BIOMOLECULES CARB PRT LIPID

SULAGNA ROY

- chief function of monosaccharides :

1. Triose ($C_3H_6O_3$) → e.g. Glycolysis → ⇅ Glyceraldehyde 3-P. (Aldo) ⇅ dihydroxy acetone P. (Keto) → G3P → DHAP
   ↓ Isomer

(Q.)

a. Intermediate in respiration.
b. photosynthesis → dark reaction.

2. Pentoses ($C_5H_{10}O_5$) → e.g. Ribose, Deoxyribose, Ribulose.
   $C_n H_{2n} O_n$
   $\frac{n}{5}$ $\frac{2n}{2.5}$ $\frac{n}{5}$
   Aldo → (ose) ; Keto (ulose)

a. synthesis of nucleic acids → Ribose is a constituents of RNA & DNA.
   deoxyribose for
b. synthesis of some co-enzymes → Ribose is used in syn. of NAD & NADP.
c. synthesis of ATP requires ribose. e.g. — Glycolysis 6th step.
d. C_3 cycle → 1st step → (Q.)
   - Carboxylation → As CO_2 acceptor Ribulose 1,5 bis phosphate. — (Rubisco)
   - Reduction.
   - Regeneration.

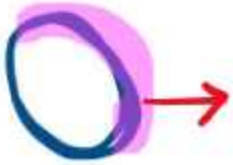
3. Hexoses → $(C_6H_{12}O_6)$ → e.g. Glucose, Fructose, Galactose

(a) Source of energy when oxidized in respiration.
(b) Glucose is the most common respiratory substrate.
(C) disaccharides → sucrose → Glucose + Fructose

due to presence of alcoholic group, monosaccharide show ester formation.

- 2-20 unit → ~~pol~~ oligosaccharides : general formula $C_n(H_2O)_{n-1}$

1. Lactose/ Milk sugar → = Glucose + Galactose → β 1,4 glycosidic bond.
2. Maltose/ Malt sugar → Germinating seeds and malt.
   ↓ 2 glucose unit. , α -1,4 glycosidic linkage.
   (Glu + Glu)

 → Amylase which break starch.

- Cellubiose → ✓ It is formed by hydrolysis of cellulose.
  ✓ β 1,4 glycosidic linkage.
- Isomaltose → α 1,6 glycosidic linkage.
- Sucrose / cane sugar → sugarcane → 1-D glucose.
  1-D fructose.
  } α-1,2 Glycosidic linkages.

- Trisaccharides → made up of three monosaccharides.
  3
  a. Raffinose: Glucose + Fructose + Galactose.
  b. Gentianose: Glucose + Glucose + Fructose.
- Tetrasaccharides → 4 monosaccharides. eg. stachyose
  4
- penasaccharides → e-g. Verbascose
  ⑤
- Hexasaccharides → cyclodextrin.
  ⑥

Function of oligosaccharides —

1. Disaccharides act as fuel.
2. Sucrose is reserve food in beet and sugarcane.
3. oligosaccharides attached with cell membrane help in recognising the cell of their own kind.

- polysaccharide — > 20 units

a. Homopolysaccharides → polysaccharides made up of one type of monosaccharide.
(similar)

e.g. Starch, Glycogen, cellulose. → (plant cellwall)

Glycosidic linkage

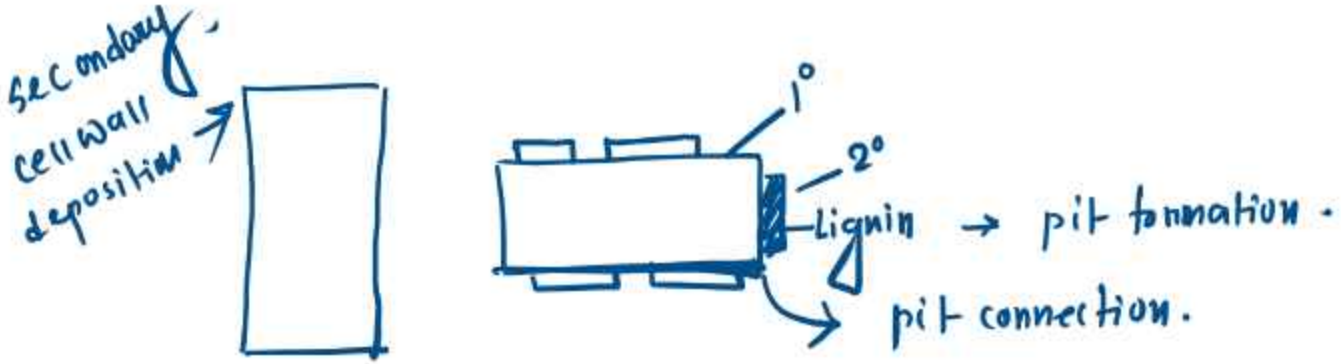
b. Heteropolysaccharides → poly. with different monosaccharides.
(diff.)

e.g. Heparin, pectin (middle lamellae), Hyaluronic acid.

Starch → = linked by α - 1,4 glycosidic linkages.

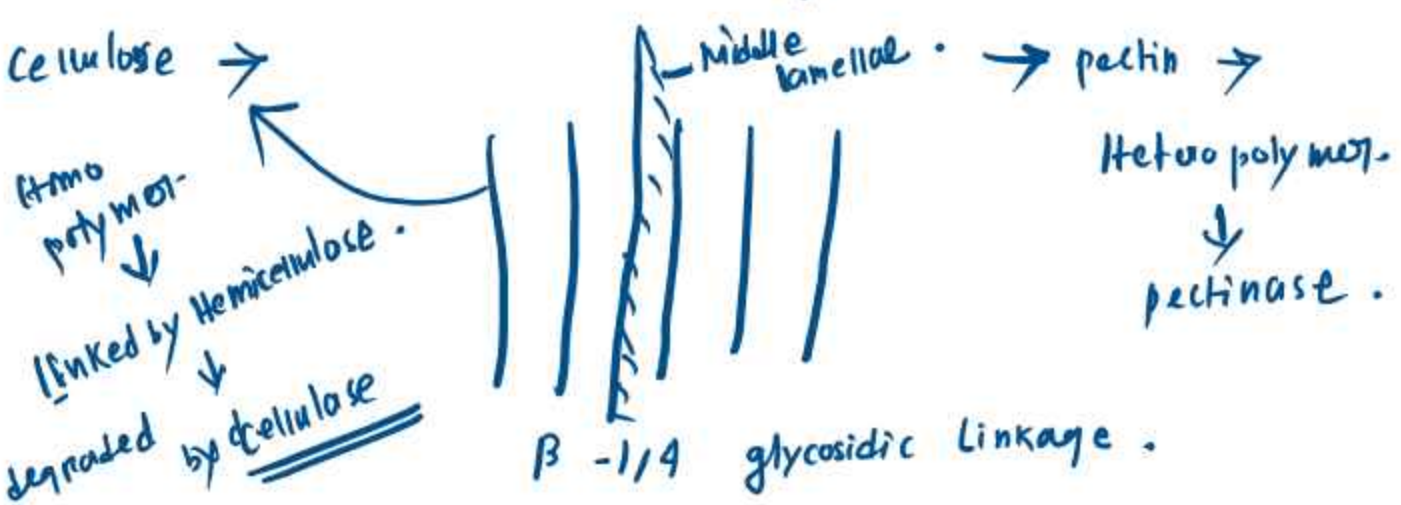
Amylose , amylopectin → 1:4 ratio

Name of polysaccharide	composition	occurance	Functions.
1. Starch	1. polymer of Glucose containing a straight chain of glu. amylose + amylopectin.	1. In several plant sp. main storage carbohydrate.	1. storage of reserve food.
2. Glycogen (Animal starch)	polymer of glucose	→ Animal (equivalent of starch)	—
3. Insulin	— — Fructose	→ In roots and tuber (Dahlia).	—
4. Lignin.	— — Glu.	→ plant cellwall (Sclereon chyma)	(cellwall matrix.
5. Chitin	— — Glucose	— Arthropod body wall, fungi	→ (Exoskeleton of Arthropod)



6. Heparin → Anticoagulant.

7. Animal starch → Glycogen.



Function of polysaccharides →

1. As necerve food : plant → starch.
   Animal → Glycogen.

2. structural polysaccharide → cellulose, Hemicellulose, pectin
   chitin.

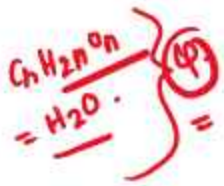
3. cotton fibre, papen → cellulosic (cellulose)

4. Exoskeleton of Anthropods consist of chitin which is a
   heteropolymen of N-acetyl glucosamine.

Function → It supplies fuel of the body.
It constitutes the structural material of the body.
calorific value → 4.1 Kcal/gm.

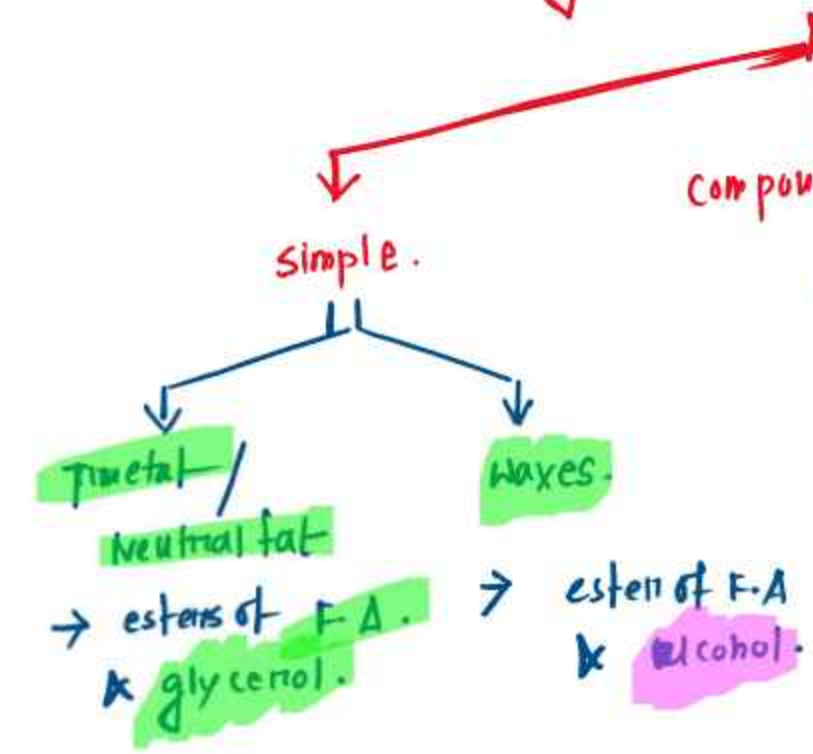
Lipids

- Lipids are esters of fatty acids and higher alcohol.
- insoluble in water.
- carbon, hydrogen, oxygen. → compound of C, H, O.
  H, O ratio > 2 : 1.
  $(C_nH_{2n}O_2)$



- Fatty acids → Ester bond / Amide / Ether bond
- sometats like olive oil, cod-liver oil – an liquid.
  solids → fat under skin / bone marrow, mammary glands.
  wax → comb of honey bee.

Classification according to compositions →



Compound./conjugated lipids.

Fat + Non fatty prosthethic group.

e.g. phospholipid → with phosphonic acid.
e.g. choline, Lecithin.

- Glycolipids → with carbohydrate → e.g. Neuron
- Gangliolipids → - amino sugar → Brain lipid.
- Lipoproteins → with amino acids → Myelin sheath.

Derived.
(derived from previous two)

Derived → e.g. Hydrocarbons.
Fat soluble vitamins → A, D, E, K. ④
sterols.
steroids.

- According to chemical structure →

Lipid

Saturated Fats.

Q. They lack double / triple bonds. only have single bonds.

- Completely reduced. yield more energy.
- They have higher melting point

Unsaturated Fats.

Q. They have one or more double bonds

- partially oxidized, thus yeild lessen energy.
- Lower thermal melting point due to lessen aggregation.

Tm → Melting point.

- Tm α chainlength.
- Tm α $\frac{1}{\text{degree of unsaturation}}$.

Q.

Function → 1. Fats are food with high calorific value →
1g. of fat → 9.3 kcal of heat.

2. Fat act as reserve food material.

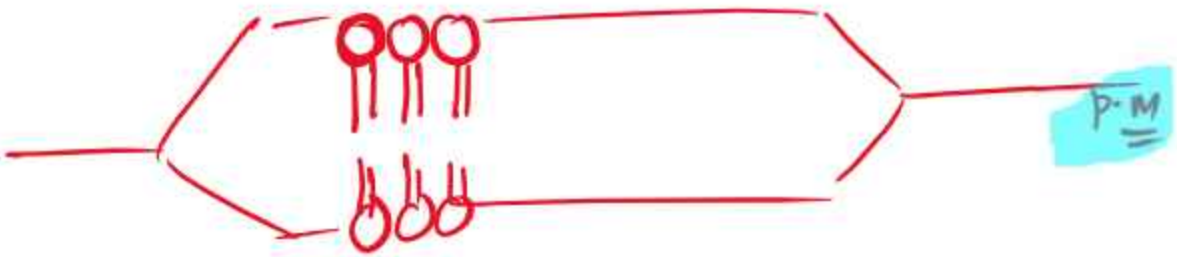
3. Fat s are generally deposited in subcutaneous tissue, act as a mechanical butter against external injury.

4. body temp. regulator (Insulator)

5. Fat soluble vit → A, D, E, K.

6. Various hormones → (Adrenocortiecoids, oestrogen) Testo.
↳ cholesterol.

7. Lipids act as a str. Component of plasma membrane.



Nucleic Acid →

1. A Nucleic acid present with proteins in chromosome are mainly DNA.
   condensation of chromatin → chromosome.

2. 3 mol. → a. phosphoric acid (H_3PO_4).
   b. pentose sugar (monosaccharides) → (5C) /Ribose.
   c. Nitrogenous base → pyrimidine
      purine.

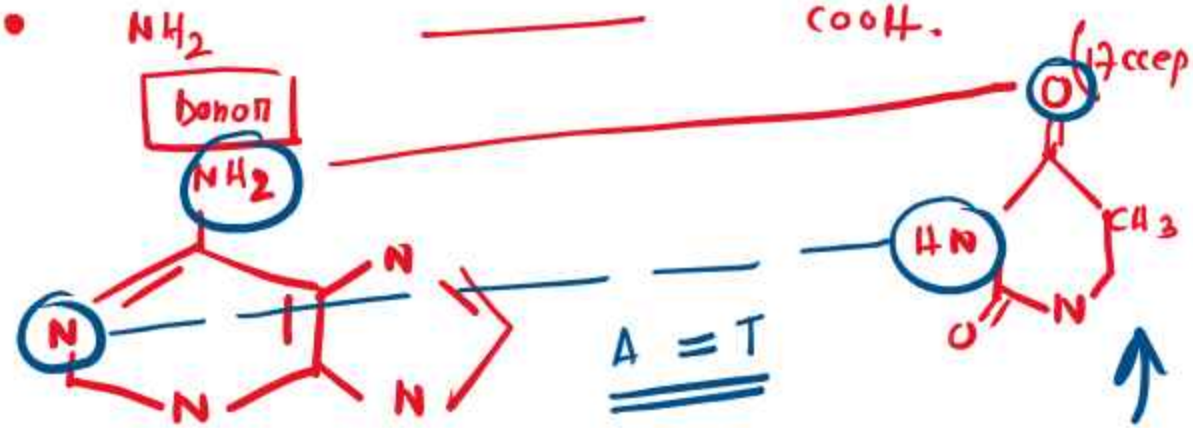
- Energy currency → ATP → plant
  GTP → Animal. (P.)
  CTP →
  UTP →

Nucleotide

- pentose sugar.
- phosphate grp.
- Nitrogenous base.
  - Purine
    - Adenine - (A)
    - Guanine - (G)
  - pyrimidine
    - Cytosine (C)
    - Thymine (T)
    - Uracil (U).

[A = T → 2 hydrogen bond.
C ≡ G → 3 " "]

Nucleoside → ~~Nucleo~~ sugar m of. + org. nitrogen base.



Adenine

Thymine (Keto).
DNA

Uracil (Keto)
RNA.

C ≡ G