Biomolecules NCERT Notes

Carbohydrates are polyhydroxy aldehydes or ketones, or compounds that yield them on hydrolysis. Also called saccharides.

Preparation of Glucose

- **From sucrose:** Boil with dilute H_2SO_4 or HCl. Forms glucose + fructose.
- **From starch:** Hydrolysis with dilute H_2SO_4 at 300 K gives glucose.

Structure of Glucose

- Forms n-hexane with HI $\Rightarrow$ 6 carbons.
- Forms oxime, cyanohydrin $\Rightarrow$ carbonyl group.
- With Br_2 water $\Rightarrow$ gluconic acid (has $-$CHO).
- Acetylation $\Rightarrow$ pentaacetate $\Rightarrow$ 5 $-$OH groups.
- With HNO_3 $\Rightarrow$ saccharic acid $\Rightarrow$ $-CH_2OH$ present.

Cyclic Glucose

- No Schiff's test.
- Pentaacetate doesn't react with hydroxylamine $\Rightarrow$ no free $-$CHO.
- Has α and β forms (anomers).
- 6-membered ring $\Rightarrow$ pyranose.

Key Points

- Sucrose → D-(+)-glucose + D-(-)-fructose. Net: laevorotatory.
- Starch = amylose + amylopectin.
- Cellulose and glycogen = polysaccharides.

Amino Acids and Proteins

- Acidic/basic: based on $-NH_2$ and $-COOH$ count.
- D/L-form: NH_2 right = D, left = L.
- Proteins = polypeptides with peptide bonds (CO–NH).
- ¿10 amino acids = polypeptide.

By Shape

- **Fibrous:** Long, structural (e.g., keratin).
- **Globular:** Spherical, functional (e.g., enzymes).

Protein Structure

- Primary: Amino acid sequence.
- Secondary: α-helix or β-sheet.
- Tertiary: 3D folding.
- Quaternary: Multiple chains.

Properties

- Denaturation = loss of function (e.g., heat).
- Amino acids = zwitterions: high solubility, high mp.

Enzymes

- Globular proteins acting as biocatalysts.
- Specific (e.g., maltase on maltose).
- Oxidoreductases = redox catalysts.

Vitamins

- **Fat-soluble:** A, D, E, K
- **Water-soluble:** B-complex, C
- A: Xerophthalmia, B_1: Beri-beri, B_2: Cheilosis

Starch

- Amylose: 10–15%, linear, 1→4, soluble.
- Amylopectin: 85–90%, branched (1→4, 1→6), insoluble.

Sucrose Linkage

- 1→2 glycosidic bond (glucose–fructose).
- Hydrolysis: H_2O/H^+ notation.

Fibrous vs Globular Proteins

Feature	Fibrous	Globular
Shape	Long	Spherical
Water Solubility	Insoluble	Soluble
Function	Structural	Functional
Examples	Keratin, collagen	Hemoglobin, enzymes
Structure	Repetitive, simple	Complex folding
Stability	High	Low