

**DAIRY CHEMIST / DAIRY BACTERIOLOGIST / DAIRY
MICROBIOLOGIST IN KERALA CO-OPERATIVE MILK MARKETING
FEDERATION LIMITED**

(Cat.No.: 109/2022)

(Total Marks – 100)

Module 1

CHEMISTRY OF MILK

(15 Marks)

Definition and structure of milk, factors affecting composition of milk, Nomenclature and classification of milk proteins, Casein: fractionation and chemical composition, Whey proteins: α -Lactalbumin and β -Lacto globulin Immuno globulin and other minor milk proteins and non-proteins nitrogen constituents of milk, denaturation of milk proteins .Estimation of milk proteins using different physical and chemical methods.Milk enzymes.Milk carbohydrates their status and importance..Maillard browning. Definition, general composition,structure and classification of milk lipids. Factors affecting the fatty acid composition. Milk phospholipids and their role in milk products, Unsaponifiable matter and fat soluble vitamins, Milk Salts: Mineral in milk major mineral and Trace elements, physical equilibria among the milk salts.Density and specific gravity of milk,hydrometer, lactometer.Effect of various processing variables on the density and specific gravity of milk.

Module 2

CHEMISTRY OF MILK PRODUCTS

(10 Marks)

Chemical composition and legal standards of milk products. Ripening and neutralization of cream.Chemistryof Butter. Ghee: Analytical constants. Hydrolytic and oxidative deterioration, their causes, prevention and role of antioxidants. Physico-chemical changes in milk constituents during manufacture and storage of traditional dairy products: Khoa, Paneer, Dahi, Channa, Lassi, Chakka, Shrikhand. Chemistry of cheese: milk clotting enzymes, enzymatic coagulation of milk, biochemical changes during ripening. Chemistry of concentrated and dried milk products. Chemistry of Ice cream. Role and mechanism of stabilizers and emulsifiers in ice cream.

Module 3

CHEMICAL QUALITY ASSURANCE

(15 Marks)

Importance of chemical quality control, quality assurance and total quality management in dairy industry. FSSAI, AGMARK, BIS ISO, IDF, Codex, etc., Accreditation of

analytical laboratories. Preparation and standardization of reagents required in the analysis of milk and milk products. Sampling procedures; labelling of samples for analysis; instrumental methods of analysis. Calibration of dairy glassware; butyrometer, pipettes, burettes, hydrometers, lactometers and thermometer. Testing methods for the detection of adulterants, preservatives and neutralizers in milk and milk products. Environmental contaminants such as pesticides, antibiotics, heavy metals in milk and milk products and their chemical testing methods. Chemical quality of water in dairy industry.

Module 4

FOOD CHEMISTRY (5 Marks)

Food proteins: Classification and physico-chemical and structural properties. Lipids: Definition, classification of lipids,. Carbohydrates: Classification of carbohydrates,. Properties of common polysaccharides, viz. cellulose, glycogen, hemicelluloses, pectin. Food Enzymes: Hydrolases and lipases, utilization in food chemistry. Minerals in foods: Main elements, trace elements in eggs, cereals and cereal products, vegetables and fruits. Food additives: Vitamins and Amino acids, Minerals, Aroma Substances/flavour enhancers- Monosodium glutamate, 5-nucleotides sugar substitutes, sorbitol sweeteners- saccharin, and cyclamate, Food colours and food preservatives. Preservation of foods, general principles of food preservation.

Module 5

NUTRITIONAL CHEMISTRY (5 Marks)

Cow, buffalo and human milk, biochemical composition and energy value. Milk intolerance and hypersensitivity, Safety aspects of food additives, toxic elements, antibiotics, radionuclides in milk and milk products. Nutraceutical, antioxidants, food toxins, anti-nutritional factors, probiotics and cultured dairy products. Nutritional labelling.

Module 6

MICROBIOLOGY OF MILK (10 Marks)

Microbial contaminants in raw milk, their sources, Microbiological changes in bulk refrigerated raw milk, Specific groups of microorganisms in milki.e. psychrotrophic, mesophilic, thermoduric and thermophillic bacteria, Types of microbial spoilage ;souring, curdling, bitty cream, proteolysis, lipolysis, abnormal flavors and discolouration, Hygienic milk production system; Cleaning and sanitation of udder,

animal, utensils, equipments and dairy farm environment, Estimation of microbial load in raw milk by standard plate count (SPC) and dye reduction tests (MBRT, RRT). Natural antimicrobial systems in milk - immunoglobulins, lactoferrin, lysozyme and lactoperoxidase (LP) system. Microbial zoonotic diseases transmitted through fluid milk; Milk borne diseases - food infection, intoxication and toxoinfection caused *E. coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Bacillus cereus*, *Listeria monocytogenes*, *Shigella* species and *Campylobacter*. Microbiological grading and legal standards of raw and processed milk.

Module 7

MICROBIOLOGY OF MILK PRODUCTS (10 Marks)

: Micro-environment and impact of critical process factors on entry of spoilage and pathogenic organisms in cream and butter, defects in pasteurized (ripened/unripened cream), sterilized, UHT cream and butter. Type of microorganisms associated with condensed, evaporated and dried milk products, their growth/ survival during manufacture and storage; Microbial defects in condensed, evaporated and dried milk products, Microenvironment in ice cream, ingredients, critical process factors and their impact on entry of pathogens in ice cream and frozen desserts, Microbiology of fermented milks ; Dahi, Yoghurt, Acidophilus milk, Cheese, Kefir, Koumiss, Bulgarian milk, cultured buttermilk, Leben, Villi and Yakult. Predominance of spoilage and pathogenic organisms in indigenous milk products: Khoa, burfi, peda, gulabjamun, paneer, Chhanna and Chhanna based sweets; rasogulla, kheer, shrikhand, dahi, kulfi. FSSAI microbiological standards for milk and milk products

Module 8

DAIRY STARTER CULTURES (10 Marks)

Classification and importance of starter Cultures in dairy industry; Single, multiple, defined and mixed strain starters; Probiotics and Functional starter cultures. Metabolism of starter cultures (carbohydrate, protein, citrate) and production of metabolites and antibacterial substances. Quality and activity tests for dairy starters and their preservation- methods (liquid, spray drying, vacuum drying, freeze-drying, frozen concentrate, concentrated dried cultures); Defects in starters and their control; Starter failures- effect of antibiotic residues, sanitizers and bacteriophages. Phages-life cycle, sources, prevention, chemical and mechanically protected systems.

Module 9

MICROBIOLOGICAL QUALITY ASSURANCE IN DAIRY INDUSTRY (10 Marks)

Concepts of quality control, quality assurance and food safety; Global quality and food safety standards, Integrated food law, main features and functions, Concepts of Quality Management System (QMS)–ISO: 9000:2000; Principles of QMS; Standard requirements for QMS; HACCP concept and principle TQM tools and techniques Risk assessment, risk management and risk communication; risk profiling of dairy products; Microbiological criteria and two and three class sampling plan / guidelines; Bio-safety concepts in handling of dairy pathogens. Concepts of hygiene and sanitation, microbial quality of water and environmental hygiene in dairy plant, chlorination of dairy water supply, quality of air, personnel hygiene, treatment and disposal of waste water and effluents.

Module 10

PATHOGENS/CONTAMINANTS OF RELEVANCE IN DAIRY INDUSTRY (10 Marks)

Enumeration principles and procedure for rapid detection of predominant hygiene indicator organisms (FSSAI) and pathogens like *E. coli* (*E. coli* 0157:H7), *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Bacillus cereus* and *Listeria monocytogenes*, Sulfite reducing *Clostridia*. Detection of antibiotic residues in milk –Delvo SP, MDR test, penzyme test, charm assay, lateral flow assay. Detection of aflatoxins, pesticides, other inhibitors and their public health importance in dairy foods

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.