Carbohydrate

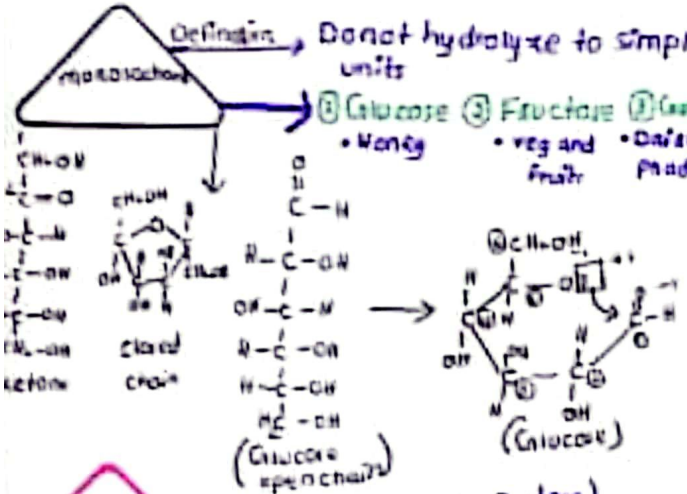
- Monosaccharide
- Disaccharide
- Oligosaccharide
- Polysaccharide

Monosaccharide

Definition → Cannot hydrolyze to simple units

① Glucose ② Fructose ③ Galactose

- ① Honey
- ② veg and fruit
- ③ Dairy product



Disaccharide

Double salt

- Sucrose (Glucose + Fructose)
- Lactose (Glucose + Galactose)
- Maltose (Glucose + Glucose)

Polysaccharide

- Long-chain carbohydrate composed of more than 10 monosaccharide units
- Homopolysaccharide
- Heteropolysaccharide

Starch → plant storage organ, potato, wheat grain

Cellulose → Structural material of plant

Biological importance

Energy storage → serve as energy storage

Structural Role → Provide structure and support to cells and tissues

Protective function → Provide protection against pathogen and environmental stressors.

Protein

Classification

- Simple protein → only amino acids
  - Albumins
  - Globulins
  - Glutelin
- Conjugate protein → aminoacids + other molecules
  - Glycoprotein
  - Lipoprotein
- Derived protein → Derived from simple + conjugated
  - proteans
  - proteoses
  - peptones
  - peptides

Structure of protein

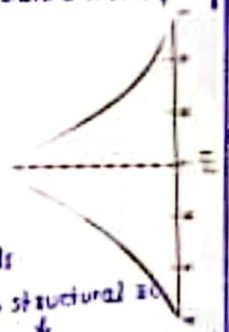
- Primary structure
- Secondary structure → Alpha helix, Beta sheet
- Tertiary structure

Properties

- Solubility → can be soluble / insoluble in water
- pH and temperature stability

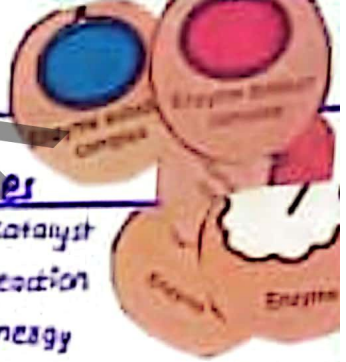
Importance of protein

- Binding properties → Proteins can bind to other molecules
  - vitamins, hormones, minerals
- Enzymatic activity → catalyze chemical reaction
- Structural → structure and support to cells and tissues



- Hormonal → regulate various bodily functions
- Defense → Antibodies
- Transport → Transport molecules across cell membrane
- Enzymatic → catalyze chemical reaction

Enzyme



Role of Enzymes

- Act as biological catalyst
- speed up chemical reaction
- Lower activation energy

Work of Enzyme

Substrate binding → Enzyme + substrate → Enzyme–substrate complex

Catalysis → Conversion of substrate into product

Enzyme release product → Free to catalyze another reaction

Factors affecting enzyme Activity

- Temperature
  - Optical temp maximum activity
  - High temp → denaturation
  - low temp reduced activity
- pH
  - optimal pH → maximum activity
  - Extreme pH Level Denaturation
- Substrate concentration
  - Low substrate → limited activity
  - High substrate → saturation point reached

Industrial Applications

- Food industry
- Detergent industry
  - Proteases
  - Lipases
- Brewing
  - Cheese making
  - baking
- Bio Fuel production
  - cellulase

Inhibitors

- Competitive → Inhibitor competes with substrate
- Non-competitive

Lipids

classification of lipids

- Simple lipids
- Complex lipids
- Derived lipids

Functions

Structure of Lipids

- Energy storage
- Cell membrane structure
- Insulation and protection

Basic structure
- Glycerol backbone
- Fatty acid chain
- phosphate or carboxylate group

Hydrophilic and hydrophobic

- Hydrophilic: water attracting, polar part, phosphate group
- Hydrophobic: water-repelling (non-polar), example: Fatty acid chain

Physical properties and chemical properties

Solubility
- Insoluble in water
- Soluble in organic solvents
- Fats → solid at R.T
- oils → liquid at R.T

Essential lipids:
- Cannot synthesize by the body

Non-essential:-
- Synthesize by body

- hydrolysis of fats and oils
- Reaction with water to produce glycerol and fatty acid
- Require enzymes
- Saponification → Reaction with strong base (NaOH) to produce soap
- Hardening of oil →
- Addition of hydrogen to unsaturated fatty acid
- converts oil into solid fat

Nucleic Acids

- DNA
- RNA

DNA
Deoxyribonucleic Acid

Nitrogenous Base
- Adenine
- Thymine
- Cytosine
- Guanine

Phosphoric Acid

Deoxyribose sugar

- Nucleotide: building blocks of DNA

Components of DNA

Double helix molecule
- Two strands coil around each other
- Anti parallel strand (5' to 3' and 3' to 5')

RNA
Ribonucleic Acid

- single-stranded strands
- Nucleotide: building blocks
  - nitrogenous base

Ribose sugar: part of nucleotide

Phosphoric Acid: Form backbone with sugar

Components of nucleotide
- Nitrogenous bases
  - Purine: Adenine (A), Guanine (G)
  - Pyrimidine: Cytosine (C), Thymine (T), Uracil (U) → in RNA
- Pentose sugar
  - Deoxyribose (in DNA)
  - Ribose (in RNA)

Phosphoric Acid: Forms the backbone of DNA and RNA with sugar

Storage of Genetic information:-
- DNA storage
- Gene expression
  - Transcription
  - Translation

Nutritional and biological importance of nucleic acid

Genetic inheritance
- passes info from one generation to another

protein synthesis
- RNA plays key role in translating genetic

cell division
- accurate distribution

Minerals
- Type:
  - macronutrients → Required in larger amounts
    - Examples → Calcium, Phosphorus
  - micronutrients → Required in small amounts
    - Example: Iron, zinc

Iron

Sources
- Red meat
- Liver
- poultry
- fish
- Biological importance
- essential for the formation of hemoglobin which transport oxygen in the blood
- Involved in energy metabolism and immune function

Calcium

Source
- Dairy product
- Leafy green vegetable
- Biological importance

Zinc

source
- meat, shellfish, dairy products
- Whole grain, legumes, nuts

source
- meat, poultry, fish
- Biological importance
- Important for bone and teeth health

Phosphorus