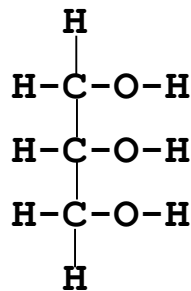


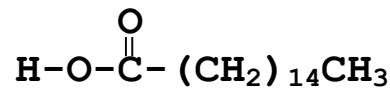
Oils and Fats

Chemical structure.

- Oils and fats - important for storing chemical energy in living things.
- Oils are liquids - fats are solids.
- Made from **esters** of **propane-1,2,3,triol** (glycerol) + long chain carboxylic acids **RCOOH**.



Propane-1,2,3-triol



palmitic acid

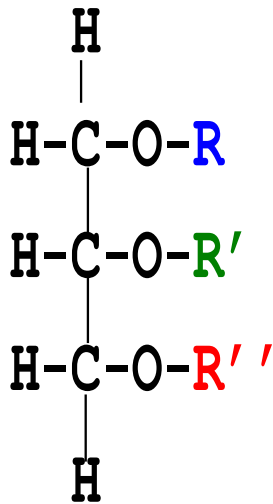
STRUKTUR ASAM LEMAK



Table 11 Common fatty acids

Structure	Traditional name	Origin of name
$\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$	palmitic acid	palm oil
$\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$	stearic acid	suet (Greek: <i>stear</i>)
$\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$	oleic acid	olive oil
$\text{CH}_3(\text{CH}_2)_4\text{CH}=\text{CHCH}_2\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$	linoleic acid	oil of flax (Latin: <i>linum</i>)

Types of triesters



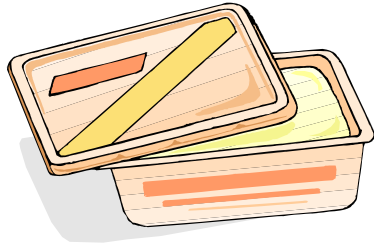
- **Triesters**
(triglycerides) – 3 carboxylic acids react with triol.
- **Mixed triesters** – three acid groups, not all alike often found in natural oils and fats.

Fats and fatty acids.

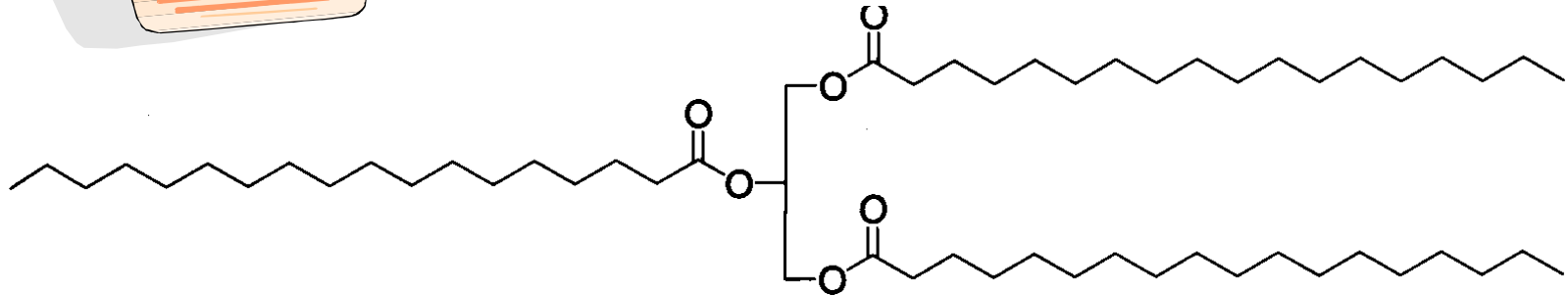
- Unbranched hydrocarbon chains.
- Called fatty acids - occur in fats!!!
- Fully unsaturated / 3 or 4 double bonds.
- Still known by old names - systematic names too long.
- Thought to cause blockage of blood vessels and heart disease, especially the saturated ones.

Fat facts!

- Natural oils and fats are **mixtures of triesters**.
- Can be split up by **hydrolysis**, heat with conc. NaOH.
- **Triester + NaOH \rightarrow glycerol + sodium salt of acid**
- Basis of soap manufacture eg. "*Palmolive*"
- Convert sodium salts to free acids by adding dil. HCl or other mineral acid.



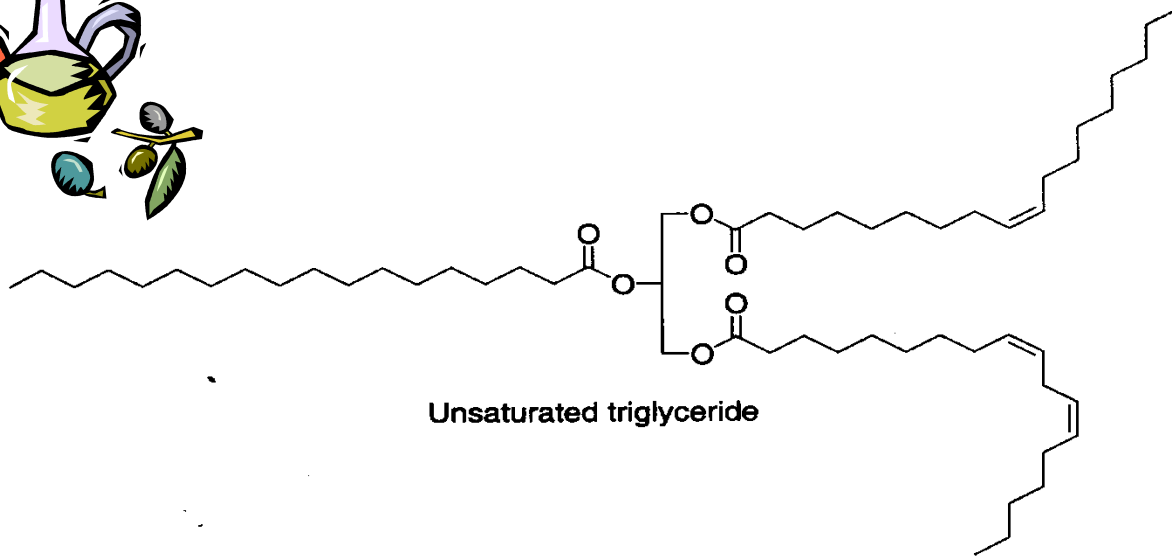
Solid or...?



Saturated triglyceride

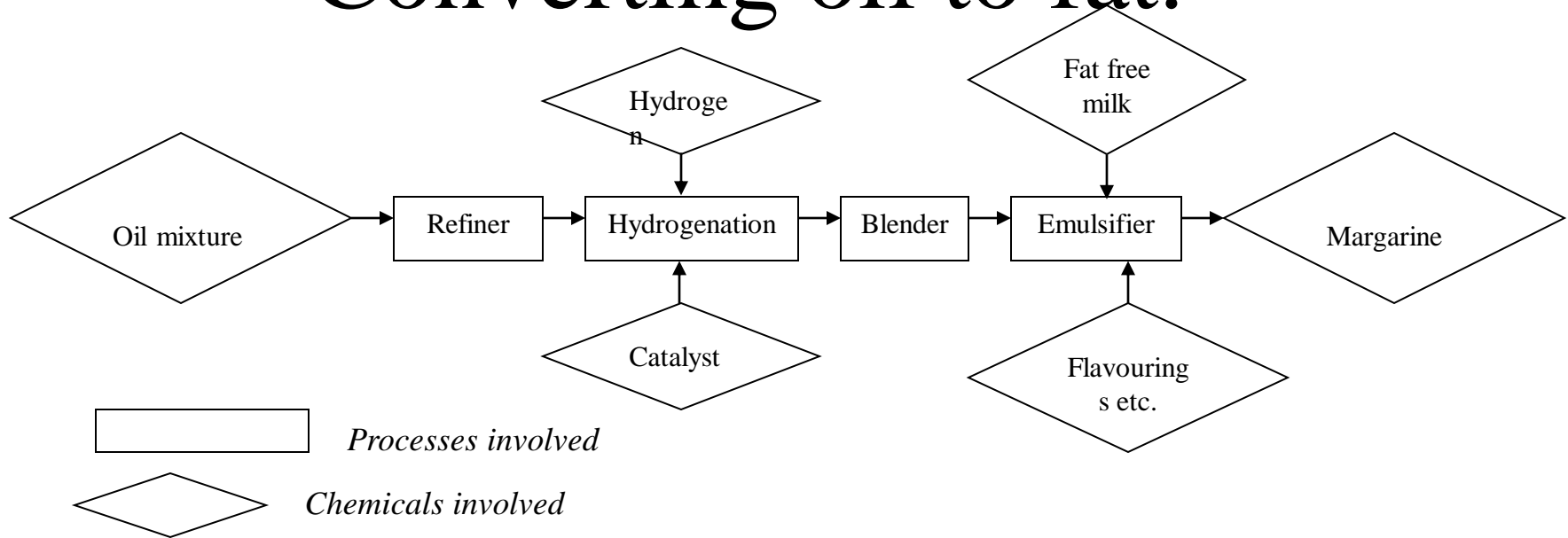
- Fatty acids present in mixture affect the properties.
- Saturated triglycerides pack closely together.
- Attractive forces - higher melting point.

...or Liquid?

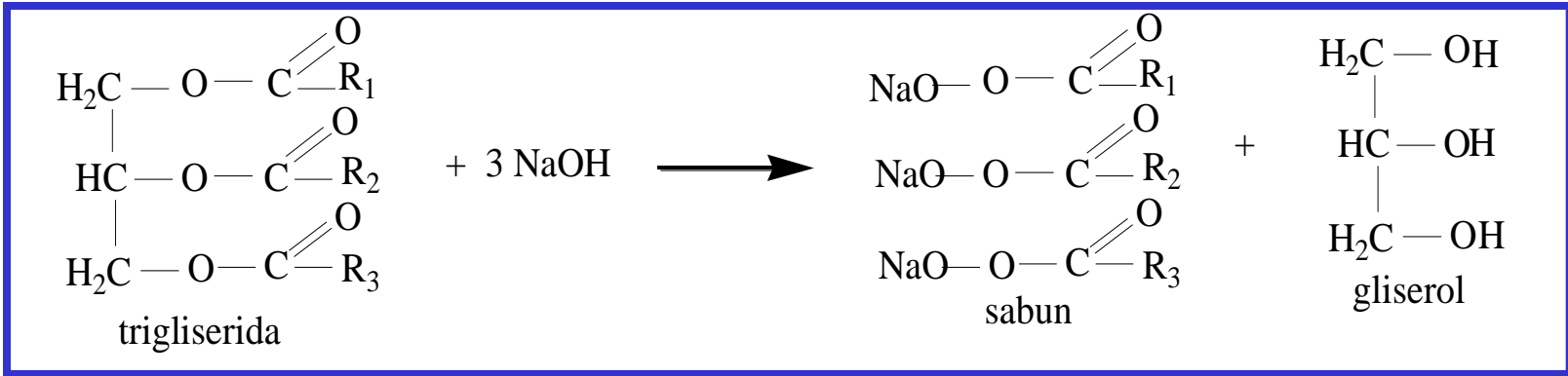
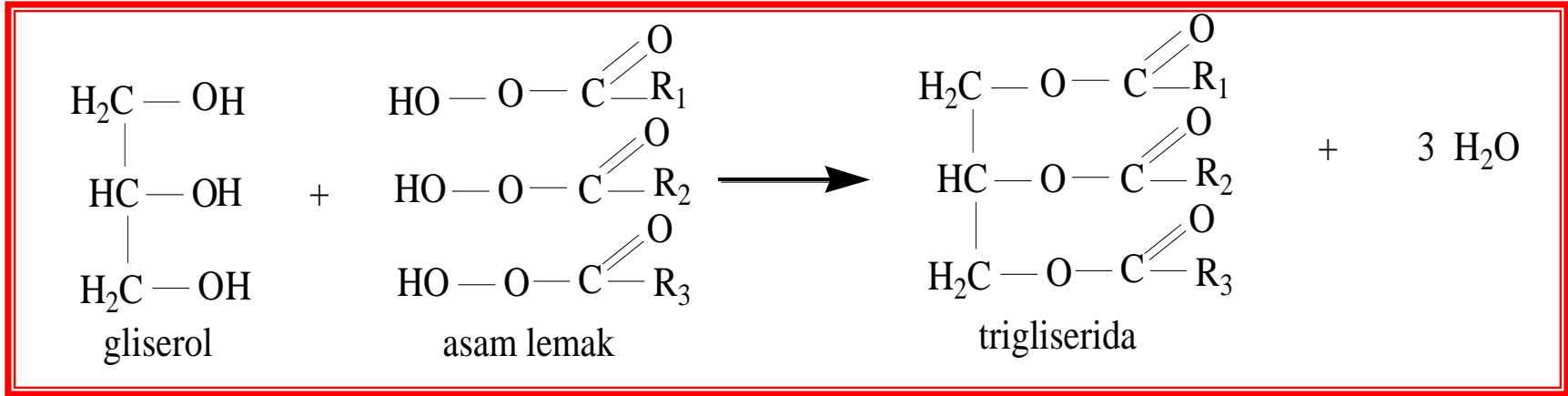


- Unsaturated triglyceride molecules cannot pack closely together because of *cis* double bonds - causes kinks!
- Intermolecular forces are weaker.
- Less energy needed to separate molecules - lower melting point.

Converting oil to fat.



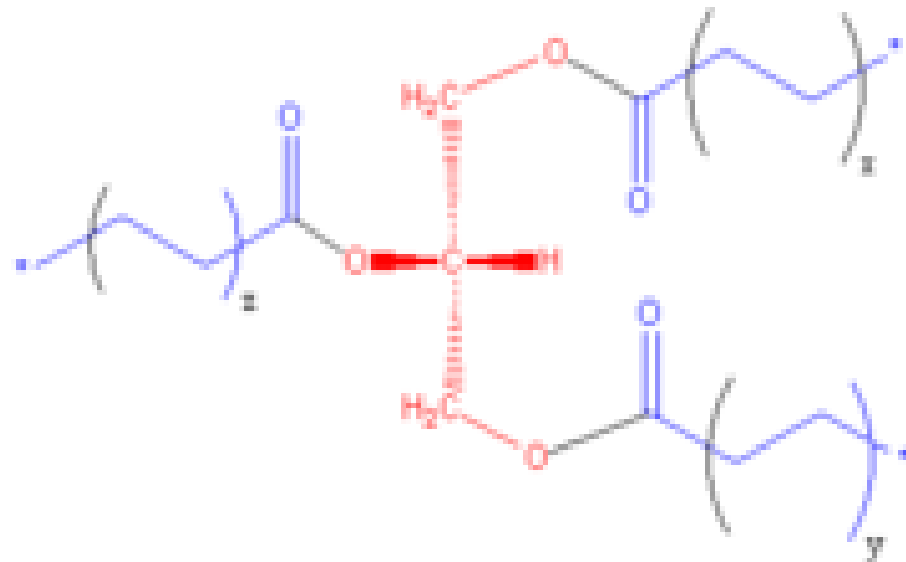
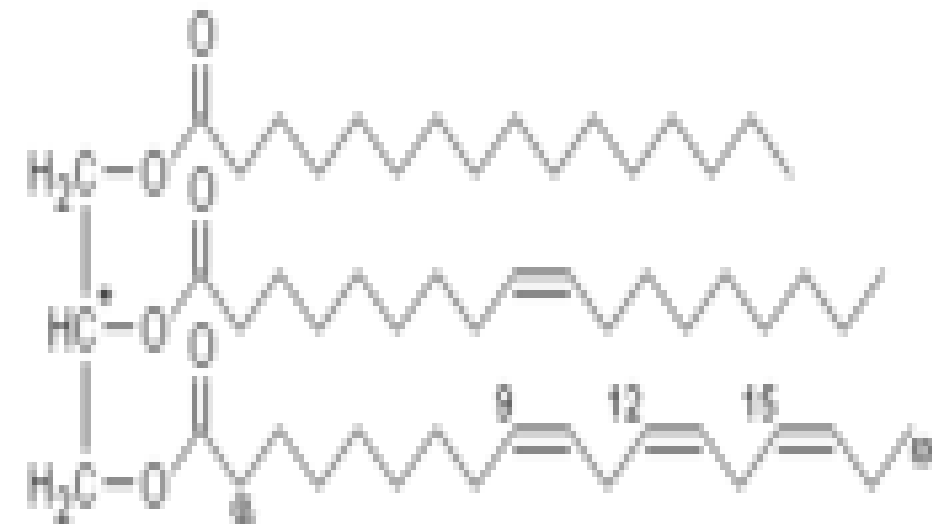
- Most natural oils need processing to make them fit for use.
- **Hydrogenation** of unsaturated oils - make margarine.
- *Controlled* hydrogenation makes oils more solid.
- Pass H_2 through heated oil - nickel catalyst.
- Add flavourings, salt, vitamins etc.



Trigliserida

(atau lebih tepatnya **triasilgliserol** atau **triasilgliserida**) adalah sebuah [gliserida](#), yaitu [ester](#) dari [gliserol](#) dan tiga [asam lemak](#).^[1] Trigliserida merupakan penyusun utama [minyak nabati](#) dan [lemak hewani](#).

[Rumus kimia](#) trigliserida adalah **CH₂COOR-CHCOOR'-CH₂-COOR''**, dimana R, R' dan R'' masing-masing adalah sebuah rantai [alkil](#) yang panjang. Ketiga *asam lemak* RCOOH, R'COOH and R''COOH bisa jadi semuanya sama, semuanya berbeda ataupun hanya dua diantaranya yang sama.



Struktur umum trigliserida

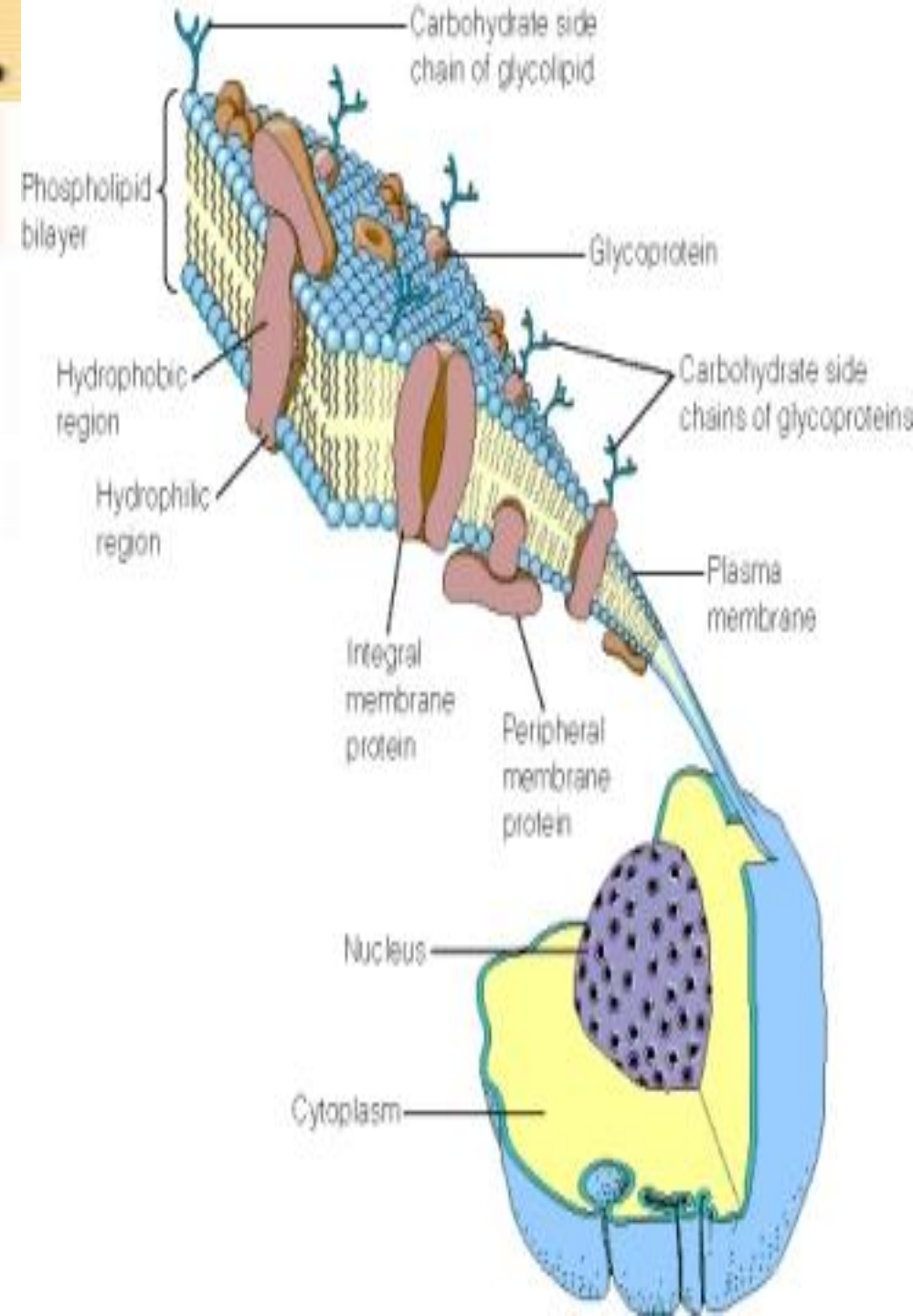
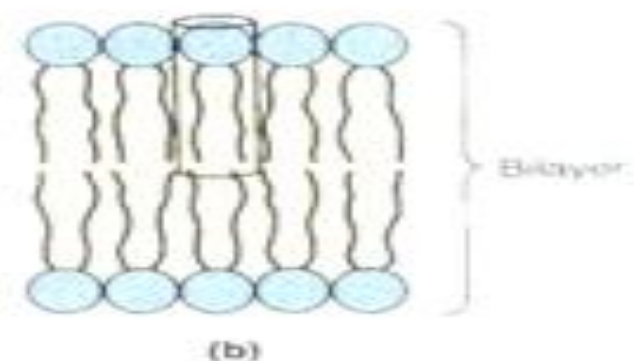
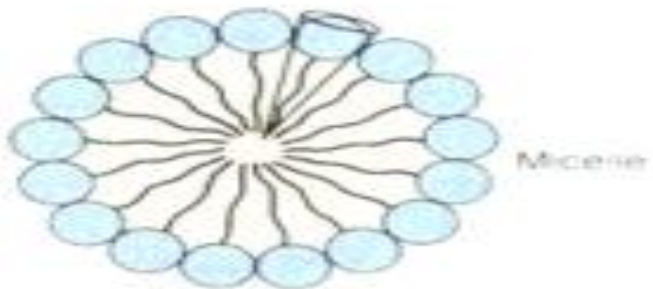
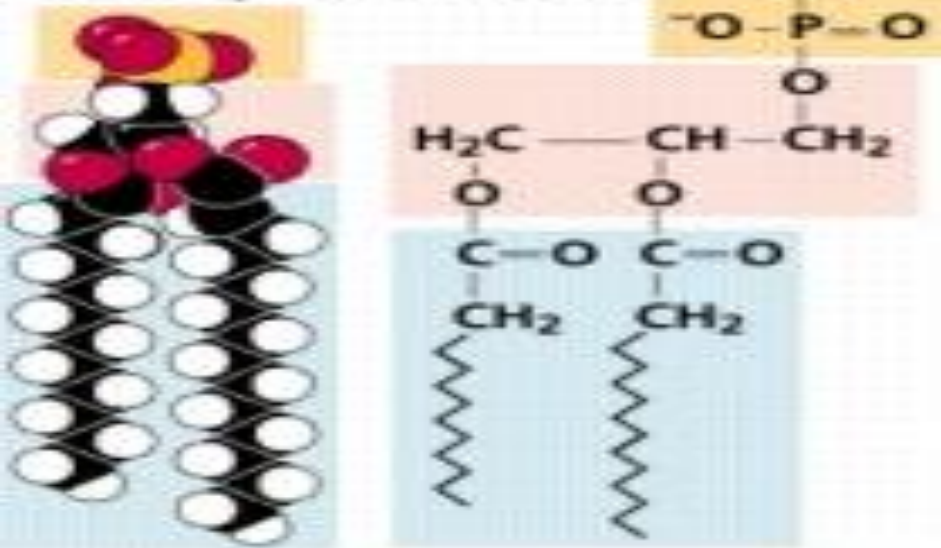
Phosfolipid

Is ester glycerol, only with 2 fatty acid that bond in the atom C_1 and C_2 of glycerol

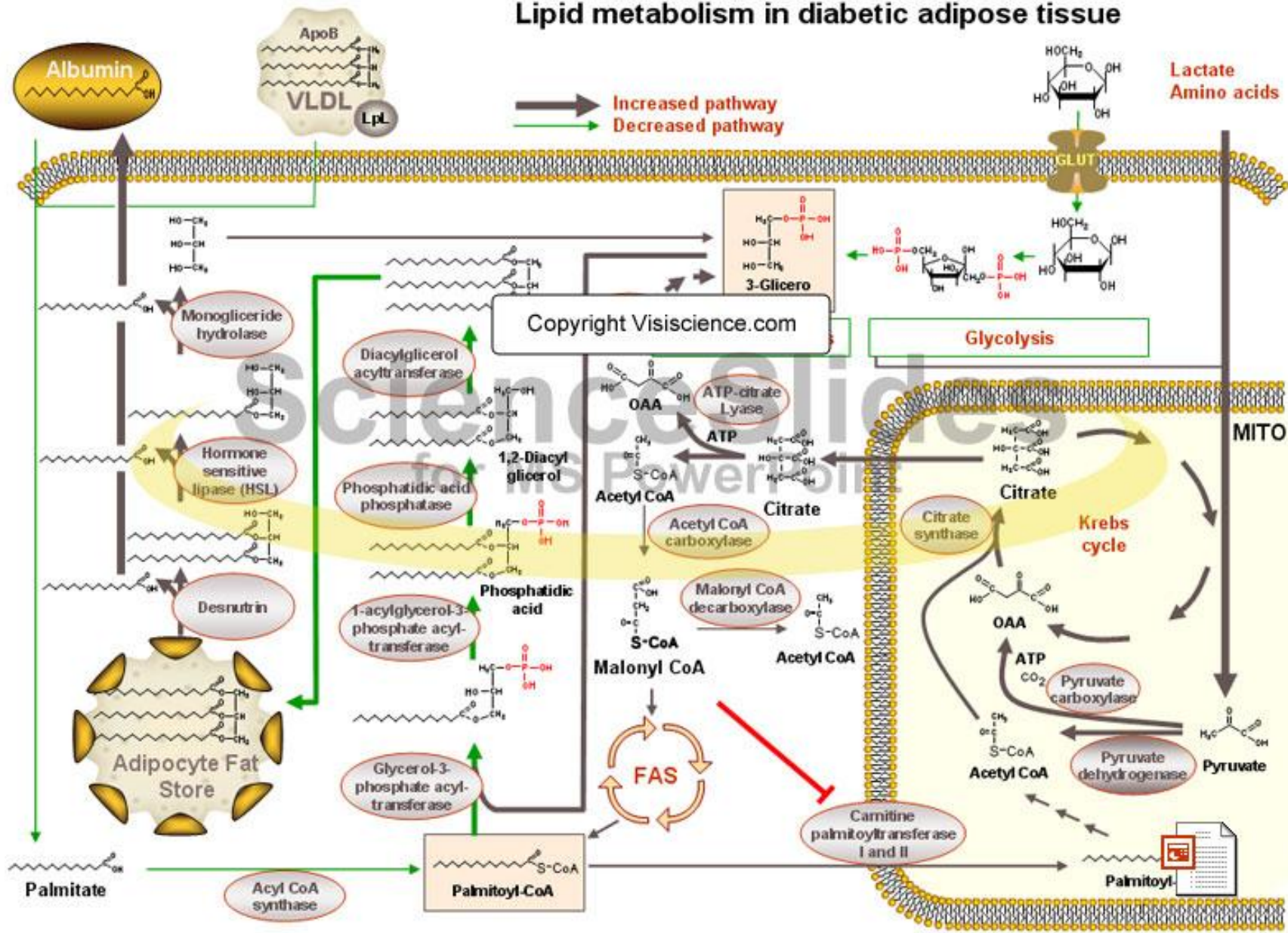
And C_3 was ester by phosphate acid, that have a binding with other alcohol group: cholina, ethanolamina, serin, dan inositol.

- phosfatidilkolin (alcohol have a binding with kolin),
- phosfatidil etanolamin (a binding with etanolamin),
- phosfatidil serin.

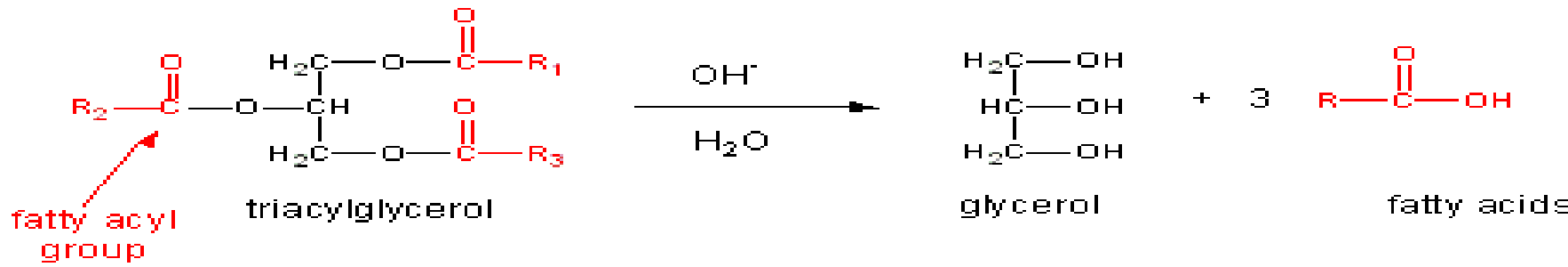
Phosphatidate



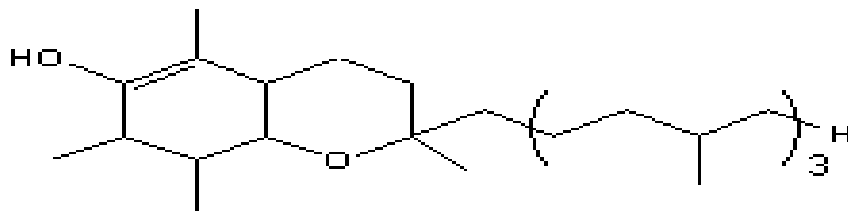
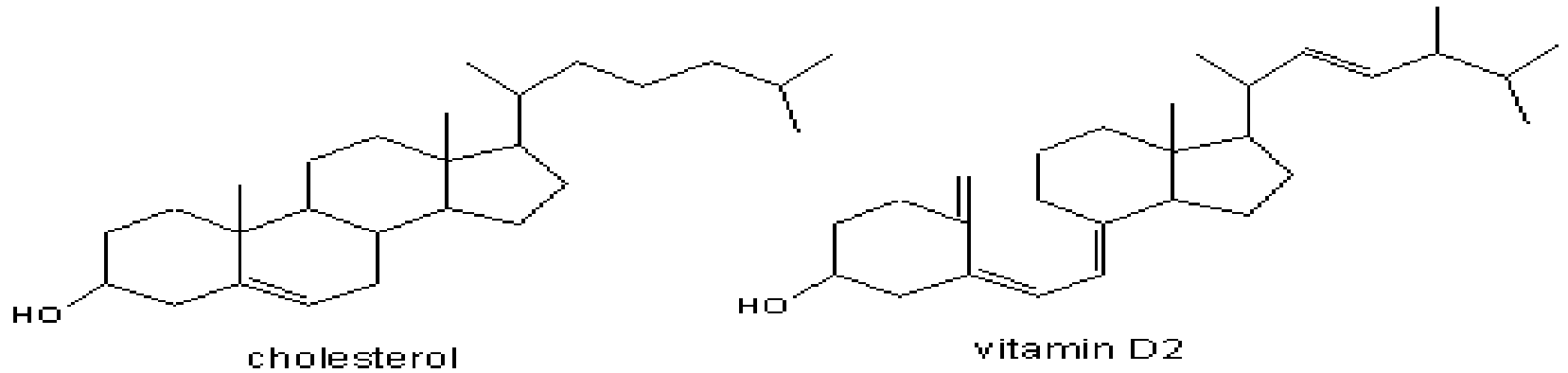
Lipid metabolism in diabetic adipose tissue



EX: SAPONIFIABLE LIPIDS - can be hydrolyzed by OH-

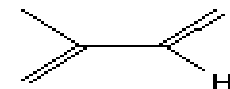


EX: NONSAPONIFIABLE LIPIDS - can't be hydrolyzed by OH-

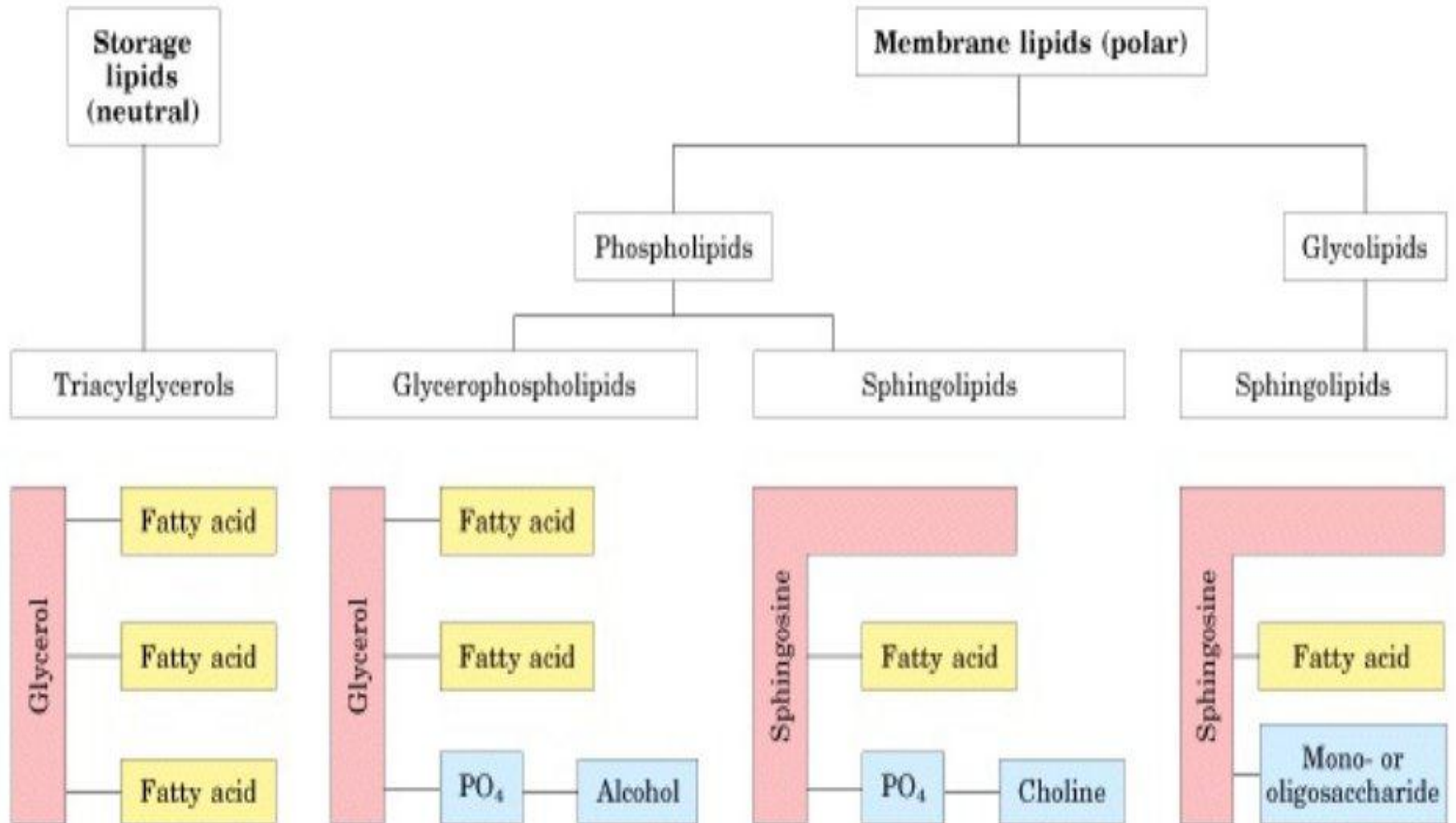


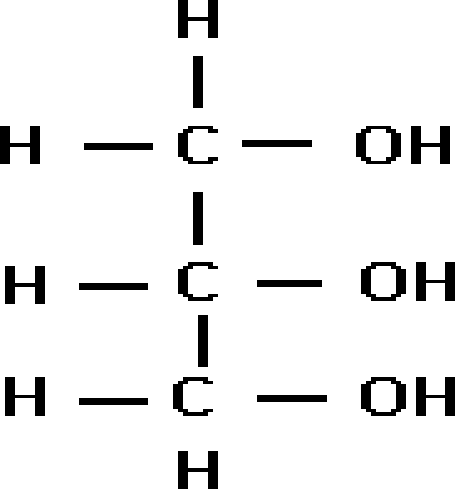
α -tocopherol
vitamin E

often derivatives of isoprene



The Structure of Lipids

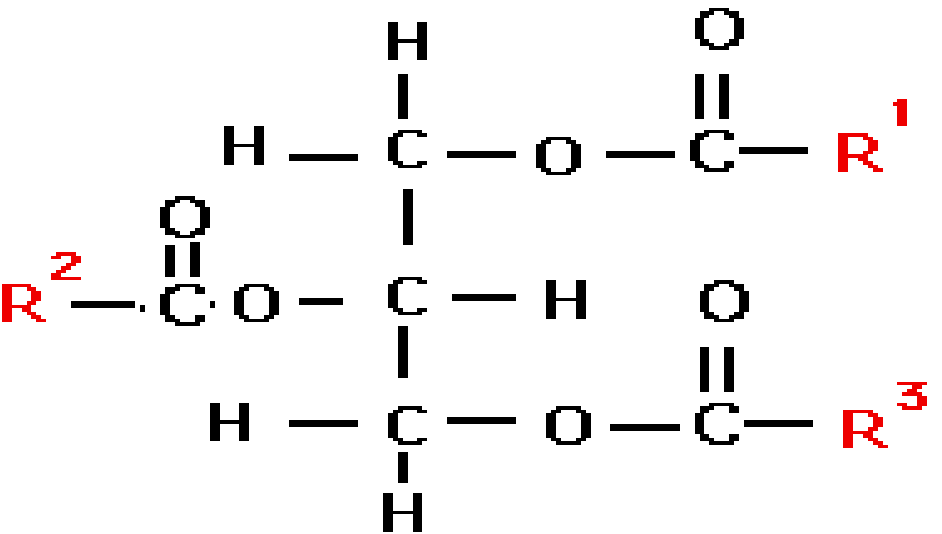




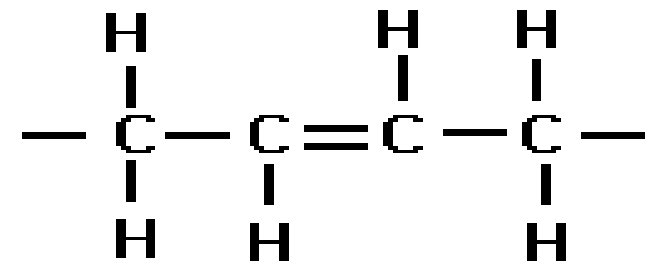
Glycerol



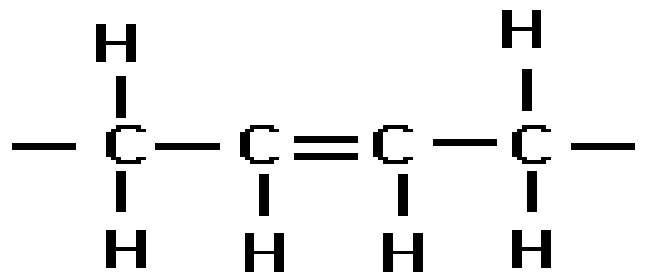
Saturated Fatty Acid (Butyric acid)



Triglyceride



Trans double bond



Cis double bond

Unsaturated

