

SYLLABUS FOR ENTRANCE TEST

Syllabus for M.Sc. (Dairy Chemistry) six semester course for Basic science graduates

Hydrogen bonding: Concepts, inter and intra molecular hydrogen bonding in alcohol, carboxylic acids and other molecule. Hydrophobic interactions: Elementary idea and its importance in structure of proteins. Alcohols: properties of mono, di and trihydric alcohols. Aldehydes and Ketone: Properties & Reactions. Importance of carbonyl compounds in food flavors. Carboxylic acids: Ionization constant and strength, important reactions, derivatives like esters, amides, lactones - their preparation and reactions. Amines: Basic character, & important reactions. Phenols: Acidic character and effect of nuclear substituents on it and reactions. Substituted carboxylic acid: halogen substituted, Keto and Hydroxy acids.

Amino Acids and Peptides: Natural amino acids, their general properties, their Zwitter ion forms & its effect on melting point and solubility. Proteins: Definition and classification, Primary, secondary, tertiary and quaternary structure. Carbohydrates: Definition, Classification and isomerism, Derivation. Structure of Glucose, open chain and ring structure, evidences for ring structure stereochemistry and stability of anomers. Reactions of monosaccharides. Fatty acids and Lipids: Definition and classification. Important reaction of fatty acids, Structure and properties of Neutral lipids, phospholipids and cholesterol. Systematic identification of Organic Compounds: Aliphatic and Aromatic character, Unsaturation, Detection of elements (Nitrogen, Sulphur and Halogens), Detection of common functional groups. Preparation of derivatives: Dinitrophenylhydrazones, Oxime and Osazones. Qualitative test for Amino Acids and Proteins: Biuret test, Million's test, Nitroprusside Test, Ninhydrin test, Xantho proteic test, Hopkin's cole reaction. Tests used for detection of Carbohydrates and their characterization. Detection of lipids and phospholipids.

Colloidal State: Distinction between true and colloidal solution, lipophilic & lyophobic solutions, properties of colloidal system. Gels: their formation and properties. Elementary idea about emulsion. Density: Density and specific gravity, pycnometer method and hydrometer. Liquid State: Surface tension, surface energy, interfacial tension. Surface tension of mixtures. Viscosity: Definition of viscosity, Newtonian and Non-Newtonian liquids, Stokes Law, influence of temperature and concentration of solute on viscosity. Refractive index. Colligative Properties of solution: Vapour pressure, Raoult's Law, Depression of freezing point, Elevation of boiling point. Osmosis and Osmotic pressure. Interrelation of colligative properties.

Aqueous solution of Electrolytes: Electrolytes & nonelectrolytes, ionic mobility, electrical conductance, Ostwald Dilution Law, Kohlrausch Law. Ionic Equilibria: Dissociation of water, concept of pH and pOH and their scale. Acids and bases: Bronsted-Lewis concepts of acids and bases, dissociation constants of acids and bases, titration, indicators and units of concentration. Salt, their hydrolysis. Buffer solutions. Derivation of Henderson – Hasselbach equation and its application. Equilibrium of electrolytes. pH indicators. Oxidation-Reduction: Redox potential, Nernst equation, electrochemical cells. Hydrogen, glass and calomel electrodes. Nuclear Chemistry: nature of isotopes, radio isotopes. & their half-life period. Important radio isotopes. Molecular Spectroscopy: spectrum of electromagnetic radiation, laws of Lambert and Beer, visible, and ultraviolet spectroscopy.

Enzymes: Ribozymes, isozymes, allosteric enzymes, zymogens, regulatory enzymes, Classification and mechanism of enzyme action, Factors affecting rate of enzyme catalysed reaction, enzyme inhibition, Coenzymes and cofactors, immobilization of enzymes, Nucleic acids: Structure and function, definition and composition. Structure of RNA & DNA. Bioenergetics. Anabolism and Catabolism of carbohydrates, lipids and proteins. Vitamins and Hormones: Structure & functions, general description. Relationship between vitamins and hormones in terms of their biological role.

Syllabus for M.Sc. (Dairy Microbiology) six semester course for Basic science graduates

Microbiology and microbes: Place of microbiology in living world and its sub-division; scope of microbiology. History and development of microbiology: cell theory; contributions of Leeuwenhoek, Pasteur and Koch & others. The microscope as tool for the study of microbiology: Principles of microscopy; Light Microscopy (Bright field, dark field, phase contrast, fluorescence) & electron microscopy; preparation and staining of specimens; staining techniques. Microbial taxonomy: principles; numerical taxonomy; major characteristics used in taxonomy; classification according to Bergey's manual of systematic bacteriology. The Cell: Structure and functions of prokaryotic & eukaryotic cells; difference between prokaryotes and eukaryotes. Microbial growth and nutrition: the growth curve; factors affecting growth of microorganisms, estimation of bacterial growth; bacteriostatic and bactericidal agents; the common nutrient requirements and nutritional types of microorganisms. Bacterial genetics; DNA as the genetic material; structure of DNA; bacterial mutations (spontaneous and induced); genetic recombination- (transformation, transduction, conjugation). Micro flora of air, soil and water: methods for controlling microorganisms in air& water; water as carrier of pathogens.

Fundamentals of food microbiology. Current awareness on quality and safety of dairy foods; food safety (HACCP) system and their application during milk production and processing. National and international food regulatory standards; BIS, PFA, ICMSF, IDF etc., their role in the formulation of standards for controlling the quality and safety of dairy foods. Rapid assessment of dairy food for microbial and non-microbial contaminants; Enumeration principles in detection of predominant spoilage organisms, pathogens and indicator organisms like, *E.coli*, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Bacillus cereus*.

Fundamental of biotechnology. Definition, scope and historical development of biotechnology, achievement and future application: structure of DNA and RNA; DNA replication, protein synthesis, genetic code, mutations: Vectors, cloning strategies in bacteria and animals, recombinant DNA technology. Protoplast fusion & Tissue culture in dairy cultures. Application of biotechnology in food and dairy industry, dairy effluents. Genetic manipulation of dairy starters for improved attributes of commercial value. Dairy enzymes and whole cell immobilization. Ethical issues related to use of genetically modified foods.