

CHEMISTRY OF LIPIDS

*Dr. Pankaj Panchal, MBBS, MD.
Assistant professor*

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Outline of lecture

- Definition and chemical structure of lipids
- Classification of lipids
- Biological importance of lipids

LIPID CHEMISTRY

Definition

Classification

Biological
importance

LIPID CHEMISTRY

Definition

Organic substances relatively insoluble in water but soluble in organic solvents like chloroform, ether and benzene

CLASSIFICATION OF LIPIDS

Simple
lipid

Complex
lipid

Derived
lipids

SIMPLE LIPIDS

They are esters of FA with various alcohols

D/U the type of alcohols these are subclassified as

Neutral fats or oils

Alcohol is
GLYCEROL

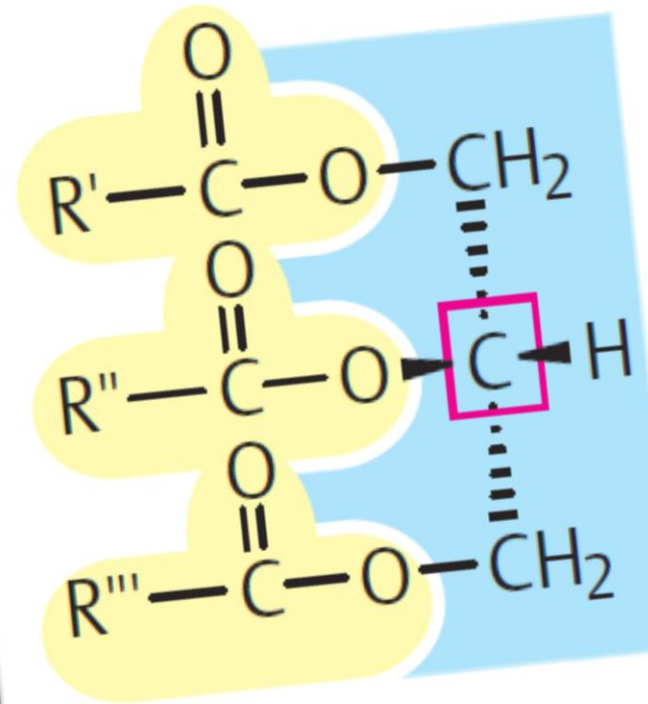
Waxes

Alcohol is
other than
glycerol

NEUTRAL FATS OR OILS

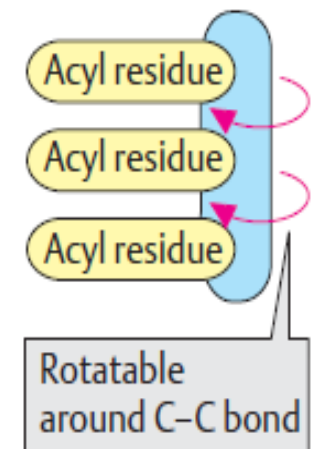
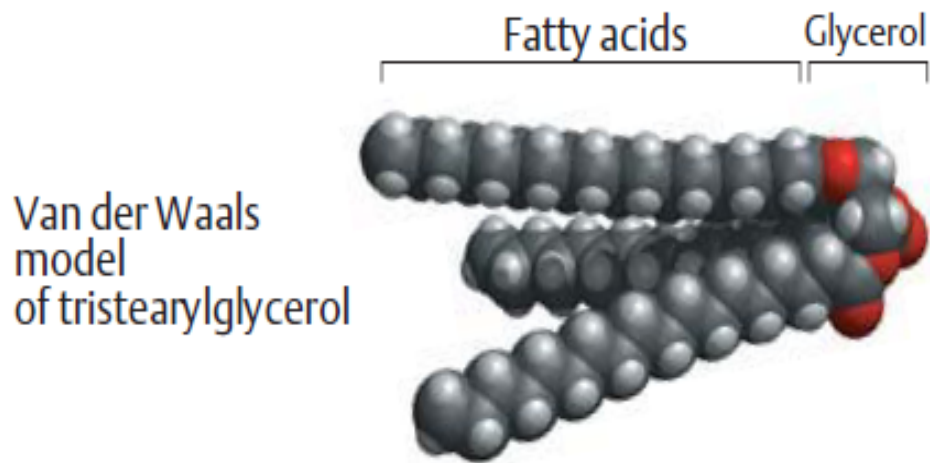
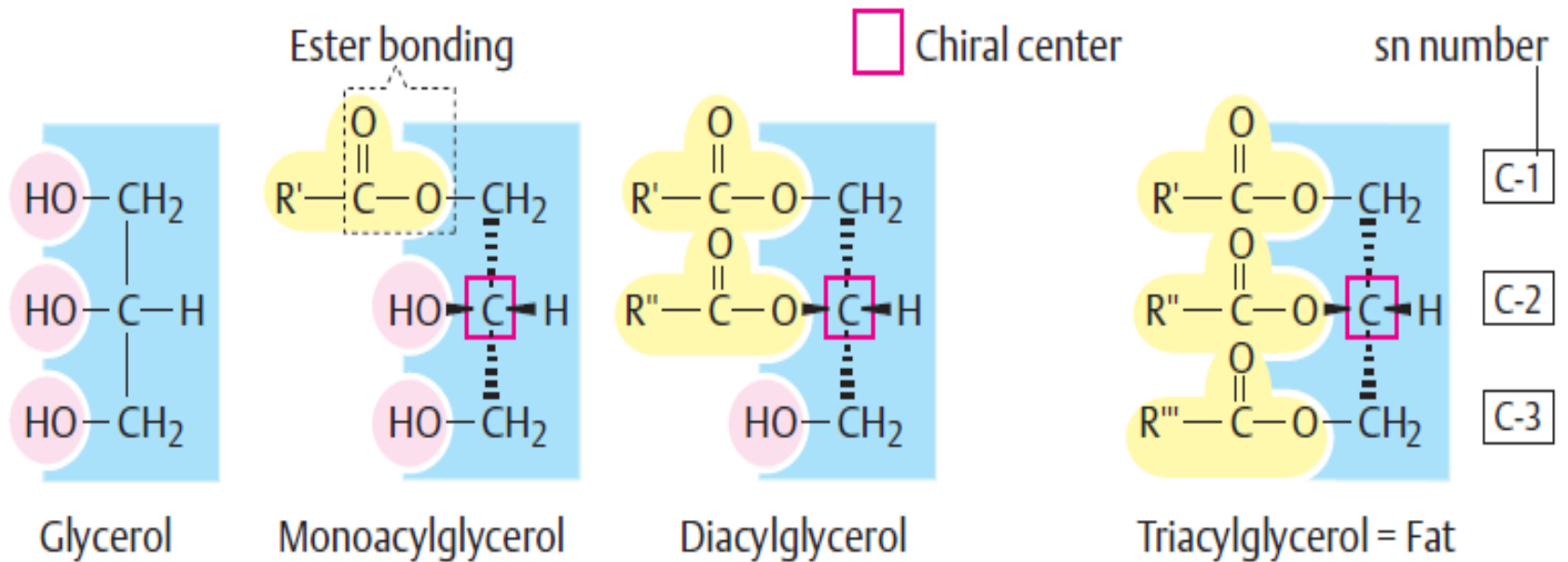
Esters of FA with alcohol
GLYCEROL

Uncharged



Triacylglycerol = Fat

B. Structure of fats



WAXES

Esters of FA with
higher molecular
weight
monohydric
alcohols

EXAMPLES

- ✓ Lanolin
- ✓ Beeswax
- ✓ Whale sperm oil

COMPLEX LIPIDS

These are esters of FA with alcohol containing additional[prosthetic] groups.

Subclassified according to the type of prosthetic group

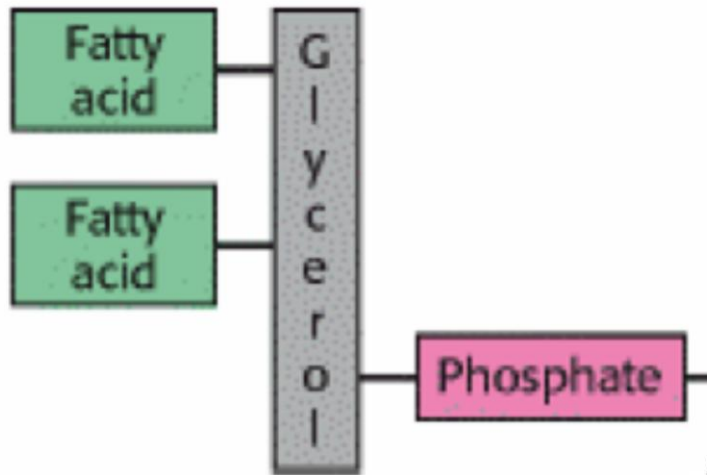
Phospholipids

Glycolipids

Lipoproteins

PHOSPHOLIPIDS

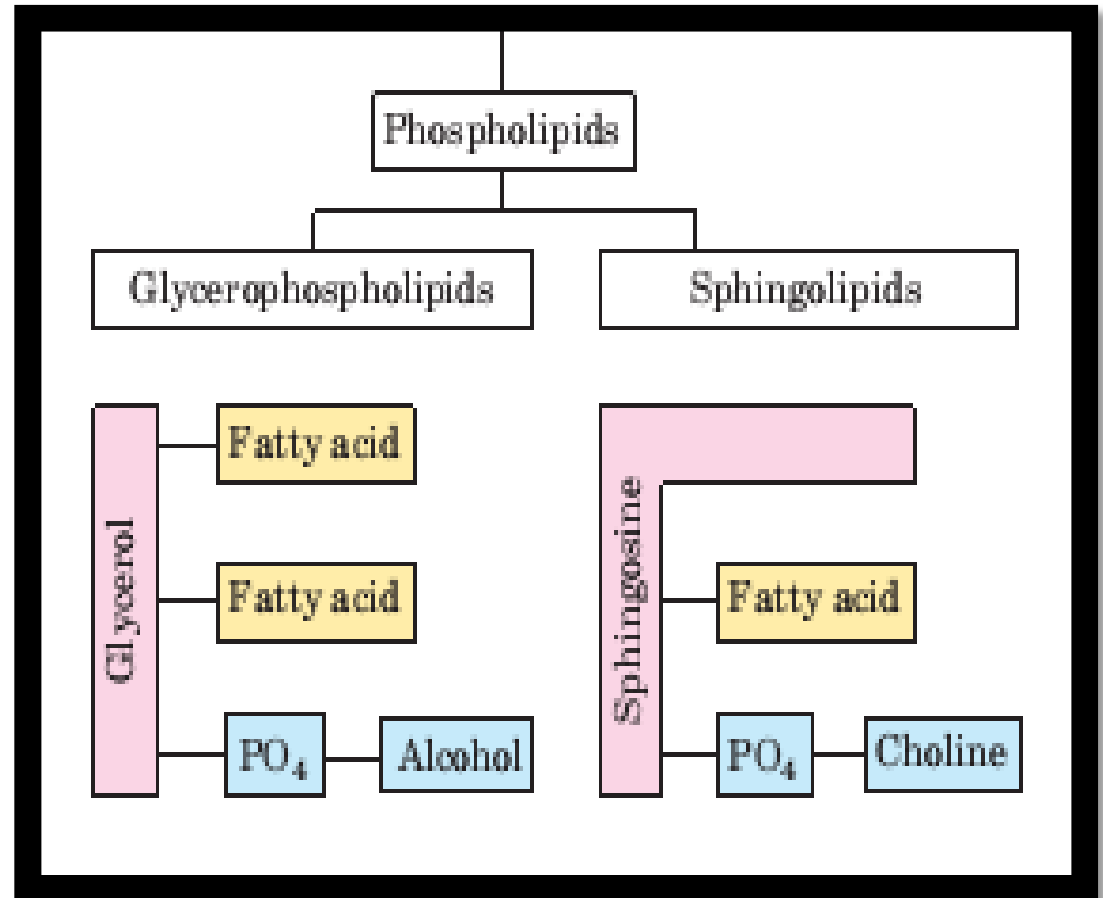
FA + ALCOHOL + PHOSPHORIC ACID



They frequently have nitrogen containing bases

PHOSPHOLIPIDS

Phospholipids may be classified on the basis of the type of alcohol present



A. Glycerophospholipids

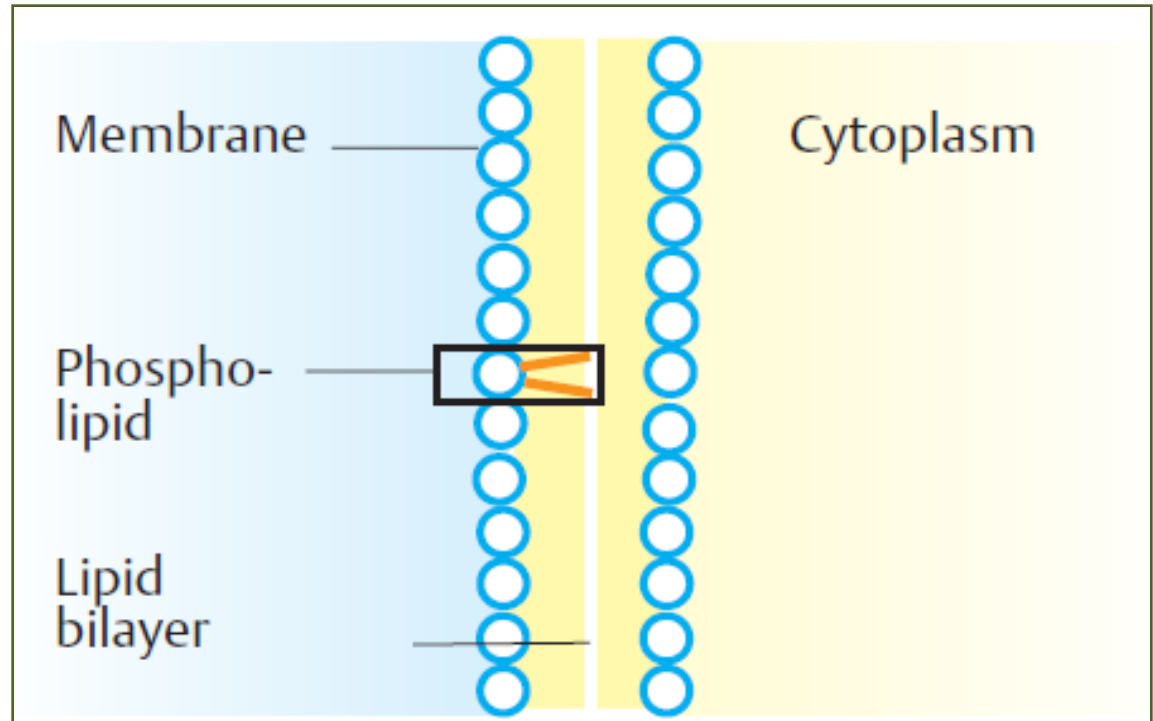
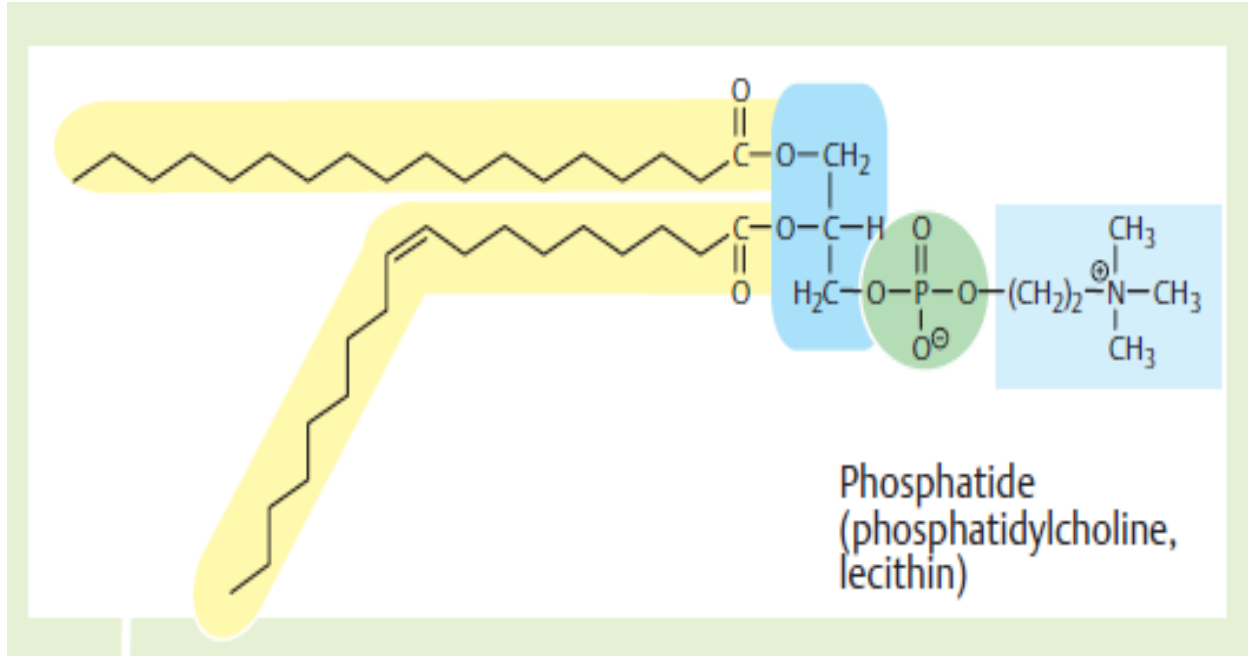
ALCOHOL IS GLYCEROL

- ✓ Phosphatidylcholine
- ✓ Phosphatidyl ethanolamine
- ✓ Phosphatidyl serine
- ✓ Phosphatidyl inositol
- ✓ Plasmalogens
- ✓ Cardiolipins

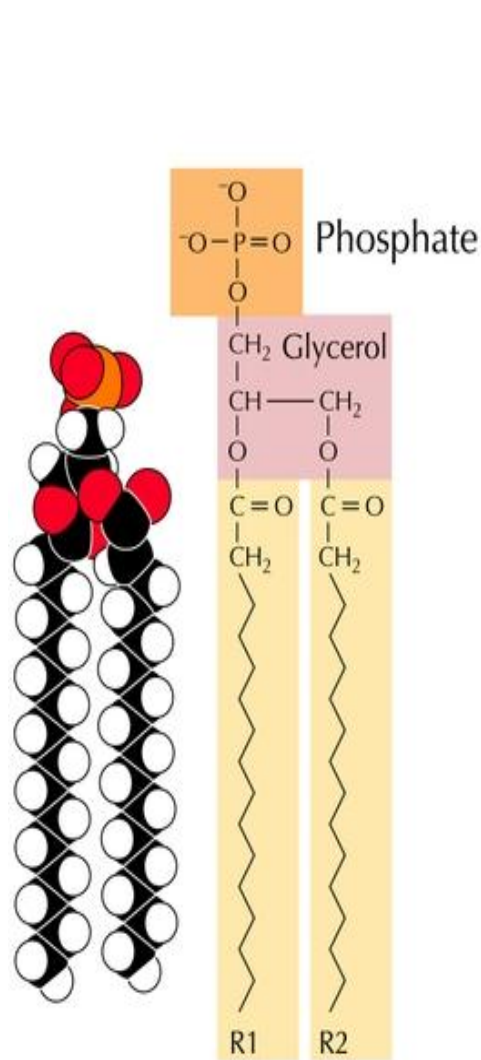
B. Spingophospholipids

ALCOHOL IS SPINGOSINE

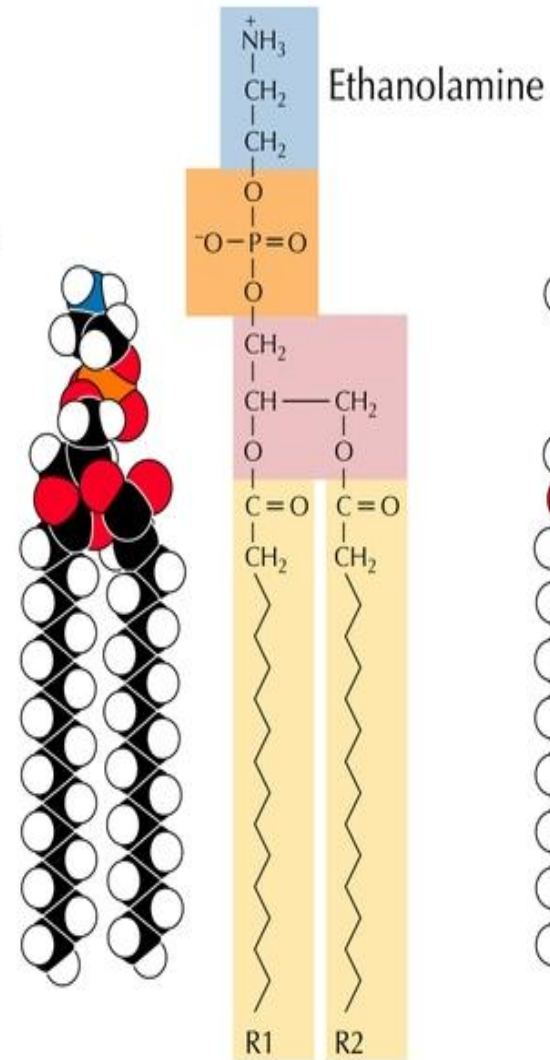
- ✓ Spingomyelins



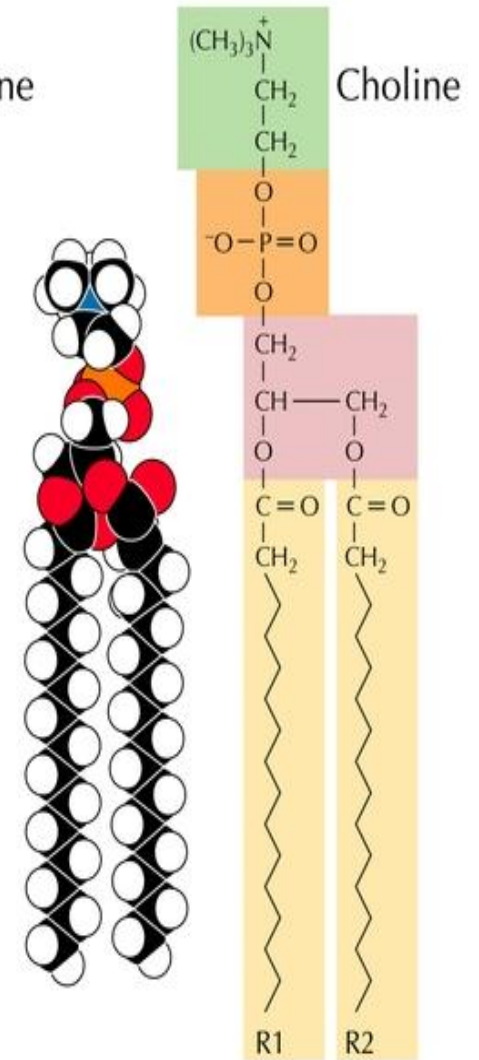
Phosphatidic acid



Phosphatidylethanolamine

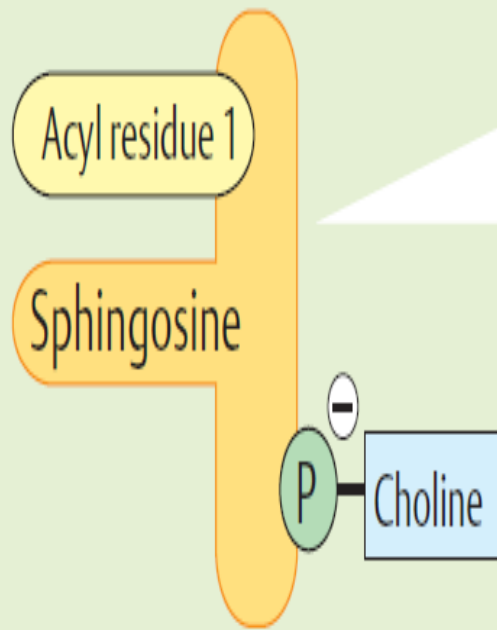


Phosphatidylcholine

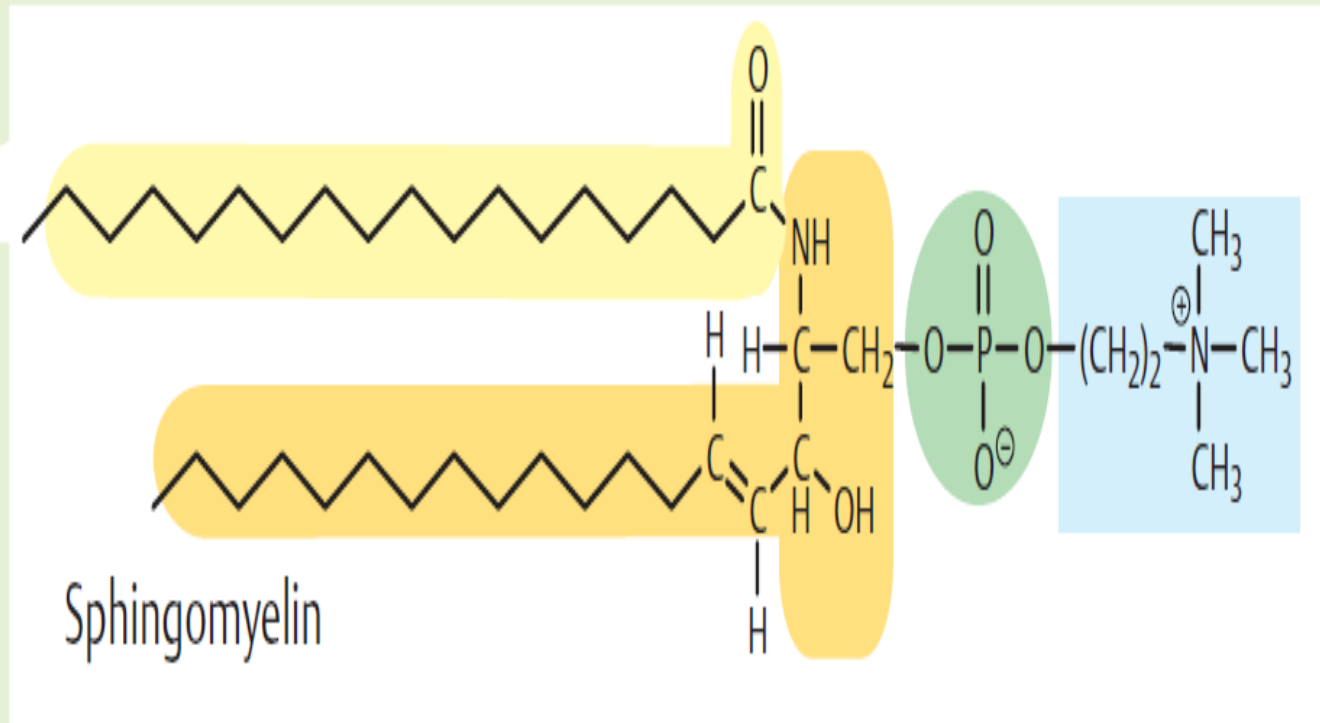


SPHINGOPHOSPHOLIPID

Sphingophospholipid



Lysophospholipid



2. Phospholipids

GLYCOLIPIDS

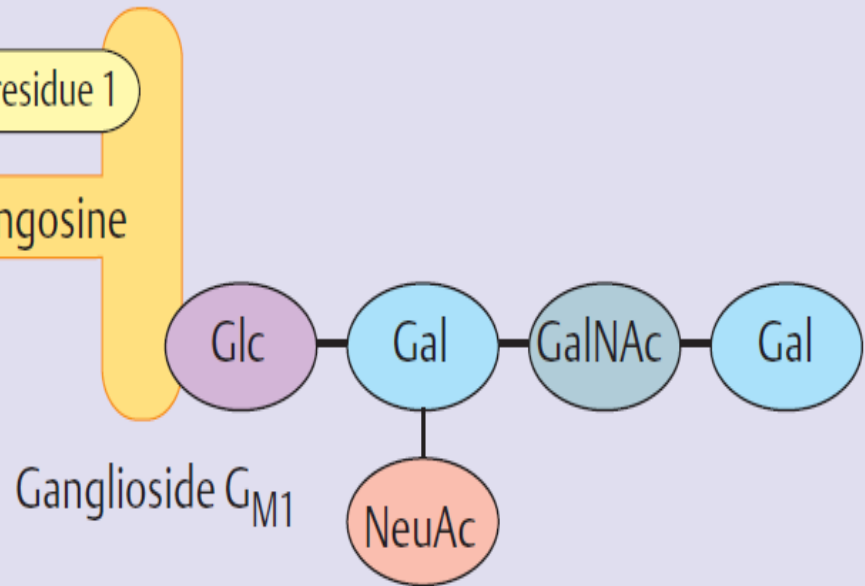
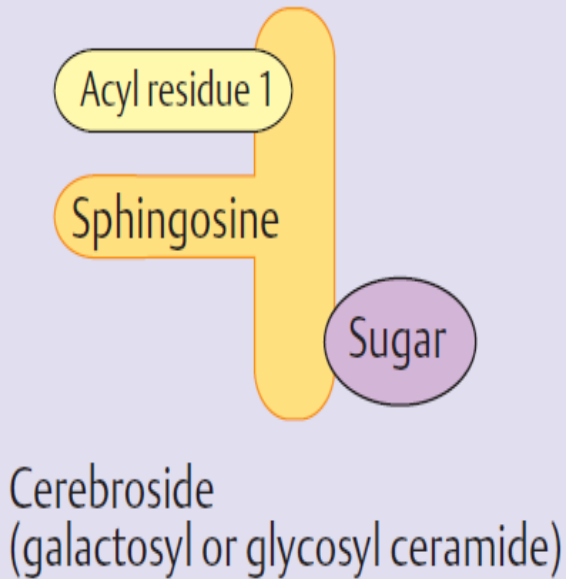
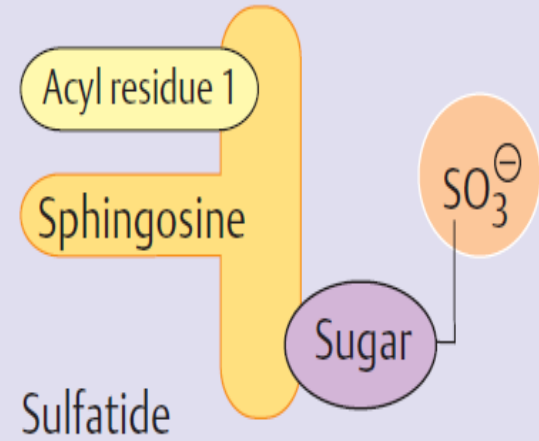
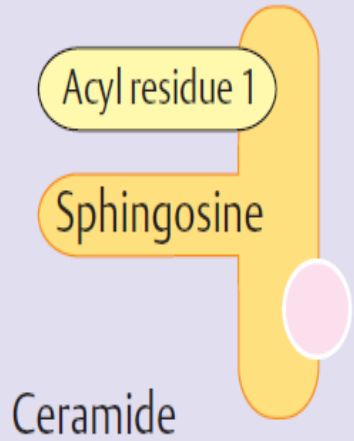
FA + ALCOHOL[SPINGOSINE] + CARBOHYDRATE
WITH NITROGEN BASE

❑ They do not contain phosphate group

Example

- ✓ Cerebrosides
- ✓ Gangliosides

GLYCOLIPIDS

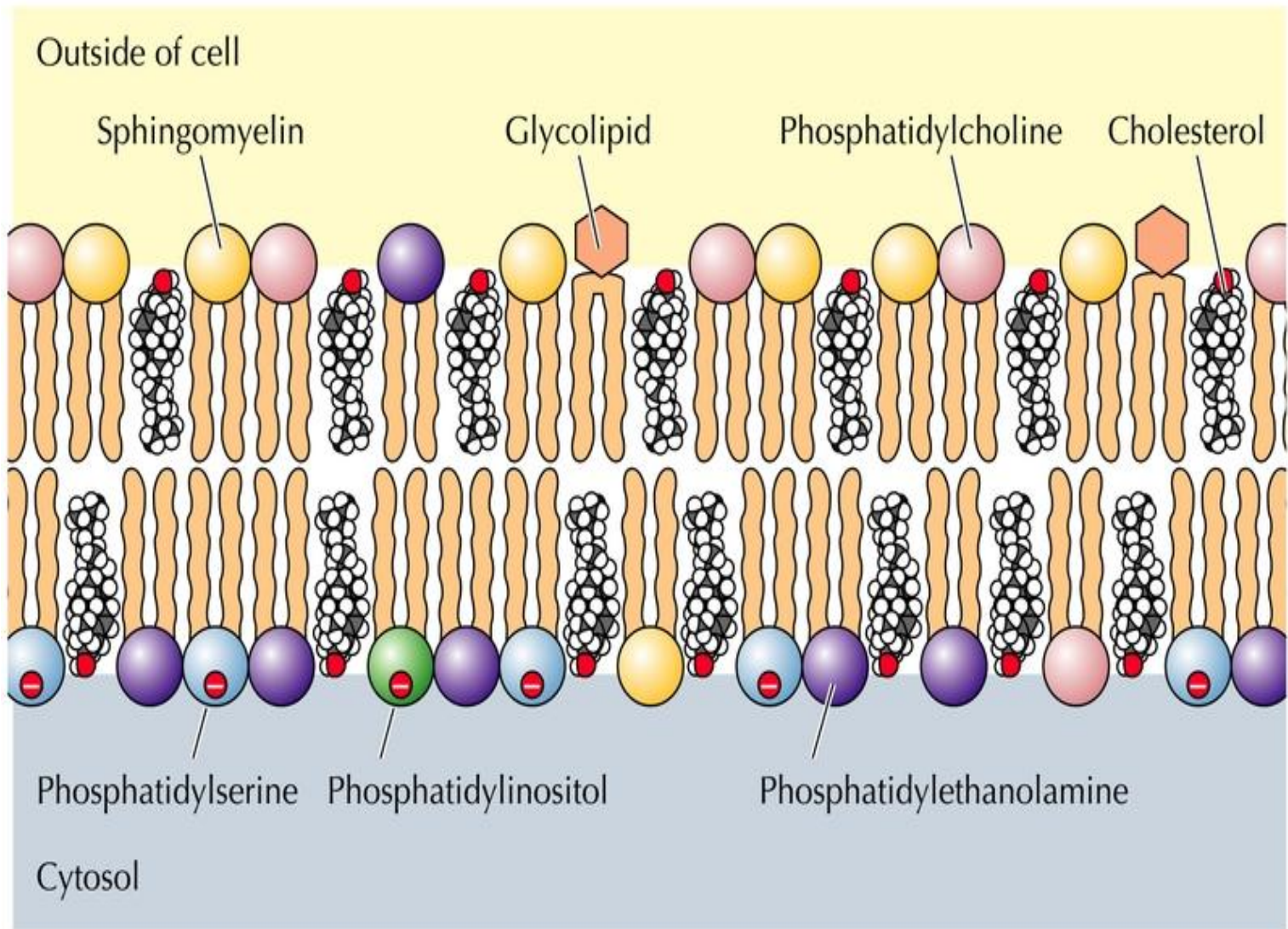


3. Sphingolipids

LIPOPROTEINS

Lipid with
prosthetic
group PROTEIN

- ✓ Chylomicrons
- ✓ Very low density lipoprotein (VLDL)
- ✓ Low density lipoprotein (LDL)
- ✓ High density lipoprotein (HDL)



DERIVED LIPIDS

Derived from lipids (simple or complex) or precursors of lipids

Example

Fatty acids

Steroids

Cholesterol

Vitamin A
and D

FUNCTIONS OF LIPIDS

Storage form of energy

Structural component of cell membrane.

Precursor of many steroid hormones, vitamin D

Act as thermal insulator

Protection of internal organs

FUNCTIONS OF LIPIDS

Helps in absorption of fat soluble vitamins

Lipoproteins transporting lipids

Fats serve as surfactants by reducing surface tension.

Improve taste and palatability.

Acts as electric insulators in neurons.