

CLASS 12

CHEMISTRY

REVISION NOTES

Class 12 Chemistry Chapter 10 Biomolecules – Revision Notes

Quick revision notes for Class 12 Chemistry Chapter 10 – Biomolecules, covering carbohydrates, proteins, enzymes, vitamins, nucleic acids and hormones. Ideal for last-minute board exam revision.

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Quick revision notes for **Class 12 Chemistry Chapter 10 – Biomolecules**, covering carbohydrates, proteins, enzymes, vitamins, nucleic acids and hormones. Ideal for last-minute board exam revision.

Carbohydrates

Carbohydrates are optically active polyhydroxy aldehydes (aldoses) or polyhydroxy ketones (ketoses), and their derivatives. Classified by hydrolysis behaviour: **monosaccharides** (cannot be hydrolysed further, e.g. glucose, fructose, ribose), **oligosaccharides** (hydrolyse to 2–10 monosaccharide units — disaccharides, e.g. sucrose, maltose, lactose, are the most common case), and **polysaccharides** (hydrolyse to many monosaccharide units, e.g. starch, cellulose, glycogen). **Glucose** exists mainly as a six-membered pyranose ring formed by cyclisation at C5, giving α and β anomers that interconvert via mutarotation (equilibrium rotation $+52.5^\circ$). **Fructose** forms a five-membered furanose ring. **Sucrose** hydrolyses to glucose+fructose (non-reducing; hydrolysis product is called invert sugar); **maltose** hydrolyses to glucose+glucose (reducing, α -1,4 link); **lactose** hydrolyses to glucose+galactose (reducing, β -1,4 link). **Starch** = amylose (unbranched, α -1,4, helical, blue with iodine)+amylopectin (branched, α -1,6 branch points); **cellulose** is an unbranched β -1,4-glucose polymer (structural, non-digestible by humans); **glycogen** is the animal storage polysaccharide, more highly branched than amylopectin.

Proteins

Proteins are polymers of α -amino acids joined by **peptide linkages** ($-\text{CO}-\text{NH}-$). Amino acids are classified as essential (must come from diet, e.g. valine, leucine) or non-essential (body can synthesise, e.g. glycine, alanine), and exist as **zwitterions** in solution, giving them amphoteric behaviour. Protein structure has four levels: **primary** (amino acid sequence), **secondary** (α -helix or β -pleated sheet, stabilised by hydrogen bonding between peptide linkages), **tertiary** (overall 3-D folding, stabilised by hydrogen bonds, disulphide bonds, van der Waals forces and electrostatic interactions), and **quaternary** (assembly of multiple polypeptide subunits, e.g. haemoglobin). **Fibrous proteins** (parallel chains, water-insoluble, e.g. keratin, myosin) differ from **globular proteins** (coiled/folded, water-soluble, e.g. insulin, albumin). **Denaturation** destroys secondary/tertiary structure and biological activity (heat, pH change) while leaving the primary structure intact — e.g. coagulation of egg white, curdling of milk.

Enzymes

Enzymes are **biological catalysts**, almost always globular proteins, that catalyse biochemical reactions with high specificity under mild physiological conditions.

Vitamins

Classified by solubility into **fat-soluble** (A, D, E, K — stored in liver/adipose tissue) and **water-soluble** (B-complex and C — not stored, except B₁₂). Key deficiency diseases: Vitamin A→night blindness; B₁ (thiamine)→beriberi; B₂ (riboflavin)→cheilosis; B₆ (pyridoxine, old name adermin)→convulsions; B₁₂ (cobalamin)→pernicious anaemia; C (ascorbic acid)→scurvy; D (calciferol)→rickets (children)/osteomalacia (adults); E (tocopherol)→increased RBC fragility, muscular weakness; K (phylloquinone)→increased blood-clotting time.

Nucleic Acids

Nucleic acids are biopolymers of **nucleotides** (nitrogenous base+pentose sugar+phosphate group); a nucleoside is just base+sugar. **DNA**: sugar is β -D-2-deoxyribose; bases are adenine, guanine, cytosine, thymine; usually a double helix of two complementary, antiparallel strands held by base pairing (adenine–thymine via 2 H-bonds, guanine–cytosine via 3 H-bonds); carries and transmits hereditary information and can self-replicate. **RNA**: sugar is β -D-ribose; bases are adenine, guanine, cytosine, uracil (in place of thymine); usually single-stranded; directs protein synthesis via three types — **m-RNA** (carries the genetic code from DNA to the ribosome), **t-RNA** (carries specific amino acids to the ribosome), and **r-RNA** (structural/catalytic component of the ribosome).

Hormones

Hormones are chemical messengers secreted by endocrine glands that regulate the body's metabolic activities. They fall into three broad chemical classes: **steroid hormones** (e.g. estrogen, progesterone, testosterone), **polypeptide hormones** (e.g. insulin), and **amino-acid-derivative hormones** (e.g. epinephrine/adrenaline, thyroxine). Insulin, secreted by the pancreas, regulates blood glucose levels; its deficiency causes diabetes.

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