

B.Sc. PART II

PAPER I: Principles of Human Physiology and Nutrition

Section A: Physiology

Functional organization of the human body and homeostasis: Intracellular and extracellular division of body fluids, the concept of homeostasis and feedback control systems.

General organization of the Nervous system: Sensory and motor nerves, major levels of nervous system function, Central and autonomic nervous systems, transmission of nerve impulse, synapse, neurotransmitters.

Digestion and absorption in the gastrointestinal tract: Digestion and absorption of carbohydrates, fats and proteins

Blood: Composition of blood, functions of blood constituents in immunity, hemostasis, blood transfusion and tissue transplant

Regulation of acid-base balance: buffers in blood, respiratory control, renal control.

Transport and exchange of respiratory gases: Carbon Dioxide dissociation curve. Bohr's effect. Haldane effect.

Body fluids and principles of urine formation:

Principles of endocrinology: Endocrine glands and hormones produced by them.

Section B: Nutrition

Scope of Nutrition

The fuels used by the body: Carbohydrates, proteins and fat. Composition of the human body. Composition of common foods. Units of energy.

Energy requirements: Components of energy requirements. Basal metabolic requirements. Energy requirements of BMR, activity, specific dynamic action of food, growth, pregnancy, lactation. Direct, indirect calorimetry. Reference Indian man and woman.

Concept of Recommended dietary allowances. Recommended allowances of energy requirement.

Carbohydrates: Types. Functions, dietary requirements, food sources. Fibre. Oligosaccharides.

Proteins: Nutritional functions, concept of protein quality, dietary requirements, food sources, deficiency symptoms, cure and prevention.

Fats: Functions, Fat quality. Dietary considerations. Essential fatty acids. Food sources, effects of excess and deficiency.

Interactions among the three fuels

The water soluble vitamins: Thiamine. Riboflavin. Niacin. Pyridoxine. Folic acid. Ascorbic acid. Functions. Requirements. Food sources. Fortifications. Deficiencies.

The fat soluble vitamins: Vitamins A, D, E, K. Functions. Requirements. Food sources. Fortifications. Deficiency and excess.

Minerals: Macrominerals. Microminerals. Calcium, Iron. Iodine. Fluorine. Absorption. Functions. Requirements. Food sources. Fortification.

Balanced diet: Foods for energy. Protective foods. Nutritional adequacy. Locally available foods.

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PAPER II: Genetics, origin of life and chemical evolution

Mendelian genetics: Mendel's laws of inheritance, Linkage and crossing over, Chromosome mapping.

Mutation: Molecular basis of mutation, Radiation induced and chemically induced mutations, Mutagens, Carcinogens, Practical applications of mutations.

Theories of origin of life: Archaeobacteria, Significance of extremozymes. Evolution of Cell from Prokaryotes to Eukaryotes, Viruses

Theories of evolution: Evolution at the molecular level, Evolution of proteins and nucleotide sequences, Structure functional relationship of Proteins, Proteomics

Introns versus Exons: Role of non-coding RNA in Evolution.

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PAPER III: Intermediary Metabolism

Introduction to metabolism, catabolism and anabolism: Integration of biochemical pathways.

Concepts in thermodynamics: Free energy, enthalpy and entropy in biochemical reactions
Coupled Reactions ATP as energy currency of cell.

Carbohydrate metabolism: An overview of aerobic and anaerobic carbohydrate metabolism: Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentation. Reactions and energetics of TCA cycle, gluconeogenesis, glycogenesis and glycogenolysis; Reactions and physiological significance of pentose phosphate pathway. Regulation of glycolysis and TCA cycle.

Electron transport chain and oxidative phosphorylation: Organisation of ETC, concept of redox potential, sites of ATP production, inhibitors of electron transport chain. Hypothesis of mitochondrial oxidative phosphorylation (basic concepts). Inhibitors and uncouplers of oxidative phosphorylation.

Lipid metabolism: Introduction to Lipids as energy sources, β oxidation of saturated fatty acids, ATP yield from fatty acid oxidation, biosynthesis of saturated and unsaturated fatty acids. Metabolism of ketone bodies, oxidation of unsaturated and odd chain fatty acids.

Photosynthesis: Light and dark reactions.

General reactions of amino acid metabolism: Transamination, oxidative deamination and decarboxylation. Urea cycle, glycolytic and ketogenic amino acids.

Nucleotide metabolism: Biosynthesis of purines and pyrimidines.