Biochemistry Syllabus – for Entrance Examination (2024)

UNIT I:

- Units of measurement of solutes in solution. Eg. Normality, molality, molarity. Ionic strength. pH, pOH, Henderson-Hasselbalch equation, buffers, pH of body fluids, red blood cells and tissues. Measurement of pH by indicators, zwitter ions. pH dependent ionization of amino acids and proteins.
- General principles of chromatography, Operational procedure and application of Paper chromatography, Thin layer chromatography, Ion exchange chromatography, Molecular sieve chromatography, Affinity chromatography, Gas Liquid chromatography, HPLC, factor affecting the migration rate – sample, electric filed, buffer and supporting medium, PAGE, SDS-PAGE, Immunoelectrophoresis.
- Atomic structure, radiation, types of radioactive decay, half life, and units of radio activity. Detection and measurement of radioactivity – methods based upon ionization (GM counter), methods based upon excitation (Scintillation counter). Autoradiography.

UNIT II:

- Steroisomerism and optical isomerism of Sugars, anomeric forms and mutarotation. Reactions of carbohydrates due to the presence of hydroxyl group, aldehyde and ketone groups.
- Classification and structure of amino acids. Physical and chemical properties of amino acids. Essential and non-essential amino acids. Non protein amino acids. Protein-Classification based on solubility, shape, compositionand function. Properties of proteins. Denaturation and renaturation of proteins. Structure of peptide bond.
- Protein structure- primary, secondary, tertiary and quaternary (helix and pleated sheet) structure of protein. Forces stabilizing the secondary, tertiary and quaternary structures of proteins. Chemical synthesis of polypeptides-solid phase peptide synthesis. Determination of the amino acid sequence of a polypeptide chain, specific chemical and enzymatic cleavage of polypeptide chain. Biologically important peptides-functions.

UNIT III:

- Nature of genetic material. Composition of RNA and DNA. Structure of purine and pyrimidines, nucleosides and nucleotides. Size and structure of different types of DNA-A, B, Z types DNA. Structure and role of different types of RNA. Properties of nucleic acid – denaturation and annealing of DNA. DNA as the vehicle of inheritance- Experimental evidence –Griffith, McLeod, McCarty and Avery, Hershey-Chase experiments. Definition of Gene, organization of genes and non-coding DNA in prokaryotes and Eukaryotes – unique, moderately repetitive and highly repetitive DNA sequence, Satellite DNA. Cot value.
- DNA replication in prokaryotes, mode of replication, Semiconservative mode of replication. Mutation-definition, types of mutations such as spontaneous and induced, point mutation. Gene mutation and chromosomal aberrations. Cause of mutation-chemical and physical agents. Role of restriction endo-nucleases, plasmid and cosmid cloning vectors.
- Basic features of genetic code. Deciphering of Genetic code. Wobble Hypothesis. Transcription-Prokeryotic RNA polymerase-Enzyme structure, role of sigma factor, promotor, Initiation, elongation and termination of RNA synthesis. Regulation of gene expression in prokaryotes Operon- Concept- Positive and negative regulation of lac operon.

UNIT IV:

- IUB system of enzyme classification, specificity, enzyme units, active site, mode of action – Lock and key theory and induced fit theory. Enzyme Kinetics – Introduction

- to chemical kinetics, rate and order of reactions, factor affecting the enzyme activity, derivation of Michaelis – Menten Equation. Line – Weaver and Burk plot, Eadie- Hofstee plot. Enzyme inhibition – Competitive, non-competitive and uncompetitive inhibitions.
- Free energy – free energy of hydrolysis of ATP and other organophosphates. Role of High energy compounds – Electron transport chain- Components and reactions of ETC. Role of ETC – Oxidative phosphorylation – Chemi Osmotic hypothesis. P/O ratio, uncouplers of oxidative phosphorylation.
- The glycolytic pathway – aerobic and anaerobic glycolysis, energetics, glycogenolysis, regulation of glycogen metabolism, citric acid cycle and its regulation. Beta oxidation, alpha oxidation and omega oxidation. Transamination, oxidative and non-oxidative deamination, decarboxylation- urea cycle and its regulation.

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UNIT V:

- Liver Function test. Metabolism of bilirubin, jaundice-types, clinical features and test based on bile pigments, level in blood and urine, plasma changes, PT, Renal function tests, Clearance test-urea, creatinine, inulin, PAH test, concentration and dilution tests.
- Clinical enzymology. Definition of functional and non-functional plasma enzymes. Isoenzymes and diagnostic tests, enzyme patterns in acute pancreatitis, liver damages, bone disorders, myocardial infarction and muscle wasting
- Diseases related to carbohydrate, amino acids and lipid metabolism. Tumor markers, markers produced by various tissues, classification and clinical application.

Model questions:

1. How many ATP molecules can be derived from each molecule of acetyl CoA that enters Krebs' Cycle?

   A) 6 B) 12 C) 18 D) 38

2. The most important allosteric inhibitor of glycolysis in resting muscle is

   A) AMP B) ATP C) Fructose 2,6 bis phosphate D) cAMP

3. The half-life of radioactive Palladium-233 is 28 days. How many days will it take for the radioactivity to fall to one eight of the initial value?

   A) 84 B) 28 C) 112 D) 56

4. Most protein coding sequences are found in which class of DNA

   A) non-repetitive sequences B) Tandem repeats

   C) highly repetitive sequences D) long interspersed repeats

5. What type of microscope would allow you to study the orderly sequence of events that lead to the separation of chromosome during mitosis?

   A) scanning electron microscope B) transmission electron microscope

   C) light microscope D) long-range telescope

Note: You will be given 100 MCQs to be answered in 2 hour. There is no negative marking