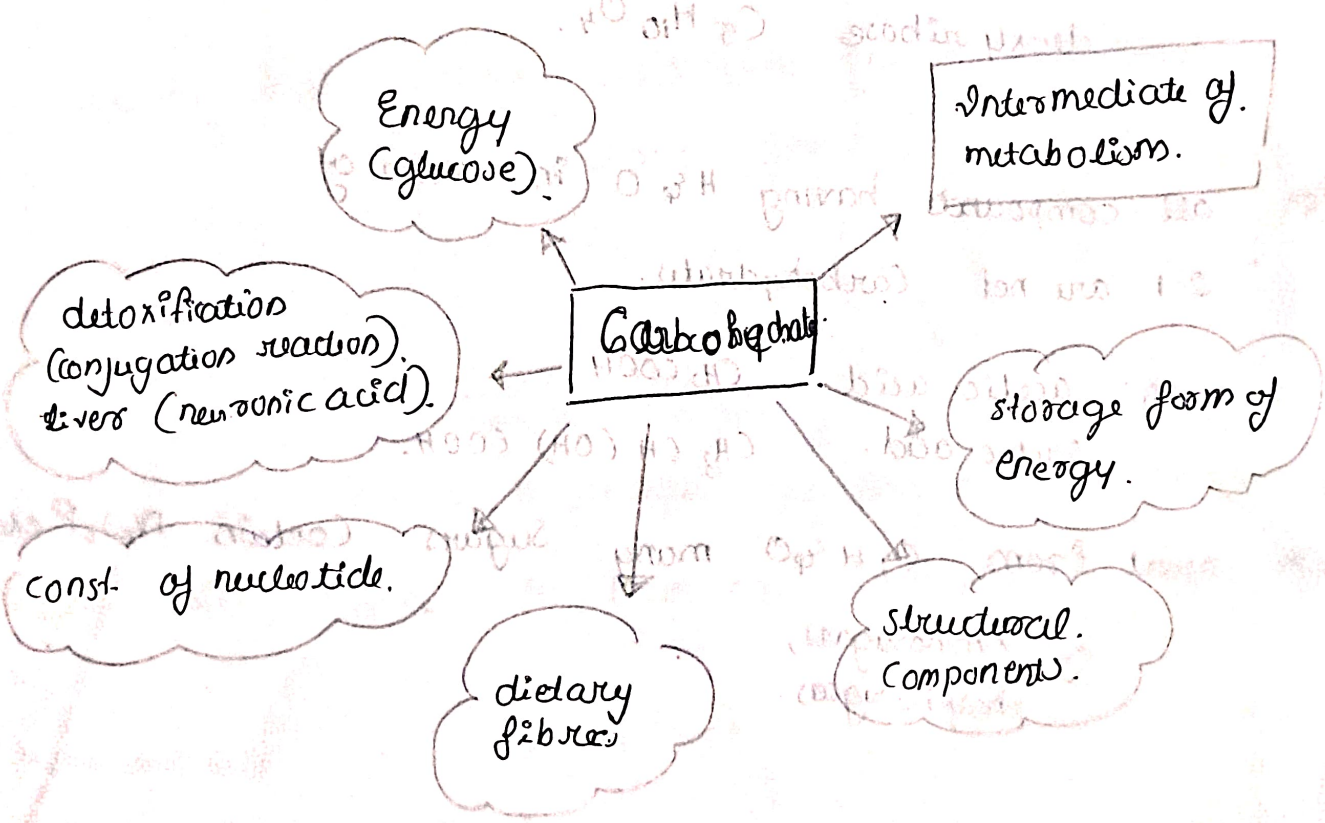
# Carbohydrates { all are D forms, naturally }

## Functions.

- Nutritional - Energy storage, fuels, metabolic Intermediate.
- Structural - components of nucleotides, plant and bacterial cell walls, connective tissue.
  (mucopolysaccharide)



# Major Energy source.

- also called as 'saccharons' meaning sugar.
- Hydrates of Carbon : $C_n(H_2O)_n$.

# not true due to 3 reasons.

(1) all sugars doesn't follow:

deoxy ribose $C_5H_{10}O_4$.

(2) all compounds having H & O in ratio of 2:1 are not Carbohydrates.

eg: acetic acid. $CH_3COOH$

lactic acid. $CH_3CH(OH)COOH$.

(3) apart from C, H & O many sugars Contain N, S, P etc.

eg: Aminosugars,
phosphosugars.

## Carbohydrates.

# aldehyde or keto derivatives of polyhydroxy alcohols or compounds which gives these on hydrolysis.

# aldehyde derivative. - glyceraldehyde.

- Dihydroxy acetone.

# keto derivative.

- Sugars that contain aldehyde group: aldoses.
  Keto group : Ketoses.

## Carbohydrates. Classification

Broadly to 4 major groups depending on the number of sugar units contained in them or liberated on hydrolysis.

Monosaccharide - 1 sugar unit.
disaccharide - 2 unit.
Oligosaccharide - 3 - 10 units
polysaccharide - >10 units.

## Monosaccharides.

- simple as they cannot be hydrolysed further.
- possess a free functional group -

  aldehyde - HC=O

  keto group >C=O.

| No. of C | Aldose | Ketose. |
|---|---|---|
| 3C - triose | glyceraldehyde. | dihydroxy acetone. |
| 4C - tetrose | Erythrose. | Erythrulose. |
| 5C - pentose | Ribose | ribulose. |
| 6C - Hexose. | glucose. | fructose. |

# Disaccharides

- 2 sugar units on hydrolysis
  units maybe same or different.
- units are linked by glycosidic or acetal bonds.

Glycosidic-OH group of one sugar molecule can react with any one of OH group of a second molecule of sugar.

## Biologically Important Disaccharides.

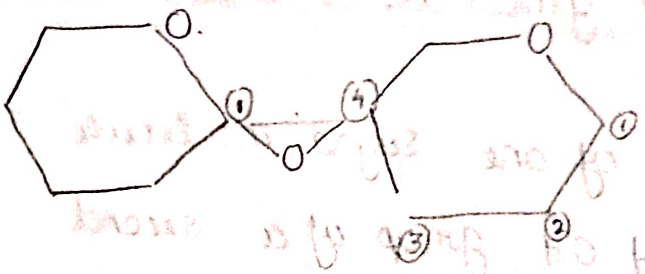
Sucrose → glucose + fructose.
maltose → glucose + glucose.
lactose → glucose + galactose.

depending on whether a disaccharide contains a free functional group or not. : acetal : $C(OR)(OR)$ ✗.
hemiacetal : $C(OR)(OH)$ ✓

1. reducing sugar disaccharides - lactose, maltose.
   ↳ hemiacetal grp can form aldehyde by breaking ring.
2. non-reducing - sucrose, trehalose. {in mushrooms}
   ↳ only acetal groups and no hemiacetal. ✓

Maltose → α D glucopyranosyl α 1→4 α D glucopyran

α 1-4



Lactose. β -1, 4.

β - D Galactopyranosyl (1→4) β D glucopyranoside.

Sucrose

α 1 - β 2.

α D Glucopyranosyl (1 → 2) β D fructofuranoside.

## Oligosaccharides.

- 3 - 10 sugar units.
- eg: raffinose, stachyose.
- constituent of glycoproteins, glycolipids.
- Involved in cell to cell recognition.

## polysaccharides.

- on hydrolysis yields >10 units of monosaccharides.
- In some, monomeric units are modified monosaccharides - amino sugars, N acetylated amino sugars etc.

### Homo polysaccharides.

- if monomeric units are all same.
- Starch, glycogen, ~~dextrin~~, dextrans, cellulose, chitin.

### Helero polysaccharides.

- different sugar units.
- Agar & Agarose
- glycosaminoglycans (GAGs.) [aminosugars + Neuraminic acid]

eg: ~~Chitin~~.