

Kamdhenu University, Gandhinagar

Advt. No. 03/2024

Syllabus for the Test for the Recruitment of Assistant Registrar

Marks - 200

Medium: English/ Gujarati MCQs-200

Sr.	Type of Test/Topics Covered
1	English Grammar / ગુજરાતી વ્યાકરણ
2	Computer/I.C.T. Aptitude, Quantitative Aptitude & Logical Reasoning Ability, Communication Skills, General Awareness: -
3	General Administration related to University Functioning, Kamdhenu University Act & Statutes, GCSR, VCI Acts, UGC Acts, NEP-2020, ICAR Accreditation Procedure, RTI Act, Antiragging Act and Guidelines, Government of Gujarat Purchase Policy, GeM, Labour Law, Reservation Policy & Roster, Gratuity, New & Old Pension Scheme, Fee Regulatory Committee etc.
4	Constitution of India, Regional National / International Events related to Political Economical / Sports / Education/ History/ Culture/ Science/ Geography and Current Affairs:

NOTE: The question paper shall be objective type MCQs (multiple choice questions). Minimum Eligibility Criteria for candidates of all categories in any case shall be 40% of the written test marks.

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option, then that question will not be considered for evaluation.

However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.

PHASE 2: PERSONAL INTERVIEW (ORAL) - 25 MARKS

Out of the candidates who will pass the written test with 40 % or more marks on merit basis and after verification of all documents, shortlisted eligible candidates shall be called for personal interview category wise as mentioned below

No of Posts to be filled up	No. of Candidates to be called for personal Interview
01	06
02	08
03	10
04 and More	Three times the number of post

Note : The final selection list will be prepared keeping in view merits of the combined marks obtained in the written test and the Personal Interview.

Kamdhenu University, Gandhinagar

Advt. No. 03/2024

Syllabus for the Test for the Recruitment of Veterinary Officer-II

Marks - 200

Medium: English

MCQs-200

1. Veterinary Anatomy

General Osteology, Arthrology and Myology. General Angiology, Neurology and Aesthesiology. General Splanchnology. Fore limb. Head and neck. Thorax. Abdomen. Hind limb and pelvis. Cytology, cell junctions, basic tissues. Microscopic structures of digestive, circulatory, urinary, respiratory, nervous, lymphatic, endocrine, male and female genital systems and mammary glands of domestic animals. Study of microscopic structure of sense organs. Introduction to embryology, gametogenesis, fertilization, cleavage, types of eggs, morula, blastulation, gastrulation, types of implantation, twinning. Formation of foetal membranes in mammals and birds, Placenta and its classification. Different germ layers and their derivatives. Study of development of organs of digestive, respiratory, urinary, circulatory, lymphatic, nervous, musculoskeletal, male and female reproductive systems. Development of endocrine glands, sense organs.

2. Veterinary Physiology

Blood, Cardiovascular, Nervous and Muscular Systems. Digestive and Respiratory Systems. Excretory and Endocrine Systems. Reproduction, Lactation, Growth and Environmental Physiology.

3. Veterinary Biochemistry

General Veterinary Biochemistry. Intermediary Metabolism. Veterinary Analytical Biochemistry.

4. Livestock Production Management

General and Livestock Management. Fodder Production Conservation. Livestock Production Management-Ruminants. Zoo Animals Production Management. Animal Welfare. Poultry Production Management. Diversified Poultry Production and Hatchery Management. Laboratory or Rabbit or Pet Animal Production Management. Swine or Equine or Camel, Yak and Mithun Production Management.

5. Veterinary Microbiology

General & Systematic Veterinary Bacteriology. Veterinary Mycology. Microbial Biotechnology. Veterinary Immunology and Serology. General and Systematic Veterinary Virology.

6. Veterinary Pathology

General Veterinary Pathology. Systemic Veterinary Pathology. Animal Oncology, Veterinary Clinical Pathology and Necropsy. Pathology of Infectious and Non-Infectious Diseases of Domestic Animals. Avian Pathology. Pathology of Diseases of Laboratory and Wild Animals.

7. Animal Genetics and Breeding

Biostatistics and Computer Application. Principles of Animal and Population Genetics. Principles of Animal Breeding.

8. Animal Nutrition

Principles of Animal Nutrition and Feed Technology. Applied Ruminant Nutrition. Applied Non-Ruminant Nutrition.

9. Veterinary Pharmacology

General Pharmacology. Drugs Acting On Autonomic Nervous System. Drugs Acting On Central Nervous System. Drugs Acting On Different Body Systems. Veterinary Chemotherapy. Veterinary Toxicology.

10. Veterinary Public Health and Epidemiology

Veterinary Public Health and Food Safety. (Veterinary Epidemiology. Zoonotic Diseases. Environmental Hygiene.

11. Veterinary Parasitology

General Veterinary Parasitology. Trematodes and Cestodes of Veterinary Importance. Nematodes of Veterinary Importance. Arthropods of Veterinary Importance. Protozoa of Veterinary Importance.

12. Livestock Products Technology

Milk and Milk Products Technology. Wool Science. Abattoir Practices and Animal Byproducts Technology. Meat Science.

13. Veterinary and Animal Husbandry Extension.

Extension Education and Development. Rural Sociology in Veterinary Extension. Transfer of Technology for Livestock Development. Livestock Economics and Marketing. Livestock Entrepreneurship. Information and Communication Technology: Strengths and limitations of ICTs application in livestock sector and farmers capacity building. Information kiosk, E-learning, CAD, virtual class room, virtual reality, multi-media etc. Cyber extension- problems and prospects in livestock extension. Contemporary Issues in Livestock Enterprises.

14. Veterinary Surgery and Radiology

Veterinary General Surgery. Veterinary Anaesthesiology. Veterinary Diagnostic Imaging Techniques. Regional Surgery. Orthopaedics and Lameness.

15. Veterinary Medicine

History and scope of Veterinary Medicine, concept of animal diseases. Concepts of diagnosis, differential diagnosis, treatment and prognosis. General systemic

states, hyperthermia, hypothermia, fever, septicemia, toxemia, shock, allergy, anaphylaxis, oedema, coma, anaemia, common clinical poisonings and dehydration. Estimates of diseases, patterns of disease, disease monitoring and surveillance, herd health and quarantine. Systemic Diseases: Etiology, clinical manifestations, diagnosis, differential diagnosis, treatment, prevention and control of the following diseases of cattle, buffalo, sheep, goat, horse, pig, dog, cat and poultry: Diseases of digestive, respiratory, cardiovascular, urinary, nervous, musculoskeletal, haemopoietic, and lymphatic systems, skin, sense organs including affections of peritoneum, liver and pancreas. Emergency medicine and critical care. Metabolic and Deficiency Disorders. Zoo and Wild Animal Medicine. Bacterial, Fungal and Rickettsia Diseases. Viral and Parasitic Diseases. Jurisprudence, Ethics, And Animal Welfare.

16. Veterinary Gynaecology and Obstetrics

Veterinary Gynaecology: Bovine. Equines. Ovines and caprines. Swines. Canines and Felines. Comparative reproductive events in camel. Principle, procedure and application of ultrasonography in farm and pet animal reproduction. Veterinary Obstetrics: Farm and pet animals. Veterinary Andrology and A.I.: Farm and pet animals.

17. Current Trends and Recent Advancements in the field of Animal Husbandry and Veterinary Science.

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option then that question will not be considered for evaluation. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.



Kamdhenu University, Gandhinagar

Advt. No. 03/2024

Syllabus for the Test for the Recruitment of Senior Research Assistant (Veterinary), Class III

Marks - 200

Medium: English

MCQs-200

1. Veterinary Anatomy

General Osteology, Arthrology and Myology. General Angiology, Neurology and Aesthesiology. General Splanchnology. Fore limb. Head and neck. Thorax. Abdomen. Hind limb and pelvis. Cytology, cell junctions, basic tissues. Microscopic structures of digestive, circulatory, urinary, respiratory, nervous, lymphatic, endocrine, male and female genital systems and mammary glands of domestic animals. Study of microscopic structure of sense organs. Introduction to embryology, gametogenesis, fertilization, cleavage, types of eggs, morula, blastulation, gastrulation, types of implantation, twinning. Formation of foetal membranes in mammals and birds, Placenta and its classification. Different germ layers and their derivatives. Study of development of organs of digestive, respiratory, urinary, circulatory, lymphatic, nervous, musculoskeletal, male and female reproductive systems. Development of endocrine glands, sense organs.

2. Veterinary Physiology

Blood, Cardiovascular, Nervous and Muscular Systems. Digestive and Respiratory Systems. Excretory and Endocrine Systems. Reproduction, Lactation, Growth and Environmental Physiology.

3. Veterinary Biochemistry

General Veterinary Biochemistry. Intermediary Metabolism. Veterinary Analytical Biochemistry.

4. Livestock Production Management

General and Livestock Management. Fodder Production Conservation. Livestock Production Management-Ruminants. Zoo Animals Production Management. Animal Welfare. Poultry Production Management. Diversified Poultry Production and Hatchery Management. Laboratory or Rabbit or Pet Animal Production Management. Swine or Equine or Camel, Yak and Mithun Production Management.

5. Veterinary Microbiology

General & Systematic Veterinary Bacteriology. Veterinary Mycology. Microbial Biotechnology. Veterinary Immunology and Serology. General and Systematic Veterinary Virology.

6. Veterinary Pathology



General Veterinary Pathology. Systemic Veterinary Pathology. Animal Oncology, Veterinary Clinical Pathology and Necropsy. Pathology of Infectious and Non-Infectious Diseases of Domestic Animals. Avian Pathology. Pathology of Diseases of Laboratory and Wild Animals.

7. Animal Genetics and Breeding

Biostatistics and Computer Application. Principles of Animal and Population Genetics. Principles of Animal Breeding.

8. Animal Nutrition

Principles of Animal Nutrition and Feed Technology. Applied Ruminant Nutrition. Applied Non-Ruminant Nutrition.

9. Veterinary Pharmacology

General Pharmacology. Drugs Acting On Autonomic Nervous System. Drugs Acting On Central Nervous System. Drugs Acting On Different Body Systems. Veterinary Chemotherapy. Veterinary Toxicology.

10. Veterinary Public Health and Epidemiology

Veterinary Public Health and Food Safety. (Veterinary Epidemiology. Zoonotic Diseases. Environmental Hygiene.

11. Veterinary Parasitology

General Veterinary Parasitology. Trematodes and Cestodes of Veterinary Importance. Nematodes of Veterinary Importance. Arthropods of Veterinary Importance. Protozoa of Veterinary Importance.

12. Livestock Products Technology

Milk and Milk Products Technology. Wool Science. Abattoir Practices and Animal Byproducts Technology. Meat Science.

13. Veterinary and Animal Husbandry Extension.

Extension Education and Development. Rural Sociology in Veterinary Extension. Transfer of Technology for Livestock Development. Livestock Economics and Marketing. Livestock Entrepreneurship. Information and Communication Technology: Strengths and limitations of ICTs application in livestock sector and farmers capacity building. Information kiosk, E-learning, CAD, virtual class room, virtual reality, multi-media etc. Cyber extension- problems and prospects in livestock extension. Contemporary Issues in Livestock Enterprises.

14. Veterinary Surgery and Radiology

Veterinary General Surgery. Veterinary Anaesthesiology. Veterinary Diagnostic Imaging Techniques. Regional Surgery. Orthopaedics and Lameness.

15. Veterinary Medicine

History and scope of Veterinary Medicine, concept of animal diseases. Concepts of diagnosis, differential diagnosis, treatment and prognosis. General systemic states, hyperthermia, hypothermia, fever, septicemia, toxemia, shock, allergy,



anaphylaxis, oedema, coma, anaemia, common clinical poisonings and dehydration. Estimates of diseases, patterns of disease, disease monitoring and surveillance, herd health and quarantine. Systemic Diseases: Etiology, clinical manifestations, diagnosis, differential diagnosis, treatment, prevention and control of the following diseases of cattle, buffalo, sheep, goat, horse, pig, dog, cat and poultry: Diseases of digestive, respiratory, cardiovascular, urinary, nervous, musculoskeletal, haemopoietic, and lymphatic systems, skin, sense organs including affections of peritoneum, liver and pancreas. Emergency medicine and critical care. Metabolic and Deficiency Disorders. Zoo and Wild Animal Medicine. Bacterial, Fungal and Rickettsia Diseases. Viral and Parasitic Diseases. Jurisprudence, Ethics, And Animal Welfare.

16. Veterinary Gynaecology and Obstetrics

Veterinary Gynaecology: Bovine. Equines. Ovines and caprines. Swines. Canines and Felines. Comparative reproductive events in camel. Principle, procedure and application of ultrasonography in farm and pet animal reproduction. Veterinary Obstetrics: Farm and pet animals. Veterinary Andrology and A.I.: Farm and pet animals.

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Kamdhenu University, Gandhinagar

Advt. No. 03/2024

Syllabus for the Test for the recruitment of Senior Research Assistant (Dairy), Class III

Marks - 200

Medium: English

MCQs-200

Senior Research Assistant (Dairy), Class III

1. Market Milk

Market milk industry in India and abroad: Distinctive features of tropical dairying as compared to those of the tropical climate of developed countries. Collection and transportation of milk; a) Organization of milk collection routes b) Practices for collection of milk, preservation at farm, refrigeration, natural microbial inhibitors, lactoperoxidase system. Reception and treatment (pre-processing steps) of milk in the dairy plant: a) Reception, chilling, clarification and storage: General practices. b) Homogenization: Definition, pretreatments, theories, synchronization of homogenizer with operation of pasteurizer (HTST) c) Effect of homogenization on physical properties of milk. d) Bactofugation: Theory and microbiology. Thermal processing of milk: a) Principles of thermal processing: kinetics of microbial destruction, thermal death curve, Arrhenius equation, D value, Z value, F value, Q₁₀ value. b) Factors affecting thermal destruction of microorganisms. c) Definition and description of processes: Pasteurization, Thermization, sterilization, UHT Processing. d) Product control in market milk plant. e) Defects in market milk. f) Manufacture of special milks: toned, doubled toned, reconstituted, recombined, flavored, homogenized, vitaminised and sweet acidophilus milk. g) Manufacture of sterilized milk. h) Distribution systems for market milk. UHT processing of milk: a) Relevance of UHT processing in the tropical climate b) UHT plants: Description. Direct, Indirect, with upstream and downstream homogenization, third generation UHT plants. c) Aseptic packaging, types and systems of packaging, sterilizing packages, filling systems. d) Technical control in the UHT plant. e) Shelf life of UHT milk and tests for UHT milk. Nutritive value of milk. Effect of heat processing on nutritive value. Cleaning and sanitization of dairy equipment.

2. Traditional Indian Dairy Products

Status and significance of traditional Indian milk products in India. **Khoa**: Classification of types, standards methods of manufacture and preservation, factors affecting yield of khoa. Mechanization in manufacture of khoa. **Khoa based sweets**: Burfi, Peda, Milk cake, Kalakand, Gulabjamun and their compositional profile and manufacture practices. **Rabri and Basundi**: Product identification, process description, factors affecting yield, physico-chemical changes during manufacture. **Chhanna**: Product description, standards method of manufacture, packaging and preservation. **Chhanna-based sweets**: Rasogolla, Sandesh, Rasomalai. Mechanization of manufacturing process, advances in preservation and packaging. **Paneer**: Product description, standards, method of manufacture, packaging and preservation. Mechanization of Paneer manufacturing/packaging process. **Chakka/Maska and Shrikhand**: Product description, standards, method of manufacture, small scale and industrial process of production, packaging and preservation aspects. **Misti Dahi**: Product description method of manufacture and packaging process. **Kheer and Payasam**: Product description methods of manufacture, innovations in manufacturing and packaging processes. Biopreservative principles in enhancing the self-life of indigenous milk products including active packaging.

3. Cheese Technology

Origin and history of development of cheese manufacture, status and scope in India and abroad. Definition, standards and classification of cheese. Milk quality in relation to cheese making. Pre-treatment of milk; Physical and chemical characteristics of milk for cheese making. Additives and preservatives for cheese. Rennet preparation and properties, rennet substitutes. Action of rennet on milk in relation to cheese making. Manufacture of different varieties of cheese: Cheddar, Gouda, Swiss, Mozzarella, Cottage. Enzyme modified cheese (EMC), flavourings, Application of membrane processing in cheese manufacture. Factors affecting yield of cheese. Packaging, storage and distribution of cheese. Accelerated ripening of cheese. Manufacture of processed cheese, cheese spread and processed cheese foods. Mechanization and automation in cheese processing. Defects in cheese, processed cheese and cheese spreads.

4

4. Ice-Cream & Frozen Desserts

History, development and status of ice cream industry, History, development and status of ice cream industry, Definition, classification and composition and standards of ice cream and other frozen desserts, Stabilizers and emulsifiers-their classification, properties and role in quality of ice cream, Technological aspects of ice cream manufacture, Thermodynamics of freezing and calculation of refrigeration loads, Types of freezers, refrigeration control / instrumentation, Types of freezers, refrigeration control / instrumentation, Hygiene, cleaning and sanitation of ice cream plant, Effect of process treatments on the physico-chemical properties of ice-cream mixes and ice cream, Processing and freezing of ice-cream mix and control of over run, Packaging, hardening, storage and shipping of ice-cream, Defects in ice cream, their causes and prevention, Recent advances in ice-cream industry (flavourings, colourings, fat replacers, bulking agents) and plant management, Nutritive value of ice-cream.

5. Fat-Rich Dairy Products

Status of fat-rich dairy products in India and abroad. **Cream:** a) Definition & Legal standards, efficiency of cream separation and factors affecting it; control of fat concentration in cream. b) Planning and operating a cream production unit) neutralization, standardization, pasteurization and cooling of cream. c) Preparation and properties of different types of cream; table cream, sterilized cream, whipped cream, plastic cream, frozen cream and chip-dips (cultured cream), UHT processing of cream. d) factors affecting quality of cream; ripening of cream e) Packaging, storage and distribution, defects (non-microbial) in cream and their prevention. **Butter:** a) Introduction to the butter making process; theory of churning, Legal standards. b) Technology of Butter manufacture, Batch and continuous methods. Over-run in butter; control of fat losses in butter-milk; packaging and storage; transportation; defects in butter; rheology of butter; uses of butter. Butter making equipment: Construction, operation, care and maintenance of cream separators, coolers and vacreator, factory butter churn and continuous butter making machine. Special butters and related products: a) Manufacture, packaging, storage and properties of whey butter, flavoured butter, whipped butter, renovated butter/fractionated and polyunsaturated milk fat products, vegetable oil-blended products and low-fat spreads. b) Manufacture, packaging, storage and characteristics of margarine of different types. **Ghee and butter oil:** a) Methods of ghee making-batch and industrial processes, innovations in ghee production, procedure, packaging and preservation of ghee; utilization of substandard milk. b) Ghee: Composition and changes during manufacture fat constants. c) Butteroil: Manufacture of butteroil, packaging and storage.

6. Condensed & Dried Milks

Condensed Milks: History, status and scope in India and abroad, Definition and legal standards: Condensed milk, sweetened condensed milk and evaporated milk, manufacturing techniques; a) Manufacture of evaporated milk including pilot sterilization test, b) Manufacture of sweetened condensed milk, c) Recombined sweetened condensed milk. Grading and quality of raw milk for condensed and evaporated milk, Physico-chemical changes taking place during manufacture of condensed milk, Heat stability of milk and condensed milk and role of stabilizers in the stability of condensed milk, Chemical defects in condensed milk, their causes and prevention. Recent advances with reference to freeze concentration and membrane concentration. *Dried Milks:* History and status in India and abroad, Grading and quality of raw milk for dried milks, Manufacture of skim milk powder (SMP), whole milk powders and heat classified powders, Physico-chemical changes taking place during manufacture of dried milks, Physical properties of dried milks, Defects in dried milk during manufacture and storage, their causes and prevention, PFA, BIS and International Standards for dried milk, Manufacture of infant foods, malted milk foods and other formulated dried products, Cheese spread powder, ice cream powder, cream powder, butter powder, whey powder, Management of condensed and dried milk industry.

7. By Product Technology

Status, availability and utilization of dairy by-products in India and Abroad. Associated economic and pollution problems, Physico-chemical characteristics of whey, butter milk and ghee residue, **By-products from skim milk:** **Casein:** types of commercial casein, their specifications, manufacturing processes with basic principles involved. b) Industrial and food uses of caseins c) Manufacture of sodium and calcium caseinates their physico-chemical and functional properties and food applications d) Manufacture of casein hydrolysates and its industrial application e) **Cooprecipitates:** types, their specifications, manufacturing processes with basic principles involved, functional properties and food applications. **Whey processing:** a) Fermented products from whey, b) Beverages from whey c) Deproteinized and demineralized whey d) Condensed whey e) Dried whey, types and their specification, manufacturing techniques. F) Utilization of whey products. Application of membrane processing for whey processing. **Whey protein concentrates:** a) Methods of isolation with basic principles involved, physico-chemical properties of whey proteins concentrates b) Functional properties and food applications of WPC. **Lactose:** methods for the industrial production of lactose, refining of lactose, uses of lactose and hydrolysis of lactose. Butter milk processing: a) Condensed butter milk b) Dried butter milk c) Utilization of butter milk products. **Ghee residue:** Composition, processing and utilization. Nutritional characteristics of byproducts.

8. Sensory Evaluation of Dairy Products

Introduction, definition and importance of sensory evaluation in relation to consumer acceptability and economic aspects. Terminology related to sensory evaluation. Design and requirements of a sensory evaluation laboratory. Basic principles: senses and sensory perception. Physiology of sensory organs. Classification of tastes and odours, threshold value. Factors affecting senses, visual, auditory, tactile and other responses. Fundamental rules for scoring and grading of milk and milk products. Procedure and types of tests – difference tests (Paired comparison, due-trio, triangle) ranking, scoring, hedonic scale and descriptive tests. Panel selection, screening and training of judges. Requirements of sensory evaluation, sampling procedures. Factors influencing sensory measurements. Milk: score card and its use. Judging and grading of milk, defects associated with milk. Cream: desirable attributes and defects in cream, Score card for cream, sensory evaluation of different types of cream. Butter: Specific requirements of high grade butter, undesirable attributes of butter, butter score-card, sensory evaluation of butter. Ghee: grades of ghee, special requirements of quality ghee, defects in ghee, sensory evaluation of ghee. Fermented milks: desirable and undesirable characteristics of fermented milks, sensory evaluation of dahi, yoghurt, chakka, srikhand, lassi and other fermented drinks. Frozen dairy products: desirable and undesirable characteristics of frozen dairy products. Sensory evaluation of ice cream, kulfi and milk sherbets. Cheese: sensory Quality attributes of some common cheese varieties and their defects, score card for cheese. Sensory evaluation and grading for cheddar, cottage and other varieties of cheeses. Dried dairy products: desirable and undesirable characteristic of dried milks. Sensory evaluation and grading of dry milk products. Concentrated milks: desirable attributes and defects. Sensory evaluation and grading of evaporated and condensed milk. Heat desiccated Indian milk products: desirable and undesirable characteristics. Sensory evaluation of khoa and khoa based sweets. Acid coagulated Indian milk products: desirable and undesirable characteristics. Sensory evaluation of paneer, chhana and chhana based sweets. Consumer acceptance studies: Objectives, methods, types or questionnaires, development of questionnaires, comparison of laboratory testing and consumers studies, limitations. Interrelationship between sensory properties of dairy products and various instrumental and physico-chemical tests.

9. Food Technology-I

Status of food processing industries in India and abroad, magnitude and inter-dependence of dairy and food industry. Prospects for future growth in India. Harvesting, transportation and storage of fruits and vegetables. Post-harvest processing of fruits and vegetables: Peeling, sizing, blanching, Canning of fruits and vegetables. Drying and freezing of fruits and vegetables. Juice processing: General steps in juice processing, role of enzymes in fruit juice processing. Juice extraction, equipments and methods of fruit juice extraction, preservation of fruit juices, fruit juice clarification, concentration of fruit juices, fruit juice powders. Fruit juice processing; Orange, Lemon and lime juice, Apple juice, Grape juice, Nectars, pulpy juices, tropical blends, Vegetable juices. Manufacture of Jam, Jelly and Marmalade: Role played by pectin, sugar and acid in jellied fruit products. Fruits and vegetable preserves, Glazed, Crystallized fruits. Tomato based products:



Juice, puree, paste, sauce, soup, ketchup. Pickles: Principle of pickling, technology of pickles. Beverages: Classification, scope, carbonated non-alcoholic beverages and their manufacture. Fruit beverages and drinks, additives for fruit based beverages. Coffee: Production practices, structure of coffee/cherry, Coffee processing including roasting, grinding, brewing extraction, dehydration, aromatization, instant coffee. Tea: Tea leaf processing i.e. Withering, Maceration/Rolling, Fermentation, Firing, Packaging; green, red, yellow, instant tea. Technology of confectionery foods: Candies, Chewing gums and Bubble gums, Toffees, Caramels. Standards of confectionery products. Chocolate products: Cocoa bean processing, chocolate liquor, Functional foods: Introduction, Phytochemicals, Dietary fibers, complex carbohydrates and protein as a functional food ingredient, fiber-rich food products, etc. Importance and scope of food preservation. Objectives, principles and methods of food preservation.

10. Food Technology-II

Cereal grains, legumes and oilseeds: Structure and composition of cereals, legumes and oilseeds, Milling of paddy, quality factors of rice grains, processing of rice bran oil, Instant rice, quick cooking rice, canned rice. Milling technology of wheat. Criteria of wheat flour quality, improvers for wheat flour, Types of wheat flour. Milling technology of maize, wet milling of corn. Milling technology of barley, malting of barley and its utilization in manufacture of value added food products including malted milk foods, Dehulling and processing technology of important pulses. Dehulling and extraction of oil in major oilseed crops like soy bean, mustard, sunflower, ground nut, Vegetable protein concentrates/isolates, Utilization of oil cake in food formulation. Bakery and Snack technology: Technology of bread, biscuits, crackers and cakes. Technology of manufacturing process of Pasta foods - Macaroni, Noodles and Spaghetti. Technology of breakfast cereals: corn flakes, puffed, extruded snacks, Potato chips. Peanut and its value added products. Peanut butter - technology. Cleaning and sanitation. Waste management of food processing plants.

11. Packaging of Dairy Products

Introduction, Importance of Packaging, History of Package Development, Packaging materials, a) Characteristics of basic packaging materials: Paper (paper board, corrugated paper, fibre board), Glass, Metal, Plastics, Foils and laminates, retort pouches, Package forms, Legal requirements of packaging materials and product information. Packaging of milk and dairy products such as pasteurized milk, UHT-sterilized milk, aseptic packaging, fat rich products-ghee and butter, coagulated and desiccated indigenous dairy products and their sweetmeades, concentrated and dried milks including baby foods. Packaging of functional dairy/food products. Modern Packaging Techniques; Vacuum Packaging, Modified atmosphere packaging (MAP), Eco-friendly packaging, Principles and methods of package sterilization, Coding and Labelling of Food packages, Aseptic Packaging (AP), Scope of AP and pre-requisite conditions for AP, Description of equipments (including aseptic tank) and machines- Micro-processor controlled systems employed for AP, Package conditions and quality assurance aspects of AP, Microbiological aspects of packaging materials. Disposal of waste package materials, Packaging Systems. Hazards from packaging materials in food.

12. Dairy Plant Management and Pollution Control

Production Management: Definition, Function and structure of Production Management, Production planning & Control. Work study and measurement motion and time study. Efficiency of plant operation: product accounting, setting up norms for operational and processing losses for quantity, fat and SNF, monitoring efficiency. Plant Operations: Energy conservation and Auditing, Product and process control, Control charts, Process Sigma, Efficiency factors losses, Financial and Managerial efficiency. Provision for Industrial Legislation in India, particularly in dairy industry, Factory Act & Regulations. Human Resource Management: Personnel Management, Manpower planning, recruitment, training, transfer, promotions policies, Job specifications, Job evaluation, Job enhancement, Job enrichment, MBO, working conditions. Safety hazards: hazards prevention, security for plant machinery and the employees. Plant maintenance. Prevention and Break-down maintenance: Spare parts inventory, tools and lubricants, etc. Food hygiene: personnel hygiene, plant hygiene, water quality, etc. Wastes discharged from dairy plants: An overview. Wastewater discharged from a) Milk reception dock, b) Liquid milk processing section, c) Butter and ghee manufacturing, d) Ice-cream and condensed milk manufacturing, e) Milk powder manufacturing, f) Cheese and paneer manufacturing. Packaging wastes. Environmental issues in effluent discharge: a) Effects on

waterways, b) Effects on land c) Effects on the atmosphere d) Solid waste. Waste treatment process in a dairy processing plant: Wastewater treatment options for a Dairy Processing Plant. Calculation of wastes discharged and the economics thereof.

DAIRY ENGINEERING

1. Workshop Practice

Introduction: workshop practice, safety, care and precautions in workshop. **Wood working** tools and their use, Carpentry. **Heat treatment process:** Hardening, tempering, annealing and normalizing etc. **Metal work:** Metal cutting. Soldering, Brazing. **Welding:** Electric arc and Gas welding. **Smithy and forging operations:** tools and equipments. **Bench work:** The bench, flat surface filing, chipping, scrapping, marking out, drilling and screwing. **Introduction to following tool machines:** (a) Lathe Machine (b) Milling Machine (c) Shaper and Planner (d) Drilling and Boring machines (e) Grinder (f) CNC Machines etc.

2. Fluid Mechanics

Units and dimensions, Properties of fluids. **Static pressure of liquids:** Hydraulic pressure, absolute and gauge pressure, pressure head of a liquid. Pressure on vertical rectangular surfaces. Compressible and non-compressible fluids. Surface tension, capillarity. Pressure measuring devices, simple, differential, micro, inclined manometer, mechanical gauges, Piezometer. **Fluid flow:** Classification, steady uniform and non-uniform flow, Laminar and turbulent, continuity equation, Bernolli's theorem and its applications. **Flow through pipes:** Loss of head, determination of pipe diameter. Determination of discharge, friction factor, critical velocity. Flow through orifices, mouthpieces, notches and weirs, Vena contracta, hydraulic coefficients, discharge losses, Time for emptying a tank. Loss of head due to contraction, enlargement at entrance and exit of pipe. External and internal mouthpieces, types of notches, rectangular and triangular notches, rectangular weirs. Venturimeters, pitot tube, Rota meter. Water level point gauge, hook gauge. **Dimensional analysis:** Buckingham's theorem application to fluid flow phenomena. Froude Number, Reynolds number. Weber number and hydraulic similitude. **Pumps:** Classification, reciprocating, centrifugal pump. Pressure variation, work efficiency. Pump selection and sizing.

3. Engineering Drawing

Drawing of lines, lettering and dimensioning types of lines, types, types of lettering, types of dimensioning. Drawing of scales. Plain scale, diagonal scale, comparative scale and Vernier scale. Drawing of projections; Orthographic projections, methods of projections. Drawing of screw threads; Types of threads and terminologies used in lit. Screw fastening: Types of nuts, types of bolts, stud, locking arrangements for nuts and Foundation bolt. Drawing of rivets and riveted joints forms of rivet heads, types of riveted joints, failure of riveted joints. Drawing of welded joints: Forms of welds, location and dimensions of welds. Drawing of keys, cotter joint, pin joints types of keys, types of cotter joints, pin joints. Drawing of shaft couplings: Rigid couplings, loose couplings, flexible couplings universal coupling. Drawing of shaft bearings. Journal bearings, pivot bearings, collar bearings.

4. Heat & Mass Transfer

Basic heat transfer process: thermal conductivity, convective film co-efficient, Stefan Boltzman's constant and equivalent radiation co-efficient, Overall heat transfer co-efficient, physical properties related to heat transfer. Working principles and application of various instruments for measuring temperature. **One-dimensional steady state conduction:** Theory of heat conduction, Fourier's law, Derivation of Fourier's equation in Cartesian coordinates, Linear heat flow through slab, cylinder and sphere. Heat flow through slab, cylinder and sphere with non-uniform thermal conductivity. Concept of electrical analogy and its application for thermal circuits, Heat transfer through composite walls and insulated pipelines. **Steady-state heat conduction with heat dissipation to environment:** Introduction to extended surfaces (FINS) of uniform area of cross-section. Equation of temperature distribution with different boundary conditions. Effectiveness and efficiency of the FINS. Introduction to unsteady state heat conduction. **Convection:** Forced and free convection, use of dimensional analysis for correlating variables affecting convection heat

transfer, Concept of Nusselt number. Prandtl number, Reynolds number, Grashoff number, Some important empirical relations used for determination of heat transfer coefficient. **Heat Exchangers:** General discussion, fouling factors, jacketed kettles, LMTD, parallel and counter flow heat exchangers, Shell and tube and plate heat exchangers, Heat exchanger design. Application of different types of heat exchangers in dairy and food industry. **Mass transfer:** Fick's Law of diffusion, steady state diffusion of gases and liquids through solids. Equimolar diffusion. Mass transfer co-efficient and problems on mass transfer.

5. Thermodynamics

Importance and applications of thermodynamics in Dairy/Food processing. **Basic concepts:** Thermodynamic systems, properties, state, processes, cycles, energy, The Zeroth Law of Thermodynamics. **Ideal gases:** Equation of state, Compression and expansion of gases. The first Law of Thermodynamics: Internal energy, enthalpy. Analysis of non-flow and flow processes. **The second Law of Thermodynamics:** Thermodynamic temperature scale, Carnot cycle, heat engine, entropy, reversibility, availability. **Air Cycles:** Otto, Diesel, dual cycles and their efficiencies, Plotting the air cycles on p-V, T-S, p-h diagram etc. **I.C. Engines:** Concepts, Classification, Working of two stroke and four stroke cycle S.I. engines and C.I. engines. Parts of I.C. engine, Performance of IC engines.

6. Boilers and Steam Generation

Fuels: Chemical properties, Calorific value and its determination, Fuel Burners, Fuel combustion analysis. **Renewable energy sources:** Concepts, classification, Types and description of renewable energy sources. **Properties of steam:** Properties of wet, dry saturated, superheated steam, Use of steam tables and Mollier charts, Analysis of energy input in steam generation and heat gain in steam consumption. **Steam generators:** Definition, classification, fire tube boilers, water tube boilers, Boiler performance parameters, Boiler mountings and Boiler accessories. Layout of steam pipe-line and expansion joints. Introduction to Indian Boiler Regulation Act. **Boiler Draught:** Definition, importance and classification of draught, Natural and artificial draught, Calculation of Height of chimney, Draught analysis. **Air Compressors:** Definition, classification, Reciprocating, Single and multi-stage reciprocating compressors and their theoretical analysis.

7. Refrigeration & Air-conditioning

Basic refrigeration cycles and concepts: Standard rating refrigerating machines; Elementary vapour compression refrigeration cycle with reciprocating, rotary and centrifugal compressors; Theoretical vapour compression cycle; Departure from theoretical vapour compression cycle, representation on T-S and p-h diagrams; Mathematical analysis of vapour compression refrigeration system. **Refrigerants:** Primary and secondary refrigerants; common refrigerants (Ammonia, Freon, HFC, HCFC etc); Brine, their properties and comparison. **Multi-Pressure Refrigeration Systems:** Applications; Multi-evaporators with single stage and multi-stage compression and expansion systems; Working, Control and mathematical analysis of above systems. **Refrigeration Equipments and Controls:** Introduction to the types, construction, operation and maintenance of Refrigeration Components, Controls and Safety Devices as used in different refrigeration applications. Capacity control methods, Refrigeration Piping: Purpose, Types, Materials, Fittings and Insulation. **Design and Balancing of Refrigeration System:** Basic elements of design of individual components and a complete refrigeration system. Input and Output design parameters, Balancing of components of refrigeration system for optimum performance. **Absorption Refrigeration Systems:** Simple vapour absorption refrigeration systems, Actual Vapour absorption refrigeration system, Refrigerant absorbent pairs, Absorption cycle analysis. **Cryogenic Freezing:** Cryogenics, cryogenics, properties, applications, cryogenic freezers. **Psychrometry:** Definition, properties of moist air, psychrometric charts, psychrometric processes; Cooling/ Heating coils, humidifiers and dehumidifiers, Temperature and humidity measurements and controls. **Air-conditioning Systems:** Types of cooling loads and their calculation, Design conditions for Human and Industrial air conditioning systems, Analysis of different air-conditioning systems with the help of psychrometric chart. **Cold Storage:** Types of cold storages, Types of cooling loads in cold storages used for food/ dairy products; Construction and operation of cold storage. Insulating materials and vapour barriers.

8. Basic Electrical Engineering

Alternating current fundamentals: Generation of alternating current or voltage, magnitude of induced E.M.F. Alternating current, R.M.S value and average value of an alternating current. Phase relation and vector representation. Cycle, Time period, Frequency, Amplitude, Phase and Phase Difference, Root – Mean Square Value, Average value, Form Factor, Crest or Amplitude Factor. **Poly-phase Circuit:** - Generation of Poly-phase Voltage, Phase Sequence, Interconnection of Three Phases such as Star Connection and Delta Connection and their respective value of current and voltages, Energy Measurement by using Single and Two Watt-meters. **Transformers:** - Working Principle of Transformer, Construction features of Core and Shell type transformer, Elementary theory of an Ideal Transformer, E.M.F. Equation of a Transformer, Vector diagram of transformer with and without load, Transformer losses, voltage regulation and efficiency of transformer, Construction and working on an Single Auto-transformer, Different parts of a 11/0.4 KV, Distribution Transformer. **Three Phase Induction Motor:** - Fundamental working principles, Production of rotating magnetic fields, construction, Different types of Rotor such as Squirrel Cage and Phase wound rotors, Starting of induction motors using Direct on Line (DOL) and Star-Delta Starter. Soft starter and variable frequency drives. **Single Phase Induction Motors:** - Introduction, Different types of single phase induction motors such as Split Phase, Capacitor type, Shaded Pole type, Universal or AC series motors, Repulsion start induction run motor, Repulsion – induction motor. **DC Machine:** - Construction and operation of DC generator, types of generators and their various characteristics. DC motors: Torque speed characteristics of DC motors, Starting and speed control of DC motors by using 3-point DC Starter. **Alternators:-** Elementary working principles, Different parts of an Alternators, Relation between Speed and Frequency, E.M.F. equation in an Alternators. Different types of Circuit Breaker and its use. Introduction to DG set system. **Electric Power Economics:** - Economics of Generation of electrical energy and related important terms such as, load curve, connected load, Maximum Demand, Demand Factor, Average load or demand, Load Factor, Diversity factor and its significance, Capacity Factor or Plant factor, Utilization Factor, Plant Operating Factor and Selection of Units and related numerical, Various types of Tariff used for calculation of electricity bill. **Lighting system:** Introduction to industrial lighting system. **Energy Management and Power Factor Corrections:** - Types of energy, Energy Management, Concept of Energy Audit. Concept of Power Factor, Disadvantages of low power factor, Causes of low power factor, Various methods of improving low power factor, Location of power factor correction equipment, Advantages of power factor improvement.

9. Instrumentation and Process Control

Instrumentation scheme & characteristics: Measurands. Some basic discussion about electric field, potential, capacitance, resistance etc. Definition, Application and types of measurements, instrument classification, Functional elements of an instrument, standards, calibration, introduction to static characteristics and dynamics characteristics, selection of instruments, loading effects. Dynamic characteristics of measurement systems. **Introduction to various types of sensors:** Definition, principle of sensing & transduction, classification, selection and applications of Sensors., Measurement of parameter : Measurement of length ,angle, area , temperature , pressure flow , speed, force , torque, vibration , level , concentration (conductivity and pH) measurement . Flow measurement using magnetic flow measurement. Piezoelectric transducer. **Micro-sensors and smart sensors:** Construction, characteristics and applications. **Electronic Instruments:** Role and importance of general purpose test instruments, Electronic Millimeter, Cathode Ray Oscilloscope, Measurement of amplitude, frequency and phase using CRO Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator. Display devices and recorders like X-Y & X-T recorders.

Automation: Introduction to plant automation, automation hierarchy, PLC, SCADA



10. Dairy Engineering

Sanitization: Materials and sanitary features of the dairy equipment. Sanitary pipes and fittings, standard glass piping, plastic tubing, fittings and gaskets, installation, care and maintenance of pipes & fittings. Description, working and maintenance of can washers, bottle washers. Factors affecting washing operations, power requirements of can the bottle washers, CIP cleaning and designing of system. **Mechanical Separation:** Fundamentals involved in separation. Sedimentation, Principles involved in filtration, Types, rates of filtration, pressure drop calculations. Gravity setting, principles of centrifugal separation, different types of centrifuges. Application in Dairy Industry, clarifiers, tri processors, cream separator, self-desludging centrifuge, cold and hot separators, Bactofuge, in-line standardization system, care and maintenance of separators and clarifiers. **Homogenization:** Classification, single stage and two stage homogenizer pumps, power requirement, care and maintenance of homogenizers, aseptic homogenizers. **Pasteurization:** Batch, flash and continuous (HTST) pasteurizers, Flow diversion valve, Pasteurizer control, Care and maintenance of pasteurizers. **Sterilization:** Different type of sterilizers, in bottle sterilizers, autoclaves, continuous sterilization plant, UHT sterilization, Aseptic packaging and equipment. Care and maintenance of Sterilizers. **Packaging machines:** Pouch filling machine pre-pack and aseptic filling bulk handling system Principles and working of different types of bottle filters and capping machine, Blow molding machines, Aseptic PET bottle filling machine. Cup filling system. Care and maintenance. **Mixing and agitation:** Theory and purpose of mixing. Equipments used for mixing solids, liquids and gases. Different types of stirrers, paddles and agitators. Power consumption of mixer-impeller, selection of mixing equipment in dairy industry, mixing pumps.

11. Material Strength & Dairy Machine Design

Strength of Materials: Basic concepts in Statics and Dynamics. Force Systems. Equilibrium condition, friction, Law of friction, Second moments of inertia, Parallel axis theorem. Dynamics: Equation of motion. Translation and rotation of a Rigid body, work and mechanics of materials: Stress-Axial Load classification Strain-Hooke's law, stress-strain diagram, Poisson's Ratio: Shearing Stresses. Torsion, Torsion formula, Angle to Twist of circular members. Power transmission shear force and bending moments, Shear in Beams, Bending Moment in beams. Pure bending of beams, Flexural stress shearing stresses in beams relations between centre, Torsional and flexural loads. **Dairy Machine Design:** Procedures, Specification, strength, design factor, factor of safety selection of factor of safety. Materials and properties. Static strength, ductility, hardness, fatigue, designing for fatigue conditions. Theories of failure, Stresses in elementary machine parts, Design of a drive system. Design of length and thickness of belt. **Bearing:** Journal and Anti-friction bearings. Selection of ball, tapered roller and thrust bearing. Springs, helical and leaf springs. Energy stored in springs. Design and selection of springs.

12. Dairy Process Engineering

Evaporation: Basic principles of evaporators, construction and operation, Different types of evaporators used in dairy industry, Calculation of heat transfer area and water requirement of condensers, Basic concepts of multiple effect evaporators, Operations and various feeding systems, Economy of operation, Thermo processor and MVR system, Care and maintenance of evaporators. **Drying:** Introduction to principle of drying, Equilibrium moisture constant, bound and unbound moisture, Rate of drying- constant and falling rate, Effect of Shrinkage, Classification of dryers-spray and drum dryers, spray drying, etc., air heating systems, Atomization and feeding systems. Factors affecting bulk density of powder, spray dryer controls, Theory of solid gas separation, cyclone separators, Bag Filters, Care and Maintenance of drum and spray dryers. **Fluidization:** Mechanisms of fluidization characteristics of gas-fluidization systems, Minimum Porosity, Bed Weight, Pressure drop in fluidized bed, Application of fluidization in drying, Batch fluidization, Fluidized bed dryers. **Processing equipments:** Mechanization and equipment used in manufacture of indigenous dairy products, Ice-cream and Cheese making equipments. **Packaging equipments:** Packaging machines for milk & milk products. **Membrane Processing:** Ultra filtration, Reverse Osmosis and electro dialysis, Materials for membrane construction, Ultra filtration of milk, Effect of milk constituents on operation, membranes for electro-dialysis.

13. Food Engineering

Rheology: Rheology of processed food, properties of fluid foods, Rheological method, Measurement of rheological parameters, properties of granular food and powders, Properties of solids foods, Viscoelastic models. Measurement of food texture. **Food Freezing:** Thermal properties of frozen foods. Predication of freezing rates. Plank's equation, Design of food freezing equipment, Air blast freezers, Plate freezers, spiral freezers, and immersion freezers, IQF, storage of frozen foods. Freeze concentration. **Food dehydration:** Estimation of drying time for food products, constant rate period and falling rate period dehydration. Diffusion controlled falling rate period. Use of heat and mass balanced in analysis of continuous dryers, Classification of driers, tray, vacuum, vacuum band, tunnel, bin, solar, drying, freeze drying, spin flash. **Freeze dehydration:** Heat and mass transfer, Calculation of drying time, Industrial freeze drying. **Other food processing operations and equipments:** Equipment for pulping, fruit juice extraction, blanching, dehulling, size reduction, milling, extrusion and distillation.

14. Dairy Plant Design and Layout

Introduction of Dairy Plant design and layout: Type of dairies, perishable nature of milk, reception flexibility. Classification of dairy plants, Location of plant, location problems, selection of site. Hygienic design considerations for dairy processing plants. **Planning:** Dairy building planning, Process schedule, basis of dairy layout, importance of planning, principles of dairy layout. Space requirements for dairy plants, estimation of service requirements including peak load consideration. **Dairy plant design aspects:** General points of considerations for designing dairy plant, floor plant types of layouts, service accommodation, single or multilevel design. Arrangement of different sections in dairy, sitting the process sections, utility/service sections, offices and workshop. Arrangement of equipment, milk piping, material handling in dairies, Common problems, office layouts-flexibility. Development and presentation of layout, model planning, use of planning table in developing plot plant and detailed layout. **Building construction materials:** Floors, general requirement of dairy floor finishes, floors for different section of dairy. Foundations, walls doors and windows. **Other design aspects:** Drains and drain layout for small and large dairies. Ventilation, fly control, mold prevention, illumination in dairy plants. **Computer aided Design:** Introduction to CAD software.

15. Energy Conservation and Management

Introduction: Potential and opportunities of industrial energy conservation in dairy and food processing. Energy conservation Act 2001 and its important features, Schemes of Bureau of Energy Efficiency (BEE). Electricity Act 2003, Integrated energy policy. Energy management & audit: Definition, energy audit, need, types of energy audit. Energy audit approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution. Energy balances and computation of efficiencies of equipment. Role of Energy inspectors and Auditors in energy management. Electrical load management: Demand management, energy management information systems, Energy saving controllers and cost saving techniques. Quality of power, Power factor and its improvement. Transformers, losses in transformers. Energy savings in transformers. Electric motor-selection and application, Energy efficient motors. Variable Speed Drives and Variable Frequency Drives (VFD) and their role in saving electric energy. Bureau of Energy Efficiency (BEE): Power saving guide with "Star Ratings" of electrical appliances: Induction Motors, Air conditioners, Refrigerators and Water Heaters. Industrial Lighting: Quality of light, types of light sources, energy efficiency, Light controls.

Energy efficiency and conservation in utilities:

High efficiency boilers, improved combustion techniques for energy conservation, Fluidized Bed Combustion and multi fuel capabilities. Energy conservation in steam distribution systems, efficient piping layouts, protective & insulation coverings in utility pipes. Steam conservation opportunities. Upkeep and maintenance of steam auxiliaries and fittings. Energy conservation in Refrigeration and AC systems (HVAC), Cooling towers, Pumps and pumping systems, Fans, Blowers, Air compressors. Maintenance and



upkeep of Vacuum lines and Compressed air pipe lines. Conservation and reuse of water, water auditing. Energy conservation opportunities in Wastewater treatment.

Processing equipments: Improving efficiency and energy conservation opportunities in few important food processing operations like Thermal processes, Evaporation, Drying & Freezing. Role of steam traps in energy saving. Energy Savings methods in hot air generator, Thermic fluid heater, Steam radiator.

Energy conservation in buildings: Concepts of "Green Buildings". Waste-heat recovery and thermal energy storage in food processing facilities. Condensate recovery and reuse. Application of recuperator to recover energy from flue gases from boiler, DG exhaust, hot air from spray dryer, FBD etc. Diesel generating sets (stand by AC Gen sets): Energy saving opportunities in DG sets, Fuel and Oil conservation; important regular maintenance aspects. Carbon credits and carbon trade: Concepts of CDM, economic and societal benefits. Cleaner energy sources: Introduction to Solar, and Bio-mass Energy; Solar thermal and photo-voltaic energy options for food processing industries. Role of automation in conservation of energy in dairy and food processing: Incorporation of enhanced PLC based computer controls and SCADA.

DAIRY CHEMISTRY

1. Organic Chemistry

Hydrogen bonding: Concepts of hydrogen bonding inter and intra molecular hydrogen bonding in alcohol, carboxylic acids and other molecule. Hydrophobic interactions: Elementary idea of hydrophobicity and its importance in the structure of proteins. *Alcohols*: Important properties of mono, di and trihydric alcohols (Glycol and Glycerol). *Aldehydes and Ketone*: Reactions of aldehydes and ketones. Importance of carbonyl compounds in food flavors. *Carboxylic acids*: Ionization constant and strength of carboxylic acids. Important reactions of carboxylic acid, Derivatives: Esters, Amides, Lactones their preparation and reactions. *Amines*: Basic character of amines, important reactions. *Phenols*: Acidic character of phenols and effect of nuclear substituents on it. Reactions in phenols. *Substituted carboxylic acid*: important reactions of halogen substituted, Keto and Hydroxy acids. Zwitter-ion forms, its properties viz. melting point and volatility. *Amino Acids and Peptides*: Synthetic and natural amino acids General properties of amino acids. Definition and classification of proteins. Primary, secondary, tertiary and quaternary structure of Proteins. *Carbohydrates*: Definition, Classification and isomerism. Derivation of 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 (saturated and unsaturated) Structure and properties of Neutral lipids, phospholipids and cholesterol.

2. Environmental Studies

Environmental Science: An introduction, Ecosystem: kinds, structure, characteristics, functioning, Biochemical cycles, Natural resources and their managements, Environmental pollution, Air pollution, Water pollution, Solid waste pollution, Noise pollution, Soil pollution, Radioactive pollution, Food processing industry waste and its management, Management of urban waste water, Recycling of organic waste, Recycling of factory effluent, Control of environmental pollution through law, Composting of biological waste and Sewage, uses of water disposal effluent treatment, microbial examination.

3. Chemistry of Milk

Definition and structure of milk, factors affecting composition of milk, Nomenclature and classification of milk proteins, Casein: Isolation, fractionation and chemical composition, physico-chemical properties of casein, Whey proteins: Preparation of total whey proteins: α -Lactalbumin and β -Lactoglobuline. Properties of α -Lactalbumin and β -lactoglobulin, Immunoglobulin and other minor milk proteins and non proteins nitrogen constituents of milk, Hydrolysis and denaturation of milk proteins under different physical and chemical environments, Estimation of milk proteins using different physical and chemical methods, Importance of genetic polymorphism of milk proteins, Milk enzymes with special reference to lipases, Xanthine Oxidase, phosphates, proteases and lactoperoxidase, Milk carbohydrates their status and importance. Physical and chemical properties of lactose, Sugar amine condensation, amadori re arrangement, production of hydroxyl methyl furfural (HMF), Processing related degradation of lactose, Definition, general composition and classification of milk lipids. Nomenclature and general structure of glycerides, 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 (a) major mineral (b) Trace elements, physical equilibria among the milk salts and Milk contact surfaces and metallic contamination.

4. Physical Chemistry of Milk

Constituents and gross composition of milk of different species and breeds of milch animals, **Colloidal State:** Distinction between true and colloidal solution, lyophilic & lyophobic solution, properties of colloidal system. Properties of colloidal systems, Gels-their formation and properties. Milk as a colloidal system and its stability. Elementary idea about emulsion. Density: Density and specific gravity, pycnometer method, hydrometer lactometer. Density and specific gravity of milk, effect of various processing variables on the density and specific gravity of milk. **Liquid State:** Surface tension, surface energy interfacial tension. Surface tension of mixtures. Surface tension of milk and the factors affecting it. Viscosity- Definition of viscosity, Newtonian and Non-Newtonian liquids, Stokes Law, influence of temperature and concentration of solute on viscosity. Viscosity of milk, evaporated milk and condensed milk. Refractive index. Colligative Properties of Dilute Solution: Vapour pressure, Raoult's Law, Depression of freezing point, Elevation of boiling point. Freezing point and boiling point of milk. Osmosis and Osmotic pressure. Inter-relation of colligative properties. Aqueous solution of Electrolytes: Electrolytes; non-electrolytes, ionic mobility, electrical conductance, Ostwald Dilution Law, Kohlrausch Law, Electrical conductance of milk. Ionic Equilibria: Dissociation of water, ionic product 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. Salt-their hydrolysis. Buffer solutions. Derivation of Henderson – Hasselbach equation and its application, buffer capacity and buffer index, milk as a buffer system. Equilibrium of electrolytes. pH indicators. Oxidation-Reduction: Redox potential, Nernst equation, electrochemical cells. Hydrogen, glass and calomel electrodes. Redox system of milk. Nuclear Chemistry: The nature of isotopes, radio isotopes. Half life period of radio isotopes. Some of the important radio isotopes. Occurrence of radio nuclide in milk & milk products. Molecular Spectroscopy: The spectrum of electro magnetic radiation, the laws of Lambert and Beer, visible, and ultra-violet Spectroscopy. Mention of mass, NMR spectroscopy.

5. Biochemistry

Bio-Molecules: General structures, classification and functions of bio molecules-Amino acids, Protein Structure, Carbohydrates, Fats, Lipids, DNA and RNA. **Enzymes:** Activation energy /Transition state & Enzyme Classification, Coenzymes/Co-factors & Enzyme kinetics, Mechanism of enzyme action, Factors effecting enzyme activity, Enzyme inhibition, isozymes & Regulatory Enzymes, Immobilization of enzyme, Ribozymes & Zymogens. **Metabolism:** Glycolysis, Gluconeogenesis, TCA cycle, Glycogen synthesis and degradation, Pentose phosphate pathway, Fatty acid oxidation, Urea cycle and transaminase reactions, ATP and Electron transport chain.

6. Chemistry of Dairy Products

Chemical composition and legal standards of milk products. Chemistry of creaming and factors affecting the same. Ripening and neutralization of cream. Theories of churning and factors affecting the same. Butter colour. Ghee: Physico-chemical changes during manufacture. 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. Physico-chemical changes during preparation and storage of concentrated and dried milk products. Physico-chemical changes during processing and storage of ice cream and frozen desserts. Role and mechanism of stabilizers and emulsifiers in ice cream.

7. Chemical Quality Assurance

Importance of chemical quality control, quality assurance and total quality management in dairy industry. Role of national and international food regulatory systems and standards with respect to quality and safety of milk and milk products: FSSAI, PFA, AGMARK, BIS ISO, IDF, Codex, etc., Application of food safety management system (ISO: 22000). Hazard analysis and critical control points (HACCP) system and its application in dairy industry with respect to chemical quality. Setting up of testing facilities and analytical laboratories; concept of mobile testing laboratories. Accreditation of analytical laboratories. Preparation and standardization of reagents required in the analysis of milk and milk products. Sampling procedures; labeling of samples for analysis; choice of analytical tests for milk and milk products for chemical analysis and instrumental methods of analysis. Calibration of dairy glassware; including 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. Importance of milk contact surfaces, metallic contamination in dairy industry. Chemical quality of water in dairy industry. Prediction of shelf life behavior of milk and milk products.

8. Food Chemistry

Water: Water binding and chemical reaction mediated by water. **Food proteins:** Classification and physico-chemical and structural properties. **Lipids:** Definition, classification of lipids, Unsaponifiable matter contents in various fats and oils, classification and chemical composition. **Carbohydrates:** Classification of carbohydrates, polysaccharides, viz. linear, branched and modified. Properties and utilization 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. **Aroma compounds in foods:** Threshold value, off-flavours. **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. **Antinutritional factors and Food contaminants:** Toxic trace elements, radio nucleotides. Cereal and cereal products: Individual constituents like proteins, lipids, carbohydrates and vitamins in cereals flour and their relationship in dough making, influence of additives /minor ingredients on baking properties: physico-chemical changes during baking. **Legumes:** Classification, general composition and physico-chemical properties. **Vegetables and Fruits:** Classification, general composition, chemical changes during ripening and storage. **Jams, Jellies and Pickles:** Classification, composition and preservation. Preservation of foods, general principles of food preservation.

9. Human Nutrition

Fundamentals of human nutrition, concept of balanced diet, nutrient requirements of different age groups. Methods of evaluation of nutritive value of food and nutritional value of cow, buffalo and human milk, biochemical composition and energy value of foods with special reference to milk and dairy products. Nutrition, digestion and absorption, Vitamins (structure and function), Hormones (structure and function), 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. Biochemical aspect of post-harvest storage specifically food spoilage.

DAIRY MICROBIOLOGY

1. Fundamentals of Microbiology

Overview of history and scope of microbiology: Discovery of Microorganisms and Microscopy (types, working principles and applications); Theories of Biogenesis and abiogenesis; Contributions of Leeuwenhoek, Pasteur, Tyndal, Joseph Lister, Robert Koch, Edward Jenner and Alexander Fleming; Scope and application of microbiology in fields like Dairy, Food, Pharmaceutical, Industrial, Medical and agriculture. **Classification of Microbes:** Microbial classification systems, numerical taxonomy, General properties and principles of microbial classification, Whittaker's five kingdom and Carl Woese's three domain classification system; Systematics of bacteria and Bergey's manual of systematic bacteriology, Phylogenetic tree. **Prokaryotic and Eucaryotic microorganisms:** Structure and functions of prokaryotic cells; Differences between prokaryotes and eukaryotes; Differences between cell wall of Gram positive and Gram negative bacteria; Structure of Archeal cell wall. **Microbial growth and nutrition:** Bacterial growth curve; factors affecting growth of bacteria, direct and indirect methods of measurement of bacterial growth; Bacteriostatic and bactericidal agents; Common nutrient requirements and nutritional types of microorganisms. **Diversity of Microorganisms:** Viruses: Structure and Classification; Bacteriophages; Differences between viruses and bacteria; Fungi: Classification of Fungi; Reproduction in Fungi; Protozoa and algae. **Microbial Ecology and Environmental Microbiology:** Microflora of air, soil and water and Microbes of Extreme environment like Archea. **Basics of Microbial Genetics and Host-Microbe interactions:** DNA as the genetic material, Structure of DNA/ RNA, DNA replication, transcription and translation; Basic concepts of immunology; Role of immune system in governing host-microbe interactions, Microbial Commensalism, Colonization, Infection, Disease and Vaccines.

2. Microbiology of Fluid Milk

Microbes associated with raw milk: Significance of specific groups of microorganisms in milk i.e. psychrotrophic, mesophilic, thermophilic and thermophilic bacteria - their morphological and biochemical characteristics and classification. Microbial contaminants in raw milk, their sources during various stages of production - milking, chilling, storage and transportation with special reference to psychrotrophic microorganisms; Microbiological changes in bulk refrigerated raw milk. **Sources of contamination and microbial spoilage of raw milk:** Microbial contaminants of raw milk supplies, their sources during various stages of production i.e. milking, chilling, storage and transportation with special reference to psychrotrophic microorganisms and preventive measures. Types of microbial spoilage - souring, curdling, bitter cream, proteolysis, lipolysis, abnormal flavors and discoloration. Mastitis milk - types of mastitis, causative microflora of mastitis, compositional and microbiological changes during mastitis infection, their processing and public health. **Concept of clean milk production:** Hygienic milk production system; Cleaning and sanitation of udder, animal, utensils, equipments and dairy farm environment; Microbiological quality of milk produced in organized and un-organized sector in India and comparative information in developed world; Microflora of aseptically drawn milk and its natural antimicrobial systems - immunoglobulins, lactoferrin, lysozyme and lactoperoxidase (LP) system. **Microbiological aspects of fluid milk:** Pasteurization, boiling, sterilization, ultra high temperature (UHT), non thermal (pulsed field) micro-filtration, bactofugation, standardization and homogenization. Significance of heat resistant and post processing contaminants in fluid milk with special reference to proteases and lipase enzymes and their role in spoilage of processed milk. Bio-film formation during processing and their control measures. **Public health aspects of fluid milk:** Microbial zoonotic diseases transmitted through fluid milk; Milk borne diseases - food infection, intoxication and toxin infection caused *E. coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Bacillus cereus*, *Listeria monocytogenes*, *Shigella species*, *Campylobacter* etc. Microbiological grading and legal standards of raw and processed milk.

3. Starter Cultures and Fermented Milk Products

Types, metabolism and propagation of starter cultures: History, classification and importance of starter cultures in dairy industry; Single, multiple, defined and mixed strain starters; Probiotics and Special cultures like exopolysaccharide production; Propagation of starter cultures-concentrates - direct bulk and direct vat starter cultures, factors affecting propagation; Metabolism of starter cultures (carbohydrate, protein, citrate) and production of metabolites and antibacterial substances; methods of starter distillates their merits/demerits.

Activity, Purity, Preservation of Starters and Starter Failure: Quality and activity tests for dairy starters and their preservation- methods (liquid, spray drying, vacuum drying, freeze-drying, frozen concentrate, concentrated dried cultures), merits and demerits; factors affecting the survival of cultures during preservation; 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. **Role of Starters in fermented milks:** Role of starters in the preparation of various fermented milks; Types of fermented milks - dahi, yoghurt, acidophilus milk; different types of dahi and yoghurt; preparation; defects and their control. Kefir and koumiss: origin and characteristics; microbiology of kefir grains; Other fermented milks such as Bulgarian milk, cultured buttermilk, Leben, Villi and Yakult; Microbiology of fermented milk products; their nutritional and therapeutic significance. **Chesse Starters:** Classification, desirable properties, Artisanal and adjunct cheese cultures, primary and secondary flora of cheese; biochemical changes during ripening, bacterial and mold ripened cheeses: soft, semi-soft, semi-hard, hard, Brick and Brie cheese, Camembert and Roquefort cheese; Rennet: rennet substitutes, microbial rennet and recombinant chymosin.



4. Dairy Biotechnology

Basics of Microbial Genetics Biotechnology - Definition, scope and historical development of biotechnology, achievement and future application. DNA as the genetic material Structure of DNA/ RNA, chromosomes and plasmids, genetic code, DNA replication, transcription and translation, protein synthesis; spontaneous and induced mutations in bacteria; genetic recombination- transformation, transduction and conjugation. Molecular genetics of dairy lactic acid bacteria – Lac and trp operon concept- Genetics of industrially relevant traits - casein degradation, bacteriophage resistance and production of anti-microbial peptides and flavour compounds. Recombinant DNA technology: Vectors, restriction enzymes, cloning strategies in bacteria and animals. Genetic manipulation of dairy starters - for improved attributes of commercial value – Fermented milk products, accelerated cheese ripening, biosensors, designer milk, Protoplast fusion. Application of biotechnology - Biotechnology for quality assurance in food industry, dairy industry and dairy effluent treatment. Dairy enzymes and whole cell immobilization. - Ethical issues related to use of genetically modified foods.

5. Quality and Safety Monitoring in Dairy Industry

Consumer Awareness about Microbiological Quality and Safety of Dairy Foods: Changing scenario; Concepts of quality control, quality assurance and food safety; Global quality and food safety standards, Integrated food law, its main features and functions. **Introduction to Food Safety Management System:** Concepts of Quality Management System (QMS)–ISO: 9000:2000; Principles of QMS; Standard requirements for QMS; HACCP concept and principle with special reference to biological hazards in dairy foods, TQM tools and techniques. **Microbiological Risk Analysis Concepts:** 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 and setting up of a microbiological/ pathogen lab in a dairy plant. **Rapid Enumeration Techniques:** Enumeration principles and procedure for rapid detection of predominant hygiene indicator organisms and pathogens like *E. coli* (*E. coli* 0157:H7), *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Bacillus cereus* and *Listeria monocytogenes*. **Role of Biosensors for monitoring hygiene and safety of dairy foods:** Detection of antibiotic residues in milk –Delvo SP, MDR test, penzyme test, charm assay, lateral flow assay (ROSA test) etc. Detection of aflatoxins, pesticides other inhibitors etc. and their public health importance in dairy foods. **Plant and equipment hygiene:** 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.

6. Microbiology of Dairy Products

Microbiology of Cream and Butter - Micro-environment and impact of critical process factors on entry of spoilage and pathogenic organisms in cream and butter; Microbiological aspects including defects in pasteurized (ripened/unripened cream), sterilized and UHT cream; Factors influencing the microbial growth during batch/continuous butter making process; Microbial Defects in butter - Bacterial/mold discoloration, enzymatic deterioration and their control measures; Regulatory microbiological standards. **Microbiology of Condensed, Evaporated and Dried products:** Type of microorganisms associated with condensed, evaporated and dried products, their growth/ survival during manufacture and storage; Microbial defects - Bacterial thickening / Mold button formation in SCM; Gassiness/bloating, Bacterial coagulation (Sour and sweet), Bitterness, Fishy flavor in evaporated milk; pre-heating/DSI temperature and their impact on microflora of dried products; Effect of reconstitution on microbial quality of milk powder including baby foods and survivability of pathogens; Regulatory microbiological standards. **Microbiology of Ice Cream and Frozen desserts:** Microenvironment in ice cream, microbiological quality of ingredients, critical process factors and their impact on entry of pathogens in ice cream and frozen desserts, their survival during storage, food poisoning outbreaks and legal standards. **Microbiology of Indigenous Milk Products:** Predominance of spoilage and pathogenic organisms in khoa and khoa based sweets – burfi, peda, gulabjamun, etc., paneer, Chhanna and Chhanna based sweets – rasogulla; kheer, shrikhand, dahi, kulfi etc.; Factors affecting the microbiological quality in reference to production, processing, storage and distribution; Microbial safety in relation to potential pathogens and their public health significance; Microbial defects, control measures and legal standards; Active packaging concepts and role in bio-preservation.

7. Food and Industrial Microbiology

Scope of food microbiology: Basic aspects, history and scope of food microbiology. Intrinsic and extrinsic factors that affect microbial growth in different foods.

Microbial Spoilage of foods: Microbial spoilage of fruits, fruit juices, vegetables, cereals, meat, poultry, sea foods, carbonated soft drinks, canned foods; Sources of contamination; Control of spoilage. **Food preservation:** Principles of food preservation: physical methods viz. low temperature and high temperature preservation (D, Z and F Values); Drying Methods; Chemical preservatives, Natural antimicrobial compounds and bio-preservation; Emerging Dairy Processing Technologies; Mode of action of various preservation methods on microbes. **Fermentation processes:** Fermentation processes: Historical development, the range, components and types (i.e. submerged, surface and solid state fermentation); criteria for selection of industrially important microorganisms; preservation and improvement of industrially important micro-organisms using metabolic engineering/genetic engineering; media for industrial process; upstream and downstream processing. **Types of fermenters:** Fermenters: types (batch, fed batch and continuous), functions, design and control; sterilization; growth rate analysis, estimation of biomass; difference in chemostat and turbidostat. **Microbial production of industrial products:** Immobilization of enzymes/cells; Microorganisms and processes involved in the production of single cell protein and industrial alcohol, beer and wine; organic acids (citric and lactic), enzymes (protease, lipase and rennet), vitamin (B₁₂), antibiotics and bacteriocins; and fermented whey beverages.

DAIRY BUSINESS MANAGEMENT

1. Dairy Development

Socio-economic and geographical features of Indian dairying. Traditional Systems of cattle keeping, estimates of milk production, utilization and sale; annual milk production and per capita availability; Public sector milk supply schemes; co-operative dairy organizations, Anand pattern and perspectives; milk products manufacture in private sector, Strategy of cattle improvement; pioneering role military dairy farm; key village scheme and its limitations, intensive cattle development programme concept, approach and achievements. Public sector dairy schemes, National Dairy Development Board-aim and objectives, policy orientation in dairy development. Operation Flood- I, II, III: programmes & Outlay, implementation, success, achievements, integrated infrastructure of milk production, improvements of dairy co-operative organization, Dairy development Corporations, Co-operative Dairy Federations, Self-reliance in dairy development, income & employment potential. Dairy problems and policies, National dairy Plan, Producer company.

2. Milk Production Management

Introduction to Animal Husbandry. Distinguishing characteristics of India and exotic breeds of dairy animals and their performance. Systems of breeding and methods of selection of dairy animals. General dairy farm practices - Identification, dehorning, castration, exercising, grooming, weighing. Care of animals at calving and management of neonates. Management of lactating and dry cows and buffaloes.

Methods of milking, milking procedure and practices for quality milk production. Dairy farm records and their maintenance. Systems of housing dairy animals and maintenance of hygiene and sanitation at dairy farm premises. Common disease problems in dairy animals, their prevention and control. Feed nutrients required by animal body. Feed resources for milk production and their nutritive values. Digestive system of ruminants and measures of feed energy. Nutrients requirements for growth and milk production. Feeding standards, Structure and function of mammary system. Milk secretion and milk let-down. Male and female reproductive system. Estrus and reproductive cycle, Ovulation, fertilization, gestation, parturition, pregnancy diagnosis. Artificial insemination and embryo transfer and their role in animal improvement introduction to biotechniques in dairy animal production.

3. Communication Skills

Communication Process: The magic of effective communication; Building self-esteem and overcoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication; Verbal and non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication. Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Précis writing /Abstracting/Summarizing; Style of technical communication Curriculum vitae/resumé writing; Innovative methods to enhance vocabulary, analogy questions. Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; phrases and clauses; Case: subjective case, possessive case; objective case; Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles; Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.

4. Computer and Application Software Packages

History, features, classification and organization and I/O peripheral devices for computers; Features of modern operating systems; number systems and coding schemes; Basics of networking and communications; Internet, email concepts and application, Word-processing and desktop publishing, Electronic spreadsheet basics and operations, Database management system basics and operations; Fundamental of presentation-graphic packages. Recent strides in computing. Framework of PERT and CPM, Activities, events and network, PERT and activity time estimates, probability of project completion Critical path analysis.

5. Economic Analysis

Basic concepts-wants, goods, wealth, utility, consumption, demand and supply, Consumer behaviour-law of diminishing marginal utility and equi-marginal utility, cardinal and ordinal utility approach for consumer's behaviors. Theory of demand-law of demand, demand schedule, demand function, determinates of demand, individual consumer demand and market demand, demand forecasting, elasticity of demand, price elasticity, income elasticity and cross elasticity, Consumer's surplus. Theory of production- concepts of firm and industry, basic factors of production and their role, production function for a single product, nature of production function, laws of returns. Concepts of costs-fixed and variable costs, short run and long run costs, average and marginal costs, economics and diseconomies of scale. Concept of market- types of market, pricing and output under different market situations, market price and normal price, price determination under perfect Competition, monopoly, oligopoly and monopolistic competition. National income – GDP, GNP, NNP, disposable personal Income, per capita income, inflation.

6. Fundamentals of Dairy Extension

History, need, definition, philosophy, principles, approaches and objectives of extension education. Present status of dairy and animal husbandry development programme launched in pre and post-independence era. Teaching and learning process, Extension Teaching Methods, classification and selection of teaching methods. Importance of Audio-Visual-Aids. Identification of rural leaders, their characteristics, role and function in rural development, training of rural leaders. Principle of working with group and their mobilisation. Need, principle and step of programme planning. Evaluation of extension programmes. Diffusion of innovations and categories of farmers. Problems of different stake holders, Conceptual orientation about different terms, like- RRA, PRA, IVLP/TAR, ATMA, ATIC, PTD, etc.

7. Financial Management and Cost Accounting

Introduction: Definition, scope and objectives of financial management, Different Systems of Accounting: Financial Accounting, Cost accounting, Management Accounting. Double entry system of Book-Keeping. Preparation of Accounting Records: Journal, Purchases and Sales Book and Posting in Ledger, Cash Book. Preparation of Final Accounts and adjustments at the end of trading period. Preparation of Trial Balance Banking Transactions and Bank reconciliation statements. Statements of Financial Information: Accounting system: A source of financial statements, Classification of capital and revenue expenditure, Balance Sheet, Profit and Loss Account, Statement of changes in the financial position, funds flow statements, cash flow statement, uses of funds flow and cash flow statements in financial decision making. **Financial Analysis:** Nature and uses of financial analysis, Liquidity ratios, Leverage ratios, Activity ratios, Profitability ratios,

Utility of Ratio analysis. Cost Volume – Profit analysis and operating leverage, Break-even analysis, Profit analysis and operating analysis, Utility of CVP analysis. Capital Structure: C.S Planning, risk return trade off, financial leverage. Cost of capital: Management of cost of capital, cost of debt, debentures, preference share capital, equity share capital & retained earning, overall cost of capital. **Investment decision:** Time value of money, Net present value, Investment evaluation criteria, NPV method, Internal rate of return method, Profitability index method, Pay back period method, Accounting rate of return method. Capital budgeting: Complex Investment Decisions: Investment timing & duration Investment decisions under inflation, Investment decisions under capital rationing. **Project Report;** Feasibility Report Valuation. Working capital management- Concept & determinants of working capital, Estimating working capital needs. Depreciation – Concept and method. Introduction, Definition, Objectives, Common terms. **Costing:** Essentials of sound costing system. Different methods of costing, elements of cost: Labour- recording of time, idle time, methods of remunerating labour, Premium & Bonus Plans, Materials, Overheads. **Cost classification:** Direct and Indirect expenses, fixed and variable costs. Various methods of apportioning indirect expenses. Inventory Management: Planning, control and costing. Stores & storekeeping, scope & importance, purchase procedure, types of purchase, location of stores & materials, procedure for the movement of stores, different methods of pricing materials, store records. Cost Sheets-Different methods, Statement of cost and statement of profit estimates, Tenders or Quotations. Contract or Terminal costing. Process Costing: Process losses and inter-process profits, joint products and by products costing. Ascertainment of cost of milk production. Preparation of Cost Account Information for managerial decisions.

8. Industrial Statistics

Definition and scope; sources of animal husbandry and dairy statistics. Measures of central tendency, Measures of dispersion, Moments, skewness and kurtosis. Elementary notions of probability, Laws of addition and multiplication probability. Theoretical frequency distributions: Binomial, Poisson and Normal distribution and their application. Concepts of sampling methods, Introduction to testing of hypotheses, Tests of significance-Z, t, F tests, and their application in the field of dairying. Analysis of variance- One-Way and two-way classification. Simple correlation coefficient and its test of significance, Linear regression, rank correlation. Basic concepts of statistical quality control, Control charts for variables and attributes, Fundamental concepts of acceptance sampling plan.

9. DBM-3109: Marketing Management & International Trade

2 (2+0)

Concept of marketing; Functions of marketing; concepts of marketing management; scope of marketing management; marketing management. Process; concepts of marketing- mix, elements of marketing- mix. Market Structure and Consumer Buying Behaviour: Concept of market structure, marketing environment, micro and macro environments. Consumers buying behaviour, consumerism. Marketing Opportunities Analysis: Marketing research and marketing information systems; Market measurement- present and future demand; Market forecasting; market segmentation, targeting and positioning. Allocation and marketing resources. Marketing Planning Process. Product policy and planning: Product-mix; product line; product life cycle. New product development process. Product brand, packaging, services decisions. Marketing channel decisions. Retailing, wholesaling and distribution. Pricing Decisions. Price determination and pricing policy of milk products in organized and unorganized sectors of dairy industry. Promotion-mix decisions. Advertising; How advertising works; Deciding advertising objectives, advertising budget and advertising message; Media Planning; Personal Selling, Publicity; Sales Promotion. Food and Dairy Products Marketing. International Marketing and International Trade. Salient features of International Marketing. Composition & direction of Indian exports; Trends in International Dairy Trade, International marketing environment; Deciding which & how to enter international market; Exports- Direct exports, indirect exports, Licensing, Joint Ventures, Direct investment & internationalization process, Deciding marketing Programme; Product, Promotion, Price, Distribution Channels. Deciding the Market Organization; World Trade Organization (WTO)

10. DBM-3110: Operations Research

Introduction-Elementary concepts, objectives of operations research, Applications of OR in decision-making. Modeling in Operation Research. Linear Programming: Introduction, mathematical formulation of the problem, Graphical solution, Simplex technique for solving simple LP problems. Inventory Control –



Introduction and general notations, Economic lot size models with known demand. Replacement – Introduction, Replacement of items whose efficiency deteriorates with time. Queuing – Introduction and general notions, Classification of queues and their problems, Probability distribution of queues. Various models in the queuing system. Sequencing – Statement of the problem, notations and assumptions, Problems with ‘n’ jobs and two machines. Generalization to ‘m’ machines. Transportation model – Definition and application of transportation model, Formulation of transportation problems and their solutions. Assignment problems and their solutions.

11. DBM-3211: Entrepreneurship Development

Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalisation and the emerging business/ entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs)/SSIs. Export and Import. Policies relevant to dairy sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Overview of dairy inputs industry. Characteristics of Indian dairy processing and export industry. Social Responsibility of Business.

12. Dairy Informatics

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System, definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, tabulation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, creating database, uses of DBMS in Dairy Internet and World Wide Web (WWW), Concepts, components and creation of web, HTML, XML coding. Computer Programming, General Concepts, Documentation and Program Maintenance, Debugging programs, Errors. Introduction to Visual Basic, Java, Fortran, C/ C++, etc, concepts and standard input/output operations, Variables and Constants, Operators and Expressions, Flow of control, Inbuilt and User defined functions, programming techniques for agriculture. Role of IT in Dairy, concepts, design and development. Application of innovative ways to use information and communication technologies (IT) in Dairy. Smartphone mobile apps in Dairy for Dairy Farm Management etc; GPS in Dairy Industry. Importance of Dairy Knowledge Portal, Milk sale kiosk and E-Pashu Haat in Dairy Sector.

13. Current Trends and Recent Advancements in the above fields.

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option then that question will not be considered for evaluation. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.



**Syllabus for the Test for the recruitment of
Senior Research Assistant (Fisheries), Class III**

Marks - 200

Medium: English

MCQs-200

Senior Research Assistant (Fisheries), Class III

1: Fisheries Resources

Fin fishes: major carp, catfishes, hilsa, mullet, sardine, mackerel Sport fishes, Introduction and some important species Shell fishes: Prawn, shrimp and molluscs.

Major fisheries resources of the World, India and Gujarat, global trends in production; Target and non-target fisheries resources of the Indian subcontinent and the EEZ; Distribution, composition, trends and dynamics of major exploited fishery resources in hill streams, rivers, reservoirs, lakes, lagoons, estuaries, territorial waters, oceanic waters, deep sea oceanic islands; Straddling/shared stocks and non-conventional resources; Sports, game and ornamental fisheries; Major commercially exploited stocks, their potentials, status, bionomics, methods of capture and yields; Issues related to capture fisheries; Endangered and threatened species, in-situ and ex-situ conservation; Juvenile fishing, destructive gears, bycatch and discards; Status and impact of exotic species, accidental introductions; Guidelines and policies for exotics.

2: Fishery Biology

Life history of economically important fish species; Food and feeding habits, methods of studying food and feeding habits; Reproductive biology, maturity stages, fecundity, ova diameter studies and breeding cycles; Length- weight relationships; Condition Factor, Gonado-Somatic Index; Age and growth studies - methods for determination of age, study of growth rates, direct and indirect methods; Taxonomy of major fish groups; Recruitment, growth and mortality of fish in natural water bodies; Different analytical and Holistic models for fish stock assessment, their advantages and disadvantages; Catch per unit effort, Concept of Maximum Sustainable Yield and Maximum Economic Yield; Application of remote sensing and Geographical Information System (GIS) in resource mapping and forecasting; Mechanisms, methods and status of fish yield data acquisition, storage, retrieval and processing for national estimates; Ecosystem-based fisheries management tools; Monitoring, control and surveillance (MCS) systems for major fisheries; Computer software in stock assessment; Use of Virtual Population Analysis and Predictive models.

3: Aquatic Environment

Various aquatic habitats and fish faunal compositions, trophic relationships, distribution and abundance; Fisheries oceanography and marine fisheries; Limnological parameters; Influence of environmental parameters on fish abundance, distribution, resource resilience; Impact of fishing, aquaculture, other anthropogenic activities on the environment and fish stock. Disaster management in fisheries; Methods for increasing productivity of water bodies (Use of thermal energy and deep-sea water through artificial upwelling, Use of ranching, Artificial reefs, FADs and their uses); Habitat degradation and its impact on fisheries; Pollution of water bodies and its impact; Bioindicators and Bioremediation; Protected areas (sanctuaries, marine parks, biosphere reserves and Ramsar sites); Potential fishing zones.

4: Conservation and Management of Fisheries Resources

Concepts and principles of fisheries management; Fisheries Acts and Legislations, revisions and amendments; Fisheries policies, instruments and mechanisms for inland, coastal and open ocean fisheries management; Management of riverine, reservoir and lacustrine fisheries; Management of marine fisheries; Modes of fisheries management - Open access, regulated, advisory; participatory, user rights; International fishery regulations, treaties and instruments; Input control measures such as access control, size, type, number and power of boats, duration of fishing; Output control measures such as Total Allowable Catch, Catch Quotas, Licensing, Technical control measures such as size limitations, closed fishing areas, closed seasons, size of nets and mesh size regulations, limited entry; Impediments to fisheries governance; UNCLOS, FAO Code of Conduct for Responsible Fisheries; India's commitment to international treaties and resolutions. Impact of dams, river linking, CRZ, Biodiversity Bill, protected/closed area, fishing bans, closed seasons, protected areas, mangroves, sanctuaries and parks on the fisher communities. Land and water body use issues in fisheries. Role of extension in fisheries, mechanisms and modes of extension and their impact on capture fisheries and fisher's livelihood, alternative livelihood options; Management of conflicts within sub-sectors in fisheries; Women in fisheries, status, role, impact, future; Vulnerability of fishers to natural disasters and coping mechanisms in disaster management.

5: Fishing Technology

Different types of craft and gear, their operation and maintenance; Selectivity of fishing gears, by-catch reduction devices in trawls, turtle excluder devices; Use of modern techniques and equipment for fish finding and capturing.

Craft Technology: Fishing crafts of the world; Principles of design and construction; Corrosion protection; Craft materials - wood, marine plywood, fibreglass, reinforced plastic, aluminium, steel, ferro-cement; Bio-deterioration and preventive measures; FAO classification of fishing vessels; Different types of fishing vessels in India; General arrangements of fishing vessels; Basic principles of fishing vessel design; Stability of fishing vessels - factors affecting stability; Powering of fishing boats; Deck machinery for trawlers, seiners, gill netters and liner; Winches- net haulers, line haulers, power blocks, special purpose winches; Engine installation- types of engines for fishing vessels, four stroke cycle, two stroke cycle; Selection of engine for fishing vessels; Transmission systems - Reduction/reverse gear boxes; Modern navigation equipment, navigation and fishing lights; Life saving devices - life jacket, life buoy, life raft, Search and rescue Transponders(SART), Emergency position-indicating Radio beacon (EPIRB).

Gear Technology: Gear Materials - Netting yarns, natural fibres and their classification, origin, properties & preservation; Synthetic fibres- Classification, manufacture, identification and comparative properties; Construction of netting twines; designation of netting yarns and twine twist-coefficient; direction, yarn numbering system; Specification and characteristics of netting; Fishing accessories- Floats, buoys and sinkers, connectors

and swivels, ground gear sheer devices, hooks; Classification of fishing gear. Fishing gears used in India; Fish behaviour in relation to fishing techniques; Factors affecting fishing gear design; Fishing gear selectivity - Selectivity of trawls, gill nets and lines; Model testing of fishing gear - flume tank; Structure and operation of trawls; Otter boards - principles of operation, variation in design; Structure, design variation and operation of purse seines, gillnets and trammel nets, lines and traps. Electrical fishing; Harvesting machines; Selective fishing gear and practices: By catch and discards, By catch reduction devices (BRDs), Turtle excluder devices (TEDs); Fish aggregating devices.

6: Aquaculture Systems

History and scope of Aquaculture; Aquaculture practices in different parts of the world; Global aquaculture production, consumption scenario and emerging trends; Different systems of Aquaculture traditional, extensive, intensive, semi-intensive, flow through and recirculatory. Farming methods ponds, pens, cages, raceway, raft, rope, monoculture, polyculture, mixed culture; Capture based aquaculture and culture-based Aquaculture, integrated multi-trophic Aquaculture (IMTA). Recirculating aquaculture Systems (RAS), Integration of Aquaculture with agriculture and animal husbandry; sewage fed farming, organic Aquaculture. Criteria for candidate species selection, criteria for site selection for various culture practices; Aquaculture practices for freshwater fish and prawn, brackish water and marine shrimp and fish (Seabass, Milkfish, Mullet, Pearl Spot, Cobia, Pompano, Grouper, Snappers, Breams, Other Perches), lobsters, crabs, molluscs (Edible and pearl oyster, mussels. Clams, cockles) echinoderms, seaweeds, freshwater and marine ornamental, exotics. Design and construction of aqua-farms: site selection, nutrient and soil quality, soil and water quality management, liming, manuring and fertilization, bio-fertilization, recirculatory systems; construction of pens, cage design and construction. Feed Technology: Feed ingredients: Introduction, sources and anti-nutritional factors, Feed formulation, feed preparation methods Feed attractants, binders, growth promoters (antibiotics, probiotics), colouring and flavouring agents, Types of feed: Pellets, flakes, powdered, micro-encapsulated, micro-bound and micro-coated diets, Compact pellet feed, floating and sinking pellet feeds Feed processing: Machineries, Effects of processing on the nutritional value of feeds, Feed Packing and storage.

7: Breeding of Fish and Shellfish

Genetic basis for selection of fish for breeding, QLT and marker assisted selection, sire and dam evaluation, selection for threshold characters, inbreeding effects, cross breeding and hybridization, selection and mating designs for select traits, selection for disease resistance, monosex, cryopreservation of gametes. Endocrine control of reproduction in fish and shellfish, synchronization of spawning, broodstock development and management, use of happa, care of fertilized eggs, assessing stripping, induced normality and mortality. Live feed development for larvae, larval feeding and maintenance, packaging and transport of shrimp post larvae, fish and fingerlings, eyed larvae or spat of molluscs. Nursery systems and their operation.



8: Diseases of Fish, Diagnosis and Control

Major bacterial, viral, fungal, parasitic, non-infectious diseases of fish and shellfish in aquaculture systems. Cell lines and their use in virus isolation, bacterial metabolism, bacterial toxins and pathogenesis, diverse bacterial species infection fish and shellfish, evolution and classification of viruses, virus-host relationship, replication of virus, molecular pathogenesis, viral vaccines, new antiviral compounds, virus and gene therapy, RNA and DNA viruses in fish and shell fish and their antigenicity, cultivation, pathogenesis, diagnosis, epidemiology, diagnosis, treatment, prophylaxis and immunity. Patho-epizootiology, treatment and control of mycotoxicosis, EUS, saprolegniasis and other fungal pathogens of fish and shellfish, diseases caused by trematodes, cestodes, nematodes, crustaceans, acanthocephalans, protozoans, algal blooms, microbial toxicity. Disease prophylaxis and therapeutics, use of chemicals, antibiotics, conventional vaccines, prebiotics and probiotics, biochemical applications in disease control, DNA and RNA vaccines, recombinant vaccines, use of RNA interference, SPF and SPR brood stock, certification, surveillance and reporting, biosecurity. Disease control through environmental management.

9: Genetic Tools in Fisheries and Aquaculture

DNA markers in stock identification: Allzymes, RFLP, RAPD, AFLP, Microsatellites, ESTs, SNPs, Type I and II markers, mtDNA and nuclear DNA markers, Real-time PCR and EST markers, Lab assays for markers. Next generation sequencing, Applications for species identification, hybridization, stock identification, genetic diversity and conservation.

10: Fish Processing Technology

Factors affecting spoilage of fish; Principles of fish preservation; Preservation of fish by curing (drying, salting and smoking); Water content, water activity (aw) and storage stability; Onboard handling of fish; sanitary and phyto-sanitary requirements for maintenance of quality; grading of fish; Chilling and freezing of fish - principles of chilling and freezing, crystallisation, nucleation, crystal growth, methods of chilling, transportation and marketing of chilled fish, the application of freezing systems in fish processing; Changes in quality of chilled and frozen products during storage; Canning of fish and fish products- principles of canning, can materials, can shapes, process value calculation and spoilage of canned food; Modified atmosphere packaging (MAP) of fish and fish products; Accelerated freeze drying (AFD); Surimi and fish-mince products- the surimi process; Fish muscle proteins; Newtonian and non-Newtonian fluids; Irradiation- Radiation sources, units, dose levels; Effects of irradiation on protein, fat and vitamin; Packaging and transportation of fish and fishery products - temperature modelling and relationships in fish transportation; transportation containers; Safety and quality and spoilage of fish during transportation; Fishery products and byproducts exported from India; Packaging- aim, purpose and objectives, packaging and transportation of fresh fish, cured fish, canned fish, frozen fish, freeze-dried fish, byproducts and value-added products; Additives- classes of additives, preservatives, antimicrobial additives.

11: Fisheries Microbiology, Quality Management and Certification

Roles of bacteria and moulds in fish preservation; Modification of intrinsic and extrinsic parameters for fish preservation; Spoilage of fresh fish, chilled fish and processed fish products; Micro-organisms in frozen, canned and dried products, and their control; Human pathogenic bacteria, virus, molds and parasites in fish and fishery products; Sources of contamination and control measures; Fish quality evaluation and different indices of quality; Quality management in seafood processing- Concepts of Total quality management, HACCP, practical aspects of planning and implementing HACCP systems; Hazards in sea foods; Risk assessment; National and international standards - ISO 9000 series, ISO 22000. Codex alimentarius, ICMSF; Food Safety and Standards Act of India 2006; Role of BIS and EIA; Traceability issues in international trade.

12: Fisheries Economics and Marketing

Supply, demand and price dynamics in the fisheries sector; domestic and export marketing of fish and fish products, trends, channels, mechanisms, regulations, trade and non-trade barriers, concerns and strategies; modern marketing methods and channels, cold chains, storage; value addition; domestic and international market demands; International regulations and practices affecting Indian fisheries trade; WTO and Indian fisheries scenario; Issues in branding and labelling; Quality concerns; Growth of domestic and exports markets; Market trends and diversification; Emerging consumer preferences and trade practices; Fisheries cooperatives; Institutional support for fisheries development.

13. Information communication technology: Concept and role in fisheries development. Information & communication technology - print and electronic media, video, teleconferencing, computer assisted instructions, touch screen and web technologies.

14. Current Trends and Recent Advancements in the above fields.

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option then that question will not be considered for evaluation. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.



Kamdhenu University, Gandhinagar

Advt. No. 03/2024

Syllabus for the Test for the Recruitment of Library Assistant, Class III

Marks - 200

Medium: English/Gujarati

MCQs-200

1. Foundation of Library and Information science

➤ Information, Knowledge and Society

Information: Meaning, Characteristics, Data, Information, Knowledge, Wisdom; Knowledge Society, Information Transfer Cycle: Generation, Storage and Dissemination of information, Library and Information Science as a Discipline

➤ Libraries- Types and Roles

Historical Development of Libraries, Types of Libraries and Information Centres: Objectives, Features, Functions; Public Relations and Extension Activities, Role of Libraries in Socio-economic, Cultural, Educational, Scientific and Technological Developments, Five Laws of Library Science

➤ Laws Related to Libraries and Information

Library Legislation: Need, Features, Library Legislation in India, The Press and Registration of Books Act; The Delivery of Books and Newspapers (Public Libraries) Act; Copyright Act, Right to Information Act; Intellectual Property Rights; Information Technology Act; Plagiarism

➤ Professional Associations and Organizations

Librarianship as a Profession, Professional Ethics, National and International Professional Associations: ILA, IASLIC, IATLIS, IFLA, ALA, CILIP, ASLIB and SLA, Role of UNESCO, UGC and RRRLF in the promotion and development of libraries. Importance of INFLIBNET and Cybrary

2. Library Management

➤ Principles and Functions of Management Management: Concept, Scope, Schools of Management Thoughts, Principles of Management, Functions of Management

➤ Collection Development and Management

Acquisition of Books and Subscription of Periodicals, Technical Processing, Circulation Methods and Processes, Maintenance: Stock Verification, Shelfrectification, Binding, Preservation

➤ Financial and Human Resource Management Sources of Library Finance Estimation of

library's Financial Requirement, Budgeting, Accounting and Auditing, Cost Effectiveness Analysis and Cost Benefit Analysis, Human Resource Management: Introduction

- Library Committee, Rules, and Reports Library Committee, Library Statistics; Annual Report, Library Rules and Regulations, Library Building and Space Management

3. Information Sources, Systems and Services

- Information Sources Nature, Characteristics, Types and Formats, Documentary and Non-Documentary Sources, Primary, Secondary and Tertiary Sources of Information, Human Sources of Information; Institutional Sources

- Reference Sources and Electronic Information Sources

Reference Sources: Characteristics, Types, Usefulness, Electronic Sources: E-books, E-journals, ETDs, Subject Gateways, Web Portals, Bulletin Boards, Discussion Group/Forum, Multimedia Resources, Databases, Institutional repositories, Evaluation of Reference Sources and Electronic Information Sources

- Reference and Information Services

Reference Service: Concept, Purpose, Types, Theories, Documentation Services: Current Awareness Service (CAS), Selective Dissemination of Information (SDI), Translation Services, Indexing and Abstracting Services, Bibliographical Services, Document Delivery Services, Inter Library Loan (ILL) Service, Online Services: Instant Messaging, RSS Feeds, Podcasts, Vodcasts, Ask a Librarian, Mobile Based Library Services and Tools; Collaborative Services: Social Networks, Social Bookmarking; Community Information Services

- Information Systems and Networks

Information Systems: Characteristics, Functions, National Information Systems and Networks: NISCAIR, NASSDOC, DESIDOC, SENDOC, ENVIS, NICNET, ERNET; National Knowledge Network (NKN), Global Information Systems and Network: MEDLARS, AGRIS, INIS, INSPEC, BIOSIS, ERIC, Patent Information System (PIS), Biotechnology Information System (BIS), Library resources sharing and Consortia

4. Knowledge organization: Classification

- Universe of Knowledge

Universe of Knowledge: Nature, Attributes, Subject: Meaning, Types (Basic, Compound, Complex), Modes of Subject Formation, Universe of Knowledge as Mapped in Different Classification Schemes (DDC, UDC, CC, LCC)

- Library Classification

Concept, Purpose, Functions, Canons and Postulates, Knowledge Classification and Book Classification, Notation: Meaning, Need, Functions, Types, Qualities, Call number



➤ Classification Schemes

Species of Library Classification Schemes, Dewey Decimal Classification (DDC), Colon Classification (CC); Universal Decimal Classification (UDC), Library of Congress Classification (LCC)

➤ Current Trends

Simple Knowledge Organization Systems (SKOS), Automatic Classification, Web Dewey, Taxonomies, Folksonomies

5. Knowledge Organization: cataloguing

➤ Library Catalogue

Introduction to various parts of documents, Library Catalogue: Concept, Objectives, Functions, Physical Forms of Library Catalogue: Conventional and Non-conventional, Types of Catalogue: Dictionary Catalogue, Classified Catalogue, Alphabetic-Classed Catalogue, Alphabetic-Subject Catalogue

➤ Catalogue Codes and Normative Principles

Catalogue Codes: History and Development, Normative Principles, Catalogue Entries according to CCC and AACR, Authority File

➤ Subject and Union Catalogue

Subject Catalogue: Meaning, Purpose, Union Catalogue: Concept, Purpose, Tools and Techniques for Deriving Subject Headings, Selective, Simplified, Cooperative and Centralized Cataloguing

➤ Current Trends in Cataloguing

ISBD, CCF, RDA, FRBR and Bibframe, Metadata: Meaning, Purpose, Types, Uses, MARC 21, DUBLIN CORE, TEI (Text Encoding Initiative), METS, EAD, VRA Core, MODES, Standards for Bibliographic Interchange and Communication: ISO 2709, Z39.50 and Z39.71

6. Basic of information and Communication Technology

➤ Fundamentals of Computers

Concept, Generations, Types, Hardware, Units of Computers: Arithmetic and Logic Unit, Control unit, Input and Output Unit, Memory Unit, Software: System Software - Operating Systems-MS-Windows, UNIX and LINUX; Application Software - MS-Word, MS-Excel and MS-Power point, Introduction to Character Recognition, Programming Languages



➤ Library Automation

Definition, Purpose, Historical Development, Planning and Implementation of Automation in Housekeeping Operations, Retrospective Conversion, Standards for Library Automation, Library Management Software: Proprietary, Free and Open Source Software (FOSS); Evaluation

➤ Telecommunication Technologies

Transmission Channels, Mode, and Media, ISDN, PSDN, Modulation, Frequency, Bandwidth and Multiplexing, Standards and Protocols, Wireless Communication: Media, Wi-fi, Li-fi, Satellite Communication, Mobile Communication

➤ Computer Networks and Library Networks

Computer Networks: Concept, Need, Topologies, Types: LAN, MAN, WAN, Internet: Web Browsers, WWW, E-mail; Search Engines (Meta & Entity); Internet Protocols and Standards: HTTP, SHTTP, FTP, SMTP, TCP/IP, URI, URL; Search Strategies, Data Security and Network Security: Firewalls, Cryptographic Techniques, Anti-virus software, Anti-spyware, Intrusion Detection System, Library Networks: Concept, History, Need, Types (Regional, National, International)

7. Public Library and Information System

➤ Role of Public Library and Information System

Public Library: Definition, Purpose; Development of Public Library System in India, Role of Public Library in Formal and Informal Education, Role of Government and other agencies in the Development of Public Libraries: UNESCO, IFLA, Raja Rammohun Roy Library Foundation and National Mission on Libraries including National Knowledge Commission, Organizational Structure of Public Libraries as depicted in Public Library Acts of States and Union Territories in India

➤ Collection Development and Management

Printed Information Sources: Selection, Acquisition, Evaluation, Electronic Information Sources: Selection, Acquisition, Evaluation, Information Sources for Special Categories of Users: Children, Young Adults, Senior Citizens, Differently Abled People, Organization and Management of Library Collection

➤ Management of Public Library and Information System

Library Governance: Composition, and Functions of Library Authority/Library Committee in Public Library Acts of States and Union Territories in India, Financial Management: Sources of Finance, Financial Provisions in Public Library Acts; Budgeting Methods, Human Resource Management, Resource Sharing and Library Networking

➤ Circulation Service, Reference Service, Readers' Advisory Service, Information



literacy, Extension Services: Author Talk, Book Clubs, Exhibition, Lectures, Outreach Activities: Mobile Library Services, Online Services, Services of Public Library and Information Systems

8. Current Trend and Recent Advancements in Relevant Field.

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option then that question will not be considered for evaluation. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.



Kamdhenu University, Gandhinagar

7

Advt. No. 03/2024

Syllabus for the Test for the recruitment of Laboratory Technician , Class III

Marks - 200

Medium: English

MCQs-200

Basic Haematology

- o Composition of blood and its functions
- o Origin, Development, and morphology of Blood cells
- o Basic concepts of Anaemia, Leukaemia, and hemorrhagic disorder Blood Banking and Immune Haematology
- o Methods of estimation of Haemoglobin
- o Methods of determination of PCV
- o Blood Group- methods of grouping and ungrouping
- o Blood transfusion and hazards

• Clinical Pathology (body fluids) and Parasitological

- o Reception of Patients
- o The Microscope- Types, Parts, Cleaning, and Care
- o Examination of Urine
- o Examination of Body Fluids

• Clinical Biochemistry

- o Definition of Antigen and Antibody
- o Clinical Enzymology
- o Disorders of Carbohydrates
- o Nutritional Disorders
- o Liver function test

• Microbiology

- o Laboratory diagnosis
- o Biosafety measures
- o Examination of stool
- o Quality control

• Immunology

- o Antigens and Antibodies
- o Types of Antigens

• Dairy Microbiology

- Fundamentals of Microbiology,
- Microbiology of Fluid Milk and Milk Products,
- Starter Cultures and Fermented Milk Products,
- Dairy Biotechnology,
- Microbial Quality and Safety Monitoring in Dairy Industry,
- Food and Industrial Microbiology

• Dairy Chemistry

- Organic Chemistry,
- Environmental Studies,
- Chemistry of Milk and Milk Products,
- Physical Chemistry of Milk,
- Human Nutrition and Biochemistry,

- Chemical Quality Assurance,
- Food Chemistry
- **Bio Technology**
- Cell, Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel
- Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultracentrifugation.
- Sterilization, pipetting, Nucleic acid amplification, PCR, Principle, Types, applications, Thermal cycler, RTPCR, reverse transcriptase PCR, Nested PCR

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option then that question will not be considered for evaluation. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.



Kamdhenu University, Gandhinagar



Advt. No. 03/2024

Syllabus for the Test for the Recruitment of
X-RAY TECHNICIAN, Class III

Marks - 200

Medium: English

MCQs-200

Name of Subject	Total Marks	Exam Medium
<ul style="list-style-type: none">• Anatomy, Physiology, Biochemistry• Pathology, Microbiology• Introduction to Radiography• Environmental Science• Generation and Properties of X-Ray• Radiation Physics, Physics of Radiology• Imaging Techniques• Different Radiographic Techniques• Ultrasound Imaging• Doppler and Echography• Radiographic Photography• Computed Tomography• Magnetic Resonance and Imaging• Nuclear Medicine and PET Scan Radio-diagnosis• Interventional in Diagnostic Radiology• Anaesthesia in Diagnostic Radiology• Radiation Hazards and Protection• Fundamentals of computer science• Biostatistics	200	English
Total Marks	200	--

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option then that question will not be considered for evaluation. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.

Kamdhenu University, Gandhinagar

Advt. No. 03/2024

Syllabus for the Test for the Recruitment of Livestock Inspector, Class III

Marks - 200

Medium: English

MCQs-200

Name of Subject	Total Marks	Exam Medium
Questions assessing the requisite knowledge for the job and technical knowledge with regard to the educational qualification.	200	English
Total Marks	200	--

Introductory Livestock Anatomy

- Brief study of bones- Glossary of osteology, Classification and identification of various bones of the body of cow, horse, dog and fowl.
- Structure of Skin and its appendages (Includes Horn, Hoof, Claws and Nails). Introduction of joints and hinges of the body.
- Gross anatomy of digestive system and associated glands in ruminants and non ruminants.
- Gross anatomy of respiratory system in cow, horse, dog and fowl.
- Brief introduction of circulatory system- systemic circulation, pulmonary circulation and foetal circulation.
- Gross anatomy of excretory system in cow, horse, dog and fowl.
- Gross anatomy of male and female reproductive system and accessory sex glands in cow, horse, dog and fowl.
- Structure of udder.

Introductory Animal Physiology

- General Physiology of cell, tissue and muscles.
- General Physiology of body fluids: plasma, serum, blood PH, various types of blood cells, immunity.
- General Physiology of digestive system, prehension, mastication, swallowing, gastric movement, physiology of small and large intestine, digestion in ruminants and non-ruminants and their comparative study, various enzymes used during digestion, absorption of feed ingredients. Digestive glands e.g. salivary glands, gall bladder, pancreas and their functions.
- General Physiology of respiratory system- mechanism of respiration and exchange of gases etc.
- General Physiology of circulatory system of heart, shock (blood volume and pressure) in animals.
- General Physiology of urinary system physiology of kidney and nephron.
- Introduction to nervous and sensory system.
- Introduction to endocrinology.
- General Physiology of female genital system-puberty, oogenesis ovulation, formation of corpus luteum, estrous cycle, hormones of female reproduction system, fertilization, pregnancy and parturition.

- General Physiology of male reproductive system-Erection, ejaculation, hormones of male reproduction system, spermatogenesis, spermatozoa, working of accessory sex glands.
- General Physiology of milk letdown-structure of udder, letdown of milk, milk fat and milk protein,agalactia.

Introductory Animal Management-1

- Common terminologies and definitions used in animal husbandry practices of cows and buffaloes.
- Economic importance of animals, their products and population in Gujarat and India.
- Utility classification of cattle and buffalo.
- Cow and buffalo breeds of Gujarat (Cows: Kankrej, Gir, Dangi & Dagri; Buffalo: Surti, Mehsani, Jaffarabadi & Banni;), their synonyms, native, rearing practices, physical characters, economical characters and breeding. Breed/Herd registration.
- Brief note on exotic and cross breed cattle, their physical, economical characters and their importance in India – Jersey, Holstein Friesian and their crosses.
- Rearing practices of cattle and buffalo.
- Care and management of calf.
- Feeding and breeding management of heifers.
- Care and management of pregnant, dry and milch animals.
- Care and management of bull and bullock.
- Shelter management of dairy cattle and buffaloes.
- Animal husbandry practices followed by professional breeders, farmers, farm labours and city milk producers in India.
- Clean milk production and its importance.
- Maintaining various records of dairy farm.

Introductory Dairy Cattle and Buffalo Management

- Common terminologies and definitions used in animal husbandry practices of cows and buffaloes.
- Economic importance of animals, their products and population in Gujarat and India.
- Utility classification of cattle and buffalo.
- Cow and buffalo breeds of Gujarat (Cows: Kankrej, Gir, Dangi & Dagri; Buffalo: Surti, Mehsani, Jaffarabadi & Banni;), their synonyms, native, rearing practices, physical characters, economical characters and breeding. Breed/Herd registration.
- Brief note on exotic and cross breed cattle, their physical, economical characters and their importance in India – Jersey, Holstein Friesian and their crosses.
- Rearing practices of cattle and buffalo.
- Care and management of calf.
- Feeding and breeding management of heifers.
- Care and management of pregnant, dry and milch animals.
- Care and management of bull and bullock.
- Shelter management of dairy cattle and buffaloes.
- Animal husbandry practices followed by professional breeders, farmers, farm labours and city milk producers in India.
- Clean milk production and its importance.
- Maintaining various records of dairy farm.

English

- Sentence, Subject, Predicate, Phrase and the clause, Parts of speech, Noun (Kinds of Nouns, Gender, Number, Case), Adjective (Comparison of adjectives, Adjectives used as Nouns, Position of the Adjectives and correct use of Adjectives), Articles, Pronouns (Personal Reflexive, Emphatic, Demonstrative, Indefinite, Distributive, Relative and Interrogative), Verb, Active and passive voice, Tenses in detail, Infinitive, Participle, Adverb (Comparison Formation and Position of Adverbs), Preposition, Conjunction, Interjection.

Introduction to Computer application

- Computer: History, definition, types and functions.
- Characteristics of computer.
- Introduction of different Components of Computer system.
- Definition of internet and its uses.
- Basic concepts and differences of Hardware and Software.
- Various types and uses of input and output devices.
- Types of Storage devices.
- Operating system: Introduction, types, functions and uses.
- Basic concepts of Microsoft-Office: MS-Word, MS-PowerPoint and MS-Excel.
- Introduction to anti-virus.
- Applications of computer in animal husbandry

Elementary Statistics

- Basic concepts: Definition, importance, scope, limitations of statistics in Animal sciences.
- Introduction of sample, population, parameter, data, ratio, variation, variable.
- Types and source of data. Types and source of variable.
- Collection of data – Introduction, types, methodology and drafting of questionnaires
- Classification and tabulation: Introduction, Objectives and types.
- Presentation of data (Diagrams and Graphs): Introduction and types.
- Measures of central tendency: Arithmetic mean, weighted mean, geometric mean, harmonic mean, mode and median for raw and grouped data.
- Measures of Dispersion: Range, standard deviation, variance, coefficient of variation and standard error of mean for raw and grouped data.
- Sampling: basic concepts and types. Sampling methods: Random and non random. Sampling vs. complete enumeration.
- Statistical survey: Introduction, Planning and execution.

Introductory Sheep and Goat Management

- Common terminologies and definitions of sheep and goat.
- Economic importance of sheep and goat production in India and Gujarat.
- Utility classification of sheep and goat breeds.
- Important sheep and goat breeds of Gujarat.
- Important exotic sheep and goat breeds being used in breed improvement in India.
- Rearing systems of sheep and goats in India.
- Care and management of lambs and kids.
- Care and management of breeding stock.
- Care and management of pregnant ewe and doe.
- Care and management of sheep and goat before and after parturition.
- Care and management of ram and buck.



- Selection and judging of sheep for mutton and fibres.
- Selection and judging of goat for milk and chevon.
- Sheep and goat housing.
- Shcaring in sheep.
- Routine health care, deworming, vaccination schedule in sheep and goat.
- Factors influencing the quality of wool.

Introductory fodder production and grassland management

- Importance of fodder production in animal nutrition.
- Classification of feeds & fodder.
- Agronomical practices for cultivation of leguminous crops i.e. lucerne, cowpea and cereal crops i.e. maize, sorghum, oats, pearl millet (*Rajkabajari*) and hybrid napier.
- Pasture management, agro forestry and system of grazing.
- Important scarcity fodders. Fodder production through intercropping and backyard cultivation.
- Importance of unconventional feeds and fodder in livestock feeding.
- Preservation of fodder- silage, hay and haylage making.
- Recycling of livestock waste including vermin compost, Bio gas.
- Agencies involved in seeds, fertilizers, animal feeds and pesticides.

Introductory Animal Breeding

- Animal Breeding: Introduction, Definition, Principles & Importance.
- Variation: Importance and Sources.
- Animal Genetic Resources (AnGRs) of Gujarat state: Species, Breeds, conservation and statistics.
- Selection: Introduction and types.
- Response to selection
- Basis of selection: Individual selection, family selection, pedigree selection, progeny testing.
- Methods of selection: individual selection, independent culling level, selection index.
- Economic traits of livestock: Introduction and their improvement.
- Mating Systems: Introduction and types
- Livestock Breeding Policy of Gujarat state.

Introduction to Environmental Sciences

- Scope of Environmental science.
- Environment: introduction, definition and importance.
- Components of environment interactions with organism.
- Indian environment –past and present status.
- Environmental pollution and pollutants. Air, water, food, soil, noise pollution sources.
- Causes of Smoke, acid rain, global warming and ozone hole.
- Impact of different pollutants on humans, plants, organisms and environment.
- Introduction to biological magnification of pollution technological and sociological measures and solutions- Indian and global efforts.
- Voluntary agencies of India working for environment conservation.
- International conferences, conventions and summits- major achievements.
- Environmental policy and legislation in India.

- Introduction to environmental impact assessment.
- Causes of environmental degradation-socio-economic factors.
- Human population growth and lifestyle.
- Biomedical waste management.

Introductory Animal Husbandry Extension-1

Extension concept, principles scope

- Education: Informal, Formal, Non formal
- Need for extension, the concept of extension, levels of extension, the philosophy of extension, objectives of extension, function of extension, extension education process
- Teaching learning process
- principles of extension education

Rural sociology

- Rural sociology: rural-urban society difference

Communication process

- Basic functions of communication, Elements of extension communication system.

Communication methods

- Individual method, Group method and mass method

Adoption and Diffusion of innovation

- Adoption, Innovation, Diffusion, perceived attributes of innovation, adoption process, innovation decision process, over adoption, consequence of innovations, transfer of technology

Programme Planning

- Objectives , need of programme planning
- Principles of Programme planning, Steps in extension programme planning,
- Role of extension agent in programme planning

Introductory Animal husbandry Extension-II

Livestock Entrepreneurship:

- Entrepreneur, concept of entrepreneurship, Characteristics of entrepreneur, Difference between entrepreneur and Manager, Types of entrepreneur
- Types of business organization, Business organizing process,
- Major schemes of state and central govt. in livestock entrepreneurship development
- Various state government institutions involved in entrepreneurship development

Co-operative Society:

- Objectives of Co-operative society, Principles of Cooperation
- Impact of co-operative society in animal husbandry sector
- Operation flood, NDDB

Panchayti raj

Types of farming: small scale farming, Large scale farming, Mixed farming, Co-operative farming, Integrated farming

Introductory Veterinary Microbiology

- Introduction to microbiology (History & Branches).
- Microbiology and structure of bacteria, shape, size and arrangement of bacteria.
- Microbiological variations and classification of bacteria. Source of infections.
- Methods of transmission of infections.
- Sterilization, disinfection, and aseptic handling of sterilization materials.

- Introduction, morphology, growth, nutrition, reproduction and classification of fungi.
- Introduction to general characteristics of virus, basic classification, cultivation and replication of viruses.
- Microbiological feature of important bacterial, viral and fungal disease, its diagnosis in animal and vaccine.

Introductory Veterinary Parasitology

- Introduction of Veterinary Parasitology.
- Parasite and its types.
- Host and its types.
- Classification of parasites.
- Important morphological features, life cycles, clinical signs and symptoms, diagnosis, prevention and control of liver flukes, blood flukes, rumen fluke, lung fluke.
- Important morphological features, life cycles, clinical signs and symptoms, diagnosis, prevention and control of ruminant tape worms, dog tape worms, poultry tape worms, broad fish tapeworm and *Spirometra*.
- Important morphological features, life cycles, clinical signs and symptoms, diagnosis prevention and control of *Ascaris*, *Parascaris*, *Toxocara*, *Toxascaris*, *Ascaridia*, *Heterakis* and *Oxyuris*. *Strongyloides*, *Strongylus*, *Syngamus* and *Oesophagostomum*. Kidney worms hook worms, *Trichostrongylus*, and *Haemonchus*. *Habronema*, *Draschia*, *Thelazia*, *Spirocerca*, and *Gongylonema*. *Dirofilaria*, *Parafilaria*, *Onchocerca*, *Setaria* and *Stephanofilaria*. Lung worms *Trichuris* and *Capillaria*. Acanthocephala.
- Important morphological features, life cycles, vector potentiality and control of biting midges, black flies, mosquitoes, horse fly, house fly, stable fly, flesh fly, warble fly, stomach bot fly, nasal bot fly, bottle flies, sheep ked, lice, fleas, soft ticks, hard ticks, mites.
- Important morphological features, life cycles, clinical signs and symptoms, diagnosis prevention and control of *Trypanosoma*, *Trichomonas*, *Histomonas*, *Giardia* and *Balantidium*, coccidia of poultry and domestic animals, *Babesia*, *Theileria*, *Anaplasma*, *Coccidia* and *Ehrlichia*.

Preliminary Pathology

- Introduction to scope of pathology.
- Common terminologies of pathology: Pathology, health, disease, etiology, predisposing, pathogenesis symptoms or sign, lesion, diagnosis, incubation period, prognosis morbidity, mortality, autopsy, Biopsy, Necrosis, Somatic death, inflammation, fever/pyrexia.
- Study of different causes of diseases.
- Mode of transmission of disease.
- Disturbance of growth: common terminology aplasia, agenesis, hypoplasia, atrophy hypertrophy, metaplasia, dysplasia.
- Wound healing by primary and secondary intention including growth factors.
- Local defence mechanism and resistance to infection.
- Preliminary pathology of common diseases.
- Collection of various samples for laboratory diagnosis, care in preservation and dispatch of sample.

- Procedure to be followed in collection of samples of specimen for laboratory examination.

Introductory Animal Nutrition-I

- History of animal nutrition.
- Nutritional terms and their definitions.
- Common feeds and fodder, their classification with example and availability.
- Unconventional feeds and fodder and their significance in livestock feeding.
- Proximate composition of feeds.
- Importance of nutrients in animal body, their functions, Classification with examples, and requirements in ration (Water, Carbohydrates, Protein, Fat, Vitamins, and Minerals).
- Feed additives, its uses and example. Antibiotics, prebiotics and probiotics in the ration of livestock and poultry.

Introductory Animal Husbandry Economics and Marketing

Economics

- Nature and scope of economics, definition and concepts, divisions of economics, economic systems, approaches to the study of economics.
- Consumption-theory of consumer behaviour, laws of consumption, classification of goods.
- Wants-their characteristics and classification, utility and its measurement.
- Theory of demand, demand schedule and curve market demand. Price, income and cross elasticity.
- Engle's law of family expenditure-consumer's surplus.
- Theory of firm, factors of production- land and its characteristics, classification and capital formation, Laws of return – cost concepts.
- Law of supply – Supply schedule, Supply curve & elasticity

Marketing

- Concepts of marketing, Needs of marketing.
- Marketing elements (Importance of logos, slogans, taglines in marketing).
- Marketing of perishable and non-perishable items.
- Types of market, functions of marketing, Problems of livestock marketing, measures for improvement.

Introductory Animal Nutrition-II

- Importance of scientific feeding, Balanced ration and its characteristics.
- Overviews of feeding standards for ruminants.
- Feeding management of dairy cattle and buffalo during different phase of growth, development and production
- Feeds for different class of poultry.
- Feeding of sick animals.
- BIS specifications for cattle feeds, poultry feeds and mineral mixture.
- Use of NPN compounds for ruminants, its significance and precautions.
- Various physical, chemical and biological methods of feed processing for improving the nutritive value of inferior quality roughages.
- Common anti-nutritional factors of feeds and fodders i.e. cyanide, nitrate and saponin.
- Feeding of livestock during natural calamities.
- Concept of total mixed ration (TMR), Bypass protein, Bypass fat and chelated minerals.

Introductory Pharmacology

- Introduction to Pharmacology: Historical development, branches and scope of Pharmacology.
- Definitions of the terms: Pharmacology, Pharmacy, Chemotherapy, Therapeutics, Toxicology, Posology and metrology etc.
- Nature and sources of drugs; Routes of drug administration; Dosage forms; Pharmaceutical processes; Handling of Hazardous substances.
- Antiseptics and disinfectants; Weights and measures.
- Definition of pharmacological terms related to various systems: digestive system, respiratory system, urinary system, skin and mucous membrane and pain management. analgesics and antipyretics used as oral administration.
- Classification & General principal of chemotherapeutic drugs in animal use.
- Definition Broad therapeutic classification of drugs employed in minor Veterinary Practice- Definitions, examples and therapeutic uses in animals.
- Scope of toxicology, Sources of poisoning, mode of action, its diagnosis and treatment/management of poisons.
- Alternative approaches (Indigenous drugs etc...) used as therapeutic in minor Veterinary practices.

Artificial Insemination in Farm animals.

- Introduction to terminologies pertaining to the animal reproduction.
- Introduction to male and female reproductive organs.
- Puberty and estrus cycle and its patterns in farm animals.
- Artificial insemination: history, advantages and disadvantages.
- Semen collection using AV method and freezing.
- Basic steps of semen evaluation.
- Transportation of semen.
- Recto-vaginal method of Artificial insemination.
- Handling of frozen semen straws.
- Post-Insemination advice and follow-up.
- Precautions of handling of liquid nitrogen.
- LN₂ container: Structure, handling and its maintenance.

Introductory Animal Health Care-I

(A) Etiology, clinical signs, diagnosis and first aid of following diseases:

- Diseases of Digestive System (Stomatitis, Choke, Simple Indigestion, Bloat, Ruminal Acidosis, Enteritis, Colic)
- Diseases of Respiratory System (Epistaxis, Pneumonia)
- Diseases of Urinary System (Nephritis, Urolithiasis, Hematuria, Cystitis)
- Udder/Mammary gland affections (Mastitis, Agalactia, Hemagalactia)
- Metabolic & Deficiency Diseases (Milk fever, Ketosis, Hypomagnaesemic tetany, Vitamin deficiencies, Mineral deficiencies)
- Diseases of the Skin, Eye & Ear (Otitis, Dermatitis, Scabies, Eczema, Conjunctivitis)
- Miscellaneous conditions [Poisoning in animals (HCN, Nitrate, OPs, Urea), Snake bite, Heat stroke]

(B) Etiology, clinical signs, diagnosis, first aid, prevention and control of following infectious diseases:



1. Bacterial diseases: Anthrax, HS, Brucellosis, TB, JD, Actinomycosis, Actinobacillosis, Leptospirosis, Salmonellosis, CCPP, Tetanus, Enterotoxaemia, Colibacillosis
2. Viral diseases: FMD, Pox (Cow pox, Sheep pox, Fowl pox), Rabies, BVD-MD, Ephemeral fever, Ranikhet disease, Marek's disease, Contagious ecthyma
3. Fungal disease: Ring worm, Aflotoxicosis
4. Parasitic diseases:
 - Protozoal diseases (Anaplasmosis, Theiliasis, Babesiosis, Surra)
 - Helminths (Fascioliasis, Amphistomiasis, Ascariasis, Tapeworm)
 - Ectoparasites (Ticks, Fleas, Lice, Mites)

(C) Elementary knowledge about deworming and vaccination of domestic animals and poultry.

Reproduction in Farm Animals.

- Gestation period in farm animals.
- Pregnancy diagnosis in farm animals.
- Parturition stages and care during and after parturition.
- Nursing care of new born calf.
- Introduction to reproductive disease conditions in farm animals i.e. Definition, etiology, common clinical signs and preventive measures:
 - ✓ Silent heat
 - ✓ Anoestrus
 - ✓ Repeat breeding
 - ✓ Endometritis
 - ✓ Pyometra
 - ✓ Metritis
 - ✓ Uterine and vaginal prolapse

Introductory Veterinary Public Health

- Introduction related to veterinary public health.
- Different definition related to veterinary public health.
- Dairy milk hygiene practices on dairy farm and public health.
- Most common microbial flora of milk and milk products.
- Source of bacterial milk contamination and method of control.
- Hygienic milk production: Collection, Processing, Pasteurization and Transport and equipment hygiene.
- Milk hygiene practice in Gujarat in comparison to other part of India.
- Most common milk borne diseases.
- Meat hygiene related terminology.
- Meat hygiene practices. Humane transport of food animals and birds.
- Meat adulteration and its test. Meat borne diseases.
- Definitions of zoonosis. Classification of zoonosis, Role and transmission of local domesticated, wild and cold blooded animals in transmission of zoonotic diseases.
- Study of the important regional specific common zoonotic diseases and its methods of prevention and control.
- Most commonly used terminology related to epidemiology.

Minor Veterinary Surgery

- Introductions, history, classification and development of Veterinary Surgery.



- Objectives of surgery
- General surgical principles Preoperative and post-operative considerations.
- Importance of sutures and suturing materials.
- Asepsis, antisepsis and their applications.
- Basic Surgical instruments and its uses.
- Methods of their sterilization.
- Introduction to Inflammation, abscess, cysts, hemorrhage, burns and scald.
- Introduction to Wound and its primary management
- Introduction to Fracture, its basic classification and Primary Management
- Different kinds of bandages and its application.
- General considerations of anesthesia and preparation of patients.

Introductory Poultry Management (Credit Hours: 2+1=3)

- Economic importance of poultry and development of poultry industry in India.
- Different terms used in poultry science.
- Different breeds and varieties of chicken and ducks.
- Structure of egg, Egg formation – Formation of yolk, albumen and shell.
- Handling, care and management of hatching eggs.
- Different systems of housing of poultry; floor space requirements, construction details of poultry houses.
- Care and management of chicks, pullets and cockerels;
- Care and management of broilers and layers;
- Feeds and feeding of broilers and layers;
- Commercial hatcheries and its role in poultry development;
- Disinfection of incubators, brooders, farm implement and poultry houses;
- Introduction to integrated poultry farming
- Vaccination and deworming in poultry

Farm Practice Training:

- Cattle and buffalo farms
- Sheep and goat farms
- Poultry farm
- Veterinary College/Veterinary Clinical Complex (VCC)/ Livestock Farm Complex (LFC)
- Government dispensary/Co-operative dairy unit /Gaushala
- Seven days Educational tour
- Report Writing

There will be 200 MCQs each of one marks for the correct answer one mark will be awarded and for incorrect answer zero marks will be awarded. If candidate tick more than one option then that question will not be considered for evaluation. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.

Kamdhenu University, Gandhinagar

Advt. No. 03/2024

Syllabus for the Test for the Recruitment of Junior Clerk

APPENDIX-F

Part I : Syllabus for written test

2 Hours

1	History and Culture of Gujarat.	25 Marks
2	Gujarati Grammar.	25 Marks
3	English Grammar.	25 Marks
4	Current Affairs of India and Gujarat, General Science, Aptitude Quantitative	50 Marks
5	Computer Theory in reference to the basic knowledge of computer applications as prescribed in Appendix – G	25 Marks
6	Public Administration and Constitution of India.	50 Marks
Total		200 Marks

Note:

- The examination shall be in O.M.R. (Optical Mark Reader) system / Computer based OMR. Every question shall be of 1 mark. Every attempted question with incorrect answer shall carry a negative mark of 0.25. However, if ticked all the answers are correct (i.e. if more than one tick, all ticked correct) than one mark will be awarded.

Part II : Syllabus for Computer Proficiency Test

1 Hour and 30 Minutes

1.	Gujarati Typing Test 25 words per minute	20 Marks
2.	English Typing Test 40 words per minute	20 Marks
3.	Computer practical test in reference to basic knowledge of computer applications as prescribed in Appendix – G & H	60 Marks
Total		100 Marks

Note:- The speed of typing shall not be less than 5000 key depressions with accuracy per hour.

APPENDIX – G

(See Appendix- F)

(1) Operating System and office Productivity Tools

- Microsoft Windows
- MS Word including Advanced Features
- MS Outlook
- File and Folder Management
- Internet Familiarity, Usages and E-mail
- Understanding Wide Area Network, Wireless LAN and connecting LAN to WAN.
- Information on Internet explorer usages and various options/ settings available
- Overview & usages of PDF
- Microsoft Office

(2) Microsoft Office Indic (Gujarati)

- Introduction about MS Office Indic
- Introduction about Desktop, Mouse, Keyboard, etc.
- How to start Word? Methods of starting Word
- How to change Language English to Gujarati
- Introduction about the Gujarati keyboards
- Introduction about the Gujarati IME. Difference between Remington and Transliteration K/B.
- How to operate the K/B. What is Transliteration K/B.
- How to type different Characters and Words from transliteration K/B.
- How to use IME help? How to use spelling grammars check in Gujarati?
- What is smart Tag? What is thesaurus?

- (XI) How to change the menu from English to Gujarati
 (XII) Convert the ASCII font to Unicode from TBIL converter.

(3) Troubleshooting, Installation and Best practices

- (I) Understanding Storage devices
 (II) How to use a DVD/CD-ROM and floppy
 (III) Burning DVD/CD
 (IV) Taking data on and from a flash drive, pen drive
 (V) Using data and resources from a Local Area Network
 (VI) Using FTP for uploading and downloading of Data from the Internet
 (VII) Information on Scanner and Scanner Software usage/ configuration

(4) Installations:

- (I) Installing basic software's like MS Office, etc.
 (II) CD Burning Software (Nero etc.)
 (III) Installing or adding printers
 (IV) Installing or adding Fonts
 (V) Installing sound drivers
 (VI) Installing drivers for any new hardware
 (VII) Installing new software and removing them using the control panel

(5) Best Practices.

- (I) General Security concepts (Covering orientation on the criticality of the password protection, guidelines on forming new passwords, guidelines on protection, of the assigned accounts
 (II) Disk Cleanup
 (III) Regular updating of anti-virus software
 (IV) Scandisk
 (V) Backups in detail including the following:
 a) Backup through Application
 b) Backup through Utilities and Tools
 c) Record Retention

(6) Troubleshooting:

- (I) Troubleshooting Tools
 (II) Troubleshooting Viruses
 (III) Troubleshooting Fundamentals
 (IV) Problems that keep a computer from starting
 (V) Troubleshooting OS, Network
 (VI) Problems after a Computer Boots

APPENDIX – H

(See Appendix – F)

Practical Test

(i)	Preparing a tender notice in word file	30 Marks
(ii)	Preparing a slide for presentation based on data provided	10 Marks
(iii)	Preparing an excel spreadsheet and answering an arithmetic problem	10 Marks
(iv)	Error check and spelling correction in given word document and other functions. - Comment remove - Spelling check - Bold – Remove (Rewriting of paragraph), etc.,	10 Marks

(ક) જુનિયર ક્લાર્કની જગ્યા માટેની ભાગ-૧ની સ્પર્ધાત્મક લેખિત પરીક્ષા (એપેન્ડીક્ષ-F મુજબ)

(સમય:૧૨૦ મીનીટ, કુલ ગુણ - ૨૦૦)

નં.	વિષય	ગુણ
૧	ગુજરાતનો ઇતિહાસ અને સંસ્કૃતિ	૨૫
૨	ગુજરાતી વ્યાકરણ	૨૫
૩	અંગ્રેજી વ્યાકરણ	૨૫
૪	ભારત અને ગુજરાતના વર્તમાન બનાવો, સામાન્ય જ્ઞાન, ઓપ્ટીટયુડ ક્વોન્ટિટેટીવ	૫૦
૫	કોમ્પ્યુટરના ઉપયોગની પાયાની જાણકારીના સંદર્ભમાં કોમ્પ્યુટર થીયરી, એપેન્ડીક્ષ-૬ મુજબ	૨૫
૬	જાહેર વહીવટ અને ભારતનું સંવિધાન	૫૦
	કુલ ગુણ	૨૦૦

નોંધ:-

૧) પરીક્ષા Multiple Choice Question (MCQ) અને Optical Mark Reader (OMR) પદ્ધતિની રહેશે.

૨) દરેક પ્રશ્ન ૦૧(એક) ગુણનો રહેશે.

૩) ખોટા જવાબ દીઠ ૦.૨૫ ગુણ કમી કરવામાં આવશે (નેગેટીવ માર્કીંગ લાગુ પડશે).

૪) લેખિત પરીક્ષા (ભાગ-૧)માં ૪૦% કે તેથી વધુ ગુણ મેળવનાર ઉમેદવારોને મેરીટના ધોરણે જાહેરાતમાં દર્શાવેલ જગ્યા મુજબ જગ્યાના ત્રણ ગણા ઉમેદવારોને કોમ્પ્યુટર પ્રોફીશીયન્સી (કોમ્પ્યુટર કાર્યક્ષમતા) કસોટી માટે બોલાવવામાં આવશે.

૫) ઉપર ક્રમ -૫ (પાંચ) પર દર્શાવેલ કોમ્પ્યુટરના ઉપયોગી પાયાની જાણકારીના સંદર્ભમાં કોમ્પ્યુટર થીયરી અંગેનો અભ્યાસક્રમ જાહેરાતના અંતે સામાન્ય વહીવટ વિભાગના Notification No.GS/2015/2/BRT/102015/315/K Dated : 04/01/2016 પ્રમાણે રહેશે (એપેન્ડીક્ષ-૬).

(ખ) જૂનિયર કલાર્કની જગ્યા માટેની ભાગ - ૨ ની કોમ્પ્યુટર પ્રોફીશીયન્સી(કોમ્પ્યુટર કાર્યક્ષમતા) કસોટી

(સમય-૯૦ મિનીટ, કુલ ગુણ-૧૦૦)

૧	ગુજરાતી ટાઇપીંગ કસોટી ૨૫ શબ્દ / મિનીટ	૨૦ ગુણ
૨	અંગ્રેજી ટાઇપીંગ કસોટી ૪૦ શબ્દ / મિનીટ	૨૦ ગુણ
૩	કોમ્પ્યુટરના ઉપયોગની પાયાની જાણકારીના સંદર્ભમાં કોમ્પ્યુટર પ્રેક્ટીકલ કસોટી, એપેન્ડીક્ષ-૬ અને H મુજબ	૬૦ ગુણ
	કુલ	૧૦૦ ગુણ

નોંધ:- ઉપર ખ(૩)માં દર્શાવેલ કોમ્પ્યુટરના ઉપયોગની પાયાની જાણકારીના સંદર્ભમાં કોમ્પ્યુટર પ્રાયોગિક કસોટી અંગેનો અભ્યાસ જાહેરાતના અંતે જોડેલ Appendix-H મુજબનો રહેશે.

	(૧) કોમ્પ્યુટર પ્રોફીશીયન્સી (કોમ્પ્યુટર કાર્યક્ષમતા) કસોટીમાં ૪૦% કે તેથી વધુ ગુણ મેળવનાર ઉમેદવારોનો જ સંયુક્ત મેરીટ (ભાગ-૧ તથા ભાગ-૨) યાદીમાં સમાવેશ કરવામાં આવશે.
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