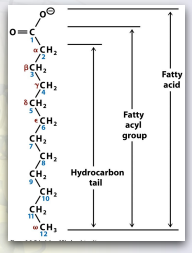


5

Fatty Acids

The carboxyl group has a pKa of 4-5

- Is charged at neutral pH values
- The salts of fatty acids are "soaps"

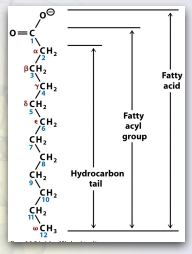


6-1

Fatty Acids

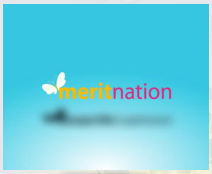
The carboxyl group has a pKa of 4-5

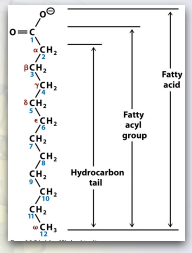
- Is charged at neutral pH values
- The salts of fatty acids are "soaps"



6-2

Fatty Acids



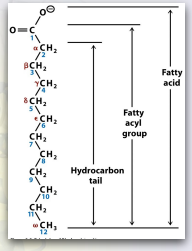


6-3

Fatty Acids

The carboxyl group has a pKa of 4-5

- Is charged at neutral pH values
- The salts of fatty acids are "soaps"



6-4

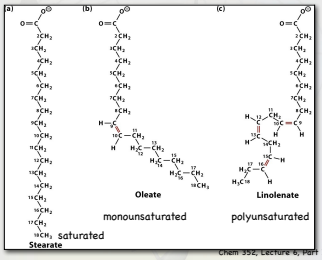
Fatty Acids

TABLE 9.1 Some common fatty acids (anionic forms)

Number of carbons	Number of double bonds	Common name	IUPAC name	Melting point, °C	Molecular formula
12	0	Laurate	Dodecanoate	44	$CH_3(CH_2)_{10}COO^{\ominus}$
14	0	Myristate	Tetradecanoate	52	$CH_3(CH_2)_{12}COO^{\ominus}$
16	0	Palmitate	Hexadecanoate	63	$CH_3(CH_2)_{14}COO^{\ominus}$
18	0	Stearate	Octadecanoate	70	$CH_3(CH_2)_{16}COO^{\ominus}$
20	0	Arachidate	Eicosanoate	75	$CH_3(CH_2)_{18}COO^{\ominus}$
22	0	Behenate	Docosanoate	81	$CH_3(CH_2)_{20}COO^{\ominus}$
24	0	Lignocerate	Tetracosanoate	84	$CH_3(CH_2)_{22}COO^{\ominus}$
16	1	Palmitoleate	cis-Δ^9-Hexadecenoate	−0.5	$CH_3(CH_2)_5CH{=}CH(CH_2)_7COO^{\ominus}$
18	1	Oleate	cis-Δ^9-Octadecenoate	13	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COO^{\ominus}$
18	2	Linoleate	cis, cis-$\Delta^{9,12}$-Octadecadienoate	−9	$CH_3(CH_2)_4(CH{=}CHCH_2)_2(CH_2)_6COO^{\ominus}$
18	3	Linolenate	all cis-$\Delta^{9,12,15}$-Octadecatrienoate	−17	$CH_3CH_2(CH{=}CHCH_2)_3(CH_2)_6COO^{\ominus}$
20	4	Arachidonate	all cis-$\Delta^{5,8,11,14}$-Eicosatetraenoate	−49	$CH_3(CH_2)_4(CH{=}CHCH_2)_4(CH_2)_2COO^{\ominus}$

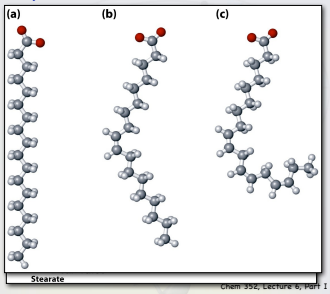
7

Fatty Acids



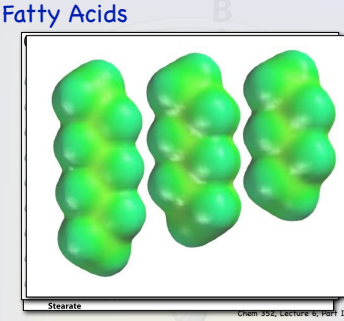
8-1

Fatty Acids



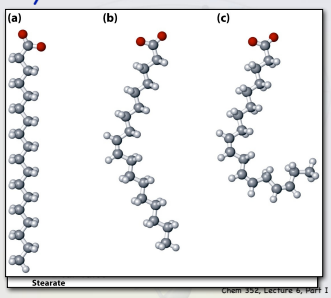
8-2

Fatty Acids



8-3

Fatty Acids



8-4

Fatty Acids

TABLE 9.1 Some common fatty acids (anionic forms)

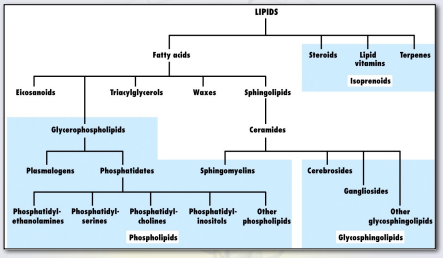
Number of carbons	Number of double bonds	Common name	IUPAC name	Melting point, °C	Molecular formula
12	0	Laurate	Dodecanoate	44	$CH_3(CH_2)_{10}COO^{\ominus}$
14	0	Myristate	Tetradecanoate	52	$CH_3(CH_2)_{12}COO^{\ominus}$
16	0	Palmitate	Hexadecanoate	63	$CH_3(CH_2)_{14}COO^{\ominus}$
18	0	Stearate	Octadecanoate	70	$CH_3(CH_2)_{16}COO^{\ominus}$
20	0	Arachidate	Eicosanoate	75	$CH_3(CH_2)_{18}COO^{\ominus}$
22	0	Behenate	Docosanoate	81	$CH_3(CH_2)_{20}COO^{\ominus}$
24	0	Lignocerate	Tetracosanoate	84	$CH_3(CH_2)_{22}COO^{\ominus}$
16	1	Palmitoleate	cis-Δ^9-Hexadecenoate	−0.5	$CH_3(CH_2)_5CH{=}CH(CH_2)_7COO^{\ominus}$
18	1	Oleate	cis-Δ^9-Octadecenoate	13	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COO^{\ominus}$
18	2	Linoleate	cis,cis-$\Delta^{9,12}$-Octadecadienoate	−9	$CH_3(CH_2)_4CH{=}CHCH_2CH{=}CH(CH_2)_6COO^{\ominus}$
18	3	Linolenate	all cis-$\Delta^{9,12,15}$-Octadecatrienoate	−17	$CH_3CH_2(CH{=}CHCH_2)_3(CH_2)_6COO^{\ominus}$
20	4	Arachidonate	all cis-$\Delta^{5,8,11,14}$-Eicosatetraenoate	−49	$CH_3(CH_2)_4(CH{=}CHCH_2)_4CH_2COO^{\ominus}$

8-5

Fatty Acids

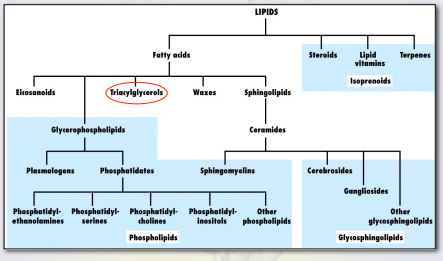
8-6

Triacylglycerols



9-1

Triacylglycerols



9-2

Triacylglycerols

- Triacylglycerols are also called
  - Fat
  - Oil
  - Triglycerides
- They are a chemical combination of glycerol and three fatty acids.
- They represent a storage form of fatty acids.

10-1

Triacylglycerols

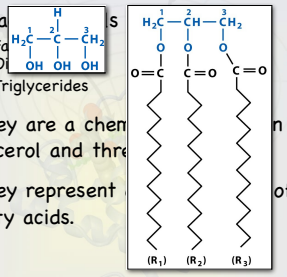
- Triacylglycerols are also called
  - Fat
  - Oil
  - Triglycerides
- They are a chemical combination of glycerol and three fatty acids.
- They represent a storage form of fatty acids.

Chem 352, Lecture 6, Part I - Lipids 10

10-2

Triacylglycerols

- Tria s
  - Fa
  - Oi
  - Triglycerides
- They are a chem n of glycerol and thre
- They represent of fatty acids.



Chem 352, Lecture 6, Part I - Lipids 10

10-3

Triacylglycerols

- Triacylglycerols are also called
  - Fat
  - Oil
  - Triglycerides
- They are a chemical combination of glycerol and three fatty acids.
- They represent a storage form of fatty acids.

Chem 352, Lecture 6, Part I - Lipids 10

10-4

Triacylglycerols

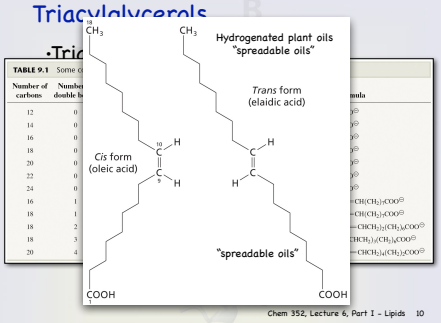
- Triacylglycerols are also called

TABLE 9.1 Some common fatty acids (anionic forms)

Number of carbons	Number of double bonds	Common name	IUPAC name	Melting point, °C	Molecular formula
12	0	Laurate	Dodecanoate	44	$CH_3(CH_2)_{10}COO^{\ominus}$
14	0	Myristate	Tetradecanoate	52	$CH_3(CH_2)_{12}COO^{\ominus}$
16	0	Palmitate	Hexadecanoate	63	$CH_3(CH_2)_{14}COO^{\ominus}$
18	0	Stearate	Octadecanoate	70	$CH_3(CH_2)_{16}COO^{\ominus}$
20	0	Arachidate	Eicosanoate	75	$CH_3(CH_2)_{18}COO^{\ominus}$
22	0	Behenate	Docosanoate	81	$CH_3(CH_2)_{20}COO^{\ominus}$
24	0	Lignocerate	Tetracosanoate	84	$CH_3(CH_2)_{22}COO^{\ominus}$
16	1	Palmitoleate	cis-Δ^9-Hexadecenoate	−0.5	$CH_3(CH_2)_5CH{=}CH(CH_2)_7COO^{\ominus}$
18	1	Oleate	cis-Δ^9-Octadecenoate	13	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COO^{\ominus}$
18	2	Linoleate	cis, cis-$\Delta^{9,12}$-Octadecadienoate	−9	$CH_3(CH_2)_4(CH{=}CHCH_2)_2(CH_2)_6COO^{\ominus}$
18	3	Linolenate	all cis-$\Delta^{9,12,15}$-Octadecatrienoate	−17	$CH_3CH_2(CH{=}CHCH_2)_3(CH_2)_6COO^{\ominus}$
20	4	Arachidonate	all cis-$\Delta^{5,8,11,14}$-Eicosatetraenoate	−49	$CH_3(CH_2)_4(CH{=}CHCH_2)_4(CH_2)_2COO^{\ominus}$

10-5

Triacylglycerols



10-6

Triacylglycerols

·Triacylglycerols are also called

TABLE 9.1 Some common fatty acids (anionic forms)

Number of carbons	Number of double bonds	Common name	IUPAC name	Melting point, °C	Molecular formula
12	0	Laurate	Dodecanoate	44	$CH_3(CH_2)_{10}COO^{\ominus}$
14	0	Myristate	Tetradecanoate	52	$CH_3(CH_2)_{12}COO^{\ominus}$
16	0	Palmitate	Hexadecanoate	63	$CH_3(CH_2)_{14}COO^{\ominus}$
18	0	Stearate	Octadecanoate	70	$CH_3(CH_2)_{16}COO^{\ominus}$
20	0	Arachidate	Eicosanoate	75	$CH_3(CH_2)_{18}COO^{\ominus}$
22	0	Behenate	Docosanoate	81	$CH_3(CH_2)_{20}COO^{\ominus}$
24	0	Lignocerate	Tetracosanoate	84	$CH_3(CH_2)_{22}COO^{\ominus}$
16	1	Palmitoleate	cis-Δ^9-Hexadecenoate	−0.5	$CH_3(CH_2)_5CH{=}CH(CH_2)_7COO^{\ominus}$
18	1	Oleate	cis-Δ^9-Octadecenoate	13	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COO^{\ominus}$
18	2	Linoleate	cis, cis-$\Delta^{9,12}$-Octadecadienoate	−9	$CH_3(CH_2)_4(CH{=}CHCH_2)_2(CH_2)_6COO^{\ominus}$
18	3	Linolenate	all cis-$\Delta^{9,12,15}$-Octadecatrienoate	−17	$CH_3CH_2(CH{=}CHCH_2)_3(CH_2)_6COO^{\ominus}$
20	4	Arachidonate	all cis-$\Delta^{5,8,11,14}$-Eicosatetraenoate	−49	$CH_3(CH_2)_4(CH{=}CHCH_2)_4(CH_2)_2COO^{\ominus}$

10-7

Triacylglycerols

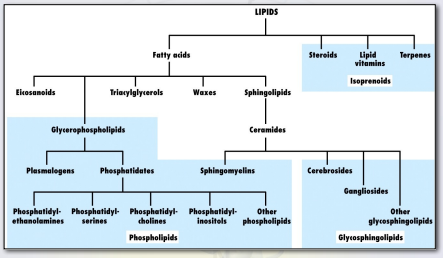
·Triacylglycerols are also called
- Fat
- Oil
- Triglycerides

·They are a chemical combination of glycerol and three fatty acids.

·They represent a storage form of fatty acids.

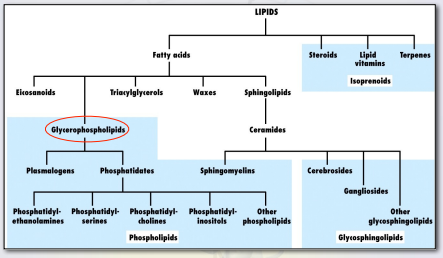
10-8

Glycerophospholipids



11-1

Glycerophospholipids



11-2

Glycerophospholipids

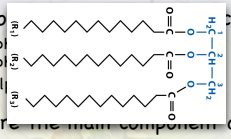
Glycerophospholipids are also called

- phosphoglycerides
- phospholipids
- diacylphosphoglycerol

They are the main component of biological membranes.

12-1

Glycerophospholipids

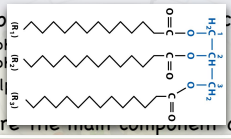


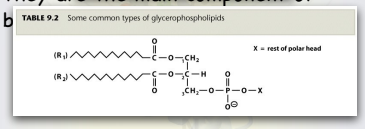
They are the main component of biological membranes.

Chem 352, Lecture 6, Part I - Lipids 12

12-2

Glycerophospholipids

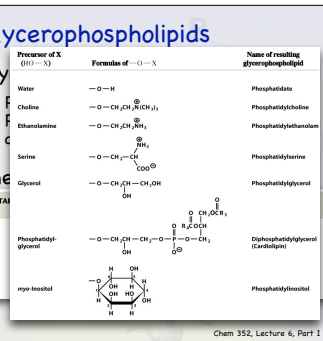




Chem 352, Lecture 6, Part I - Lipids 12

12-3

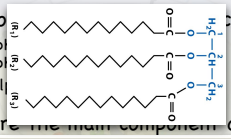
Glycerophospholipids

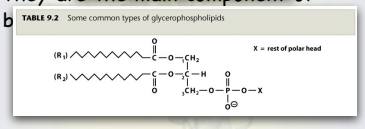


Chem 352, Lecture 6, Part I - Lipids 12

12-4

Glycerophospholipids





Chem 352, Lecture 6, Part I - Lipids 12

12-5

Glycerophospholipids

Glycerophospholipids are also called

- phosphoglycerides
- phospholipids
- diacylphosphoglycerol

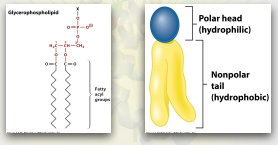
They are the main component of biological membranes.

12-6

Other Biological Molecules

An important group of lipids are the phospholipids

- Phospholipids are not polymers, but they do aggregate in the presence of water to form membranes.

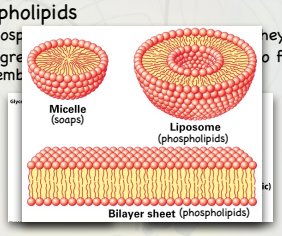


13-1

Other Biological Molecules

An important group of lipids are the phospholipids

- Phosp ey do aggre o form memb

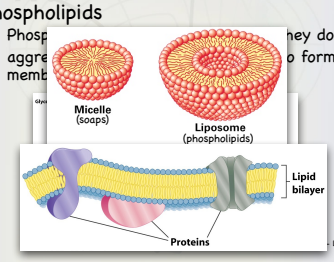


13-2

Other Biological Molecules

An important group of lipids are the phospholipids

- Phosp ey do aggre o form memb

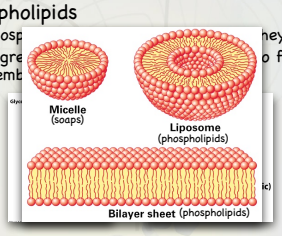


13-3

Other Biological Molecules

An important group of lipids are the phospholipids

- Phosp ey do aggre o form memb

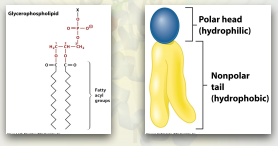


13-4

Other Biological Molecules

An important group of lipids are the phospholipids

- Phospholipids are not polymers, but they do aggregate in the presence of water to form membranes.

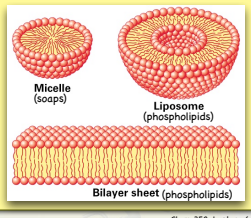


13-5

Other Biological Molecules

Question:

Why do phospholipids form lipid bilayers instead of micelles when placed in water?

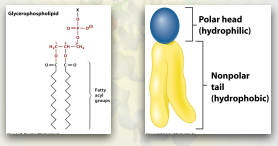


13-6

Other Biological Molecules

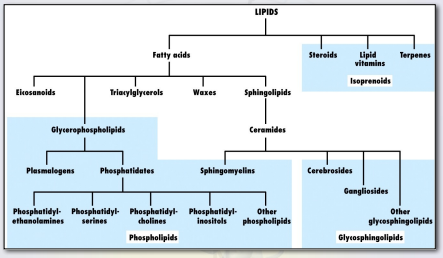
An important group of lipids are the phospholipids

- Phospholipids are not polymers, but they do aggregate in the presence of water to form membranes.



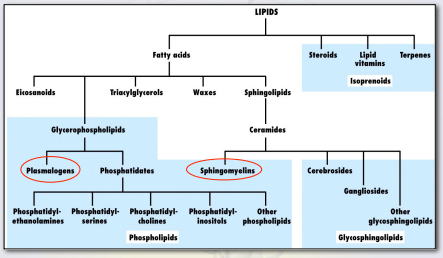
13-7

Other Membrane Lipids



14-1

Other Membrane Lipids

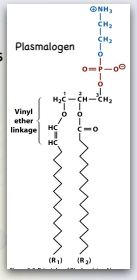


14-2

Other Membrane Lipids

Plasmalogens

- Derived from glycerophospholids
- Found in nerve tissue.

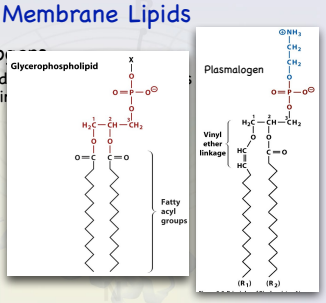


15-1

Other Membrane Lipids

Plasmalogens

- Derived
- Found i

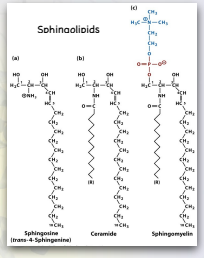


15-2

Other Membrane Lipids

Sphingolipids

- Derived from Sphingosine
- Also found in nerve tissue.

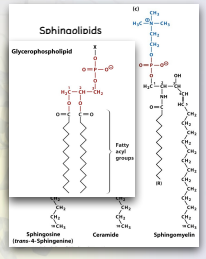


16-1

Other Membrane Lipids

Sphingolipids

- Derived from Sphingosine
- Also found in nerve tissue.

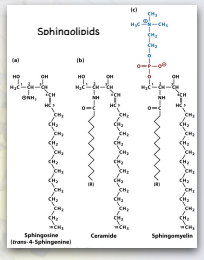


16-2

Other Membrane Lipids

Sphingolipids

- Derived from Sphingosine
- Also found in nerve tissue.



16-3

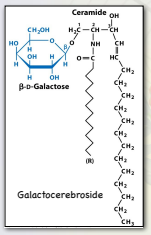
Other Membrane Lipids

- Sphingolipids
  - Are used to make glycolipids

17-1

Other Membrane Lipids

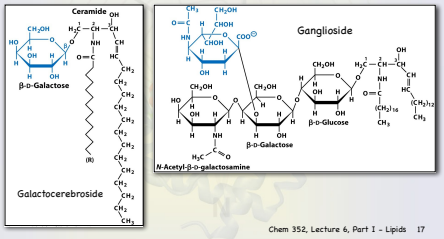
- Sphingolipids
  - Are used to make glycolipids



17-2

Other Membrane Lipids

- Sphingolipids
  - Are used to make glycolipids



17-3

Other Membrane Lipids

Sphingolipids

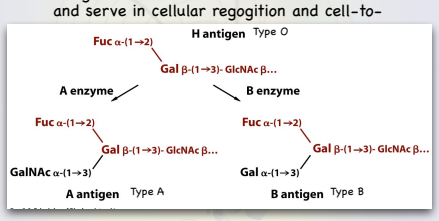
- Gangliosides are used as cell surface markers and serve in cellular regogition and cell-to-cell communication.
- The ABO blood group antigens are an example.

18-1

Other Membrane Lipids

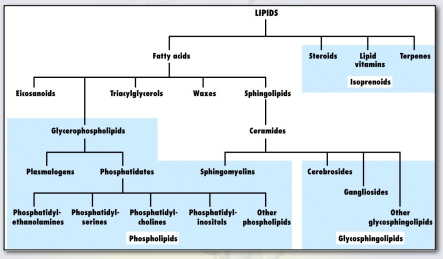
Sphingolipids

- Gangliosides are used as cell surface markers and serve in cellular regogition and cell-to-



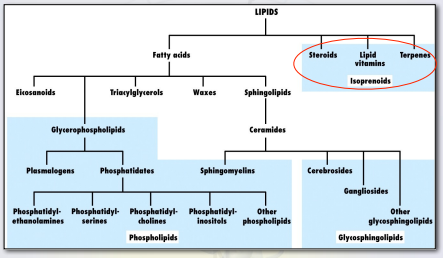
18-2

Isoprenoids



19-1

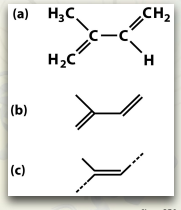
Isoprenoids



19-2

Isoprenoids

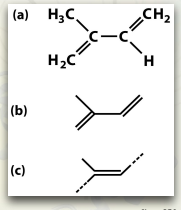
Isoprenoids are based on the isoprene unit (2-methyl-1,3-butadiene).



20

Isoprenoids

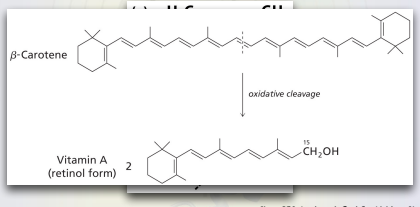
Isoprenoids are based on the isoprene unit (2-methyl-1,3-butadiene).



21-1

Isoprenoids

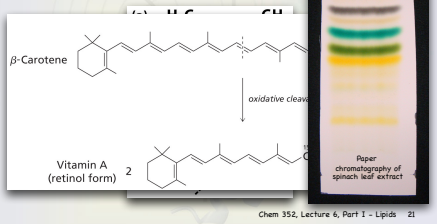
Isoprenoids are based on the isoprene unit (2-methyl-1,3-butadiene).



21-2

Isoprenoids

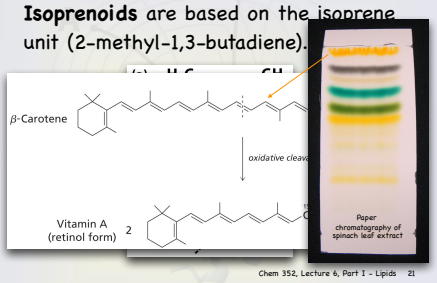
Isoprenoids are based on the isoprene unit (2-methyl-1,3-butadiene).



21-3

Isoprenoids

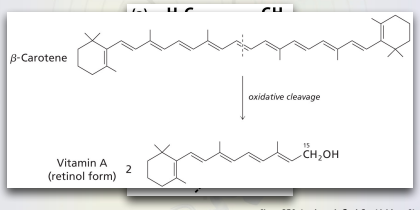
Isoprenoids are based on the isoprene unit (2-methyl-1,3-butadiene).



21-4

Isoprenoids

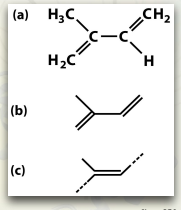
Isoprenoids are based on the isoprene unit (2-methyl-1,3-butadiene).



21-5

Isoprenoids

Isoprenoids are based on the isoprene unit (2-methyl-1,3-butadiene).



21-6

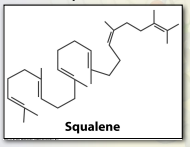
Isoprenoids

- The **steroids** are an important member of this group
  - Steroids are derived from the isoprenoid **squalene**, which forms **cholesterol**.

22-1

Isoprenoids

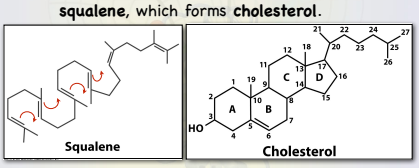
- The **steroids** are an important member of this group
  - Steroids are derived from the isoprenoid **squalene**, which forms **cholesterol**.



22-2

Isoprenoids

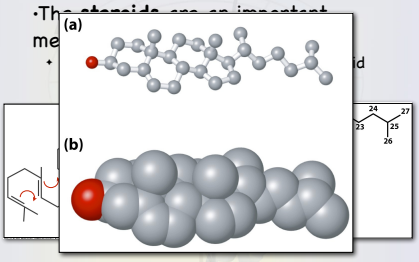
- The **steroids** are an important member of this group
  - Steroids are derived from the isoprenoid **squalene**, which forms **cholesterol**.



22-3

Isoprenoids

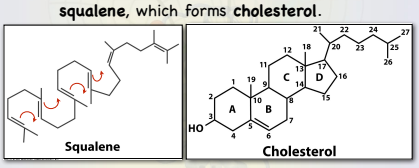
- The **steroids** are an important member of this group
  - Steroids are derived from the isoprenoid **squalene**, which forms **cholesterol**.



22-4

Isoprenoids

- The **steroids** are an important member of this group
  - Steroids are derived from the isoprenoid **squalene**, which forms **cholesterol**.



22-5

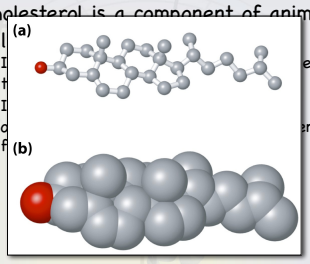
Isoprenoids

- Cholesterol is a component of animal cell membranes.
  - It is dissolved in the lipid bilayer and used to keep them in a liquid state.
  - It is also the precursor to a number of other steroids having an array of different functions.

23-1

Isoprenoids

- Cholesterol is a component of animal cell
  - I
  - I



ed

nt

23-2

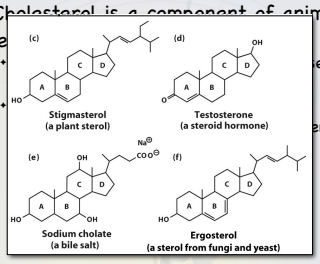
Isoprenoids

- Cholesterol is a component of animal cell membranes.
  - It is dissolved in the lipid bilayer and used to keep them in a liquid state.
  - It is also the precursor to a number of other steroids having an array of different functions.

23-3

Isoprenoids

- Cholesterol is a component of animal ce
  - I
  - I

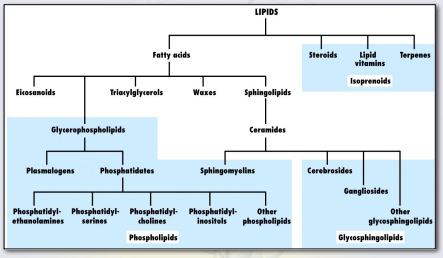


ed

nt

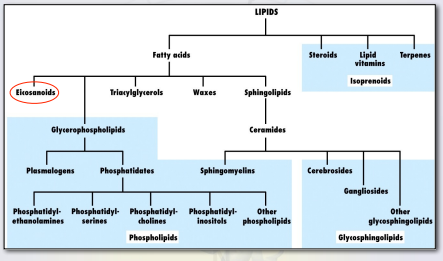
23-4

Eicosanoids



24-1

Eicosanoids



24-2

Eicosanoids

- Eicosanoids are derived from the fatty acid arachinoic acid (20:4-$\Delta^{5,8,11,14}$).
  - They are used as signaling molecules.
  - **Prostaglandins** are an example
    - They mediate smooth-muscle contraction and are associated with triggering fever, swelling and inflammation.

25-1

Eicosanoids

- Eicosanoids are derived from the fatty acid arachinoic acid (20:4-

TABLE 9.1 Some common fatty acids (anionic forms)

Number of carbons	Number of double bonds	Common name	IUPAC name	Melting point, °C	Molecular formula
12	0	Laurate	Dodecanoate	44	$CH_3(CH_2)_{10}COO^{\ominus}$
14	0	Myristate	Tetradecanoate	52	$CH_3(CH_2)_{12}COO^{\ominus}$
16	0	Palmitate	Hexadecanoate	63	$CH_3(CH_2)_{14}COO^{\ominus}$
18	0	Stearate	Octadecanoate	70	$CH_3(CH_2)_{16}COO^{\ominus}$
20	0	Arachidate	Eicosanoate	75	$CH_3(CH_2)_{18}COO^{\ominus}$
22	0	Behenate	Docosanoate	81	$CH_3(CH_2)_{20}COO^{\ominus}$
24	0	Lignocerate	Tetracosanoate	84	$CH_3(CH_2)_{22}COO^{\ominus}$
16	1	Palmitoleate	*cis*-Δ^9-Hexadecenoate	−0.5	$CH_3(CH_2)_5CH{=}CH(CH_2)_7COO^{\ominus}$
18	1	Oleate	*cis*-Δ^9-Octadecenoate	13	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COO^{\ominus}$
18	2	Linoleate	*cis*, *cis*-$\Delta^{9,12}$-Octadecadienoate	−9	$CH_3(CH_2)_4CH{=}CHCH_2CH{=}(CH_2)_6COO^{\ominus}$
18	3	Linolenate	all *cis*-$\Delta^{9,12,15}$-Octadecatrienoate	−17	$CH_3CH_2(CH{=}CHCH_2)_3(CH_2)_6COO^{\ominus}$
20	4	Arachidonate	all *cis*-$\Delta^{5,8,11,14}$-Eicosatetraenoate	−49	$CH_3(CH_2)_4(CH{=}CHCH_2)_4(CH_2)_2COO^{\ominus}$

25-2

Eicosanoids

- Eicosanoids are derived from the fatty acid arachinoic acid (20:4-$\Delta^{5,8,11,14}$).
  - They are used as signaling molecules.
  - **Prostaglandins** are an example
    - They mediate smooth-muscle contraction and are associated with triggering fever, swelling and inflammation.

25-3

Eicosanoids

- Eic  are derived from the f chinoic acid (20:4-Δ
  - as signaling molecules.
  - Pr ndins are an example
    - They mediate smooth-muscle contraction and are associated with triggering fever, swelling and inflammation.

25-4

Eicosanoids

- Eic  are deri the f chino Δ
  - as sig
  - Pr ndins are an e
    - They mediate smooth-muscle contraction and are associated with triggering fever, swelling and inflammation.

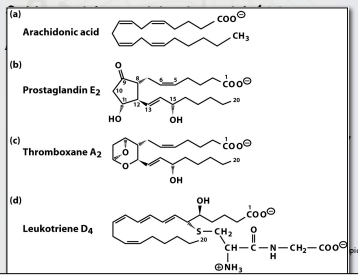
25-5

Eicosanoids

25-6

Eicosanoids

•Eicosanoids are derived from the



25-7

Eicosanoids

•Eicosanoids are derived from the fatty acid arachinoic acid (20:4-$\Delta^{5,8,11,14}$).

- They are used as signaling molecules.
- **Prostaglandins** are an example
  - They mediate smooth-muscle contraction and are associated with triggering fever, swelling and inflammation.

25-8

Eicosanoids

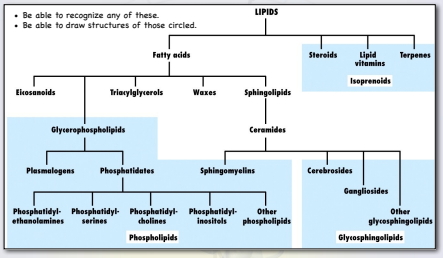
•The conversion of arachidonic acid to protaglandin E_2 is carried out by and enzyme call cyclooxygenase (COX).

- Asprin, and other **nonsteroidal antiinflammatory drugs (NSAID's)**, such as ibruprofen, are inhibitors of the COX enzyme.

26

Introduction to Lipids

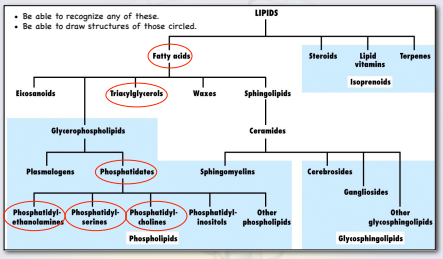
- Be able to recognize any of these.
- Be able to draw structures of those circled.



27-1

Introduction to Lipids

- Be able to recognize any of these.
- Be able to draw structures of those circled.



27-2

Next Up

- Part II: Membranes (Chapter 9)

28