

- lipids are macromolecules that contain Carbon, Hydrogen & Oxygen atoms
 $C_6H_{12}O_6$ (1:2:1)
- Unlike Carbohydrates it contains low oxygen concⁿ.
- Lipids are non-polar & water insoluble (hydrophobic)
- They play an important role in energy yield, energy storage, insulation & hormonal communication Product
- Triglycerides are the most common type of lipids

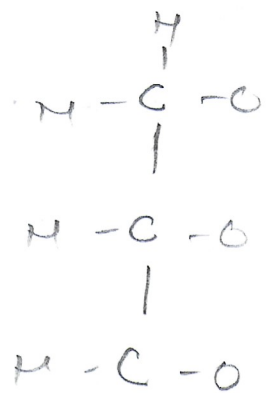
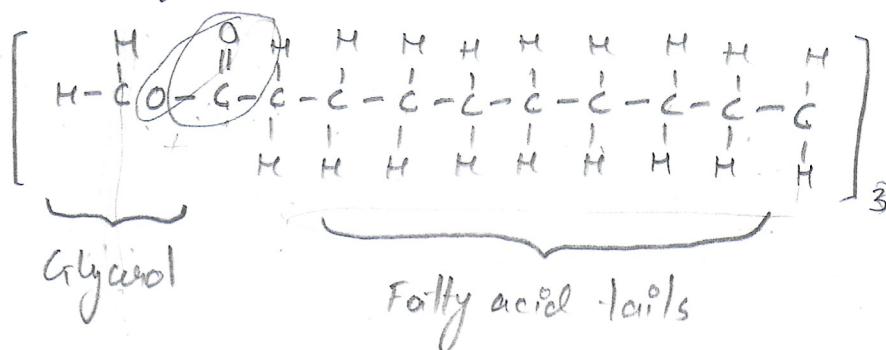
TRIGLYCERIDES:

3 Fa 1 G

- Formed by 3 molecules of fatty acid and one glycerol molecule's combination alcohol
- Non-polar & hydrophobic
- Organic molecules with -COOH ^{carboxylic a} attached to a Carbon-hydrogen-tail.
- Fatty acids have an R-Group (methyl group) at one end of hydrocarbon
- Methyl group is typically 4-24 Carbon long

Fatty acids: $RCOOH$

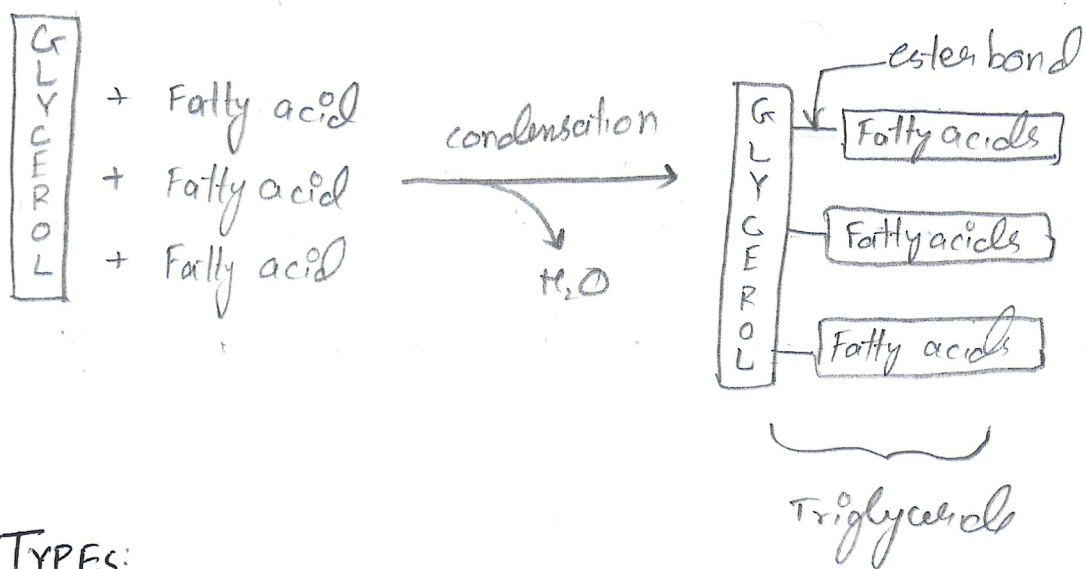
R - tail - $COOH$



- Each of fatty acid binds to Glycerol by Condensation reaction.
- fatty acids with glycerol forms a glyceride.
- Soluble in organic solvents like ether, chloroform & ethanol ^{2 al.}

FORMATION OF ESTER BOND By Condensation Reaction:

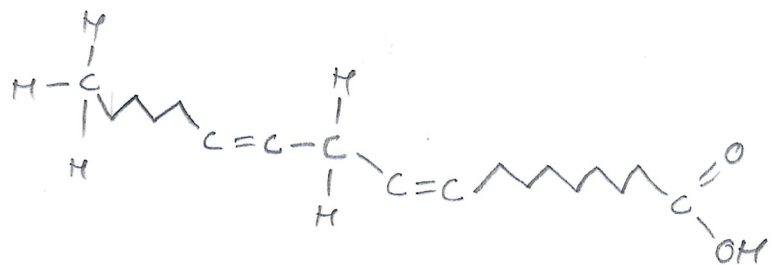
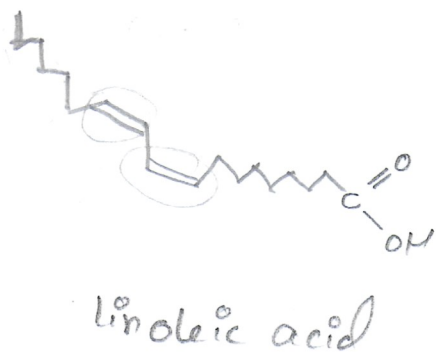
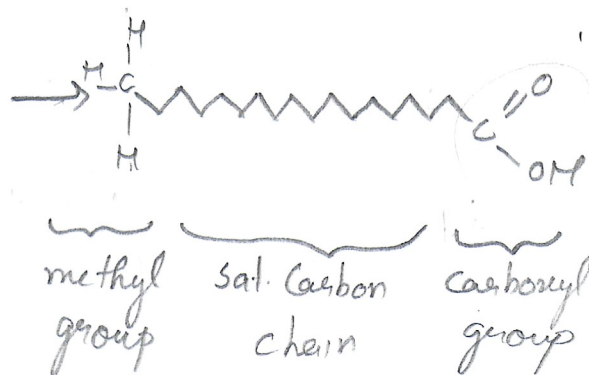
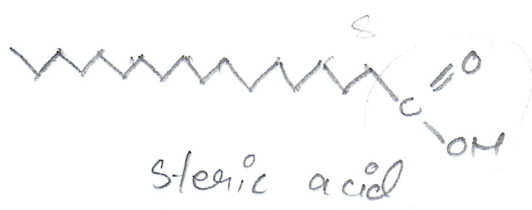
- Triglycerides are produced by esterification
- An ester bond forms when a hydroxyl (OH) group binds with a carbonyl group (RCOOR)
- The ester bond is formed by condensation reaction by release of water molecule. So, during the formation of Triglyceride 3 water molecules are released.



TYPES:

- They are usually of 2 types:
- ① Saturated: No C-C double bonds, forms unbranched linear chain
- ② Unsaturated: Presence of C-C double bonds, further divided in mono (if one double bond) & Poly (if more than 2)

- Double bonds make fatty acids & lipids melt more easily.
- Animal lipids are mostly saturated & are present as fats, whereas plant lipids are unsaturated and occur as oils.
- if hydrogen atoms is Present on same side : cis-fatty acids
 - Metabolised by enzymes
- if hydrogen atoms are present on different/opposite sides : Trans-fatty acids
 - Cannot be metabolised by enzymes & are linked with Coronary heart diseases.



Testing for Lipids: Lipids are water insoluble, ethanol is used

Emulsion Test:

Sample + abs. alcohol (shaken to dissolve)



cloudy white suspension

← yes

Powered in tube with water → no → dissolve in water, looks transparent

Emulsion: a fine dispersion of minute droplets when one liquid is dissolved in its insoluble solvent

Phospholipids:

- Special Categorized lipid.
- Each molecule of which has the unusual property of having a hydrophilic end.
- This is possible due to replacement of one phosphate group ^{by} of the three fatty acids which is polar. ~~to~~ ^{by}
- The phosphate group (hydrophilic) makes the head of phospholipid.