SYLLABUS
JUNIOR MANAGER (QUALITY ASSURANCE)
KERALA STATE CIVIL SUPPLIES CORPORATION LIMITED

(Cat.No:346/2021)

PART I:

Module I : CROPS, SOIL AND WATER (5 Marks)

- Agronomy - scope, seeds and sowing, tillage and tilth, crop density and geometry. Growth and development of crops, factors affecting growth and development, crop rotation - its principles, adaptation and distribution of crops.
- Crop nutrition- manures and fertilizers, nutrient use efficiency– soil and climatic requirements – area and production – varieties – seed rate spacing – methods of sowing/planting – manurial schedule, cultural practices and yield of major field crops of Kerala, viz, rice, tapioca, sugarcane, pulses and sesamum.- origin, geographic distribution, economic importance, botany and growth phases, varieties, harvesting, processing, conversion ratios (ratio between harvested and economic produce)
- Cropping systems – terminology – plant interactions in multiple cropping systems – criteria for assessing yield advantage –Major cropping systems of Kerala – (rice based – coconut based – cassava based – homestead farming) – organic farming – precision farming – Integrated farming system – sustainable agriculture – LEIA – HEIA – LEISA – sustainable technologies for crop production.
- Water management of principal crops, critical stages of crops, depth and schedule of irrigation – rice, wheat, banana, coconut, cowpea, sugarcane and vegetables .Soil moisture constants-Evapo-transpiration, potential evapo-transpiration and consumptive use, Reference crop evapo-transpiration (ETo)- Crop co-efficient (Kc)- K_c values for different crops. Main empirical methods of calculation of ETo- Effective rainfall, Water requirement of crops- Scheduling irrigation– Methods of irrigation-.Surface , subsurface, overhead and micro irrigations. Irrigation efficiency- Water productivity and water use efficiency- Agricultural drainage-causes of water logging and types of drainage.
- Weeds – harmful effects, classification of weeds, crop weed association – crop associated weeds, crop bound weeds and season bound weeds – critical period of crop weed competition – aquatic weeds and parasitic weeds
- Soil – definition; different kinds of rocks; soil physical/-chemical- biological properties - soils of India and Kerala; soil organic matter – composition and properties; soil organisms; soil taxonomy and its characteristics.Soil colloids – properties – nature - types and significance. Layer silicate clays - their genesis and sources of charges. Adsorption of ions - ion exchange - CEC and AEC - Concept of pH - soil acidity - Soil organic matter – composition – decomposability – humus - fractionation of organic matter. Carbon cycle - Characteristics, problems and management/reclamation; Salt affected soils-Arid soils -Acid soils- submerged soils-Eroded soils-Acid sulphate soils-Degraded soils-special problem soils
- Agroclimatic and agroecological classification of India and Kerala
- Organic Farming, natural farming, conventional farming, sustainable agriculture - Current status of organic farming -Initiatives in India and Kerala- National Programme for Organic Production (NPOP)

- Operational structure of NPOP-Accreditation agencies- Certification Agencies
- National Standards for Organic Products (NSOP)-inspection and certification procedures, labeling and marketing
- Marketing and export potential of organic produce
- Geo-informatics- GIS and Remote sensing concepts application in agriculture-Global positioning system (GPS),components and its functions. Nanotechnology- definition, concepts and techniques, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors

Module II: SEED TECHNOLOGY (6 Marks)

- Seed and seed technology: introduction, definition, its importance in increasing agricultural production. Difference between seed and grain and concept of seed quality. Deterioration causes of crop varieties and their control. Maintenance of genetic purity during seed production. Genetic and agronomic principles of seed production.
- Seed quality; Definition, Characters of good quality seed.
- Seed certification, field inspection- Different classes of seeds; Breeder seed, Foundation seed, Certified seed, Registered seed, Hybrid seed, Improved seed, Composite seed, etc. Foundation and certified seed production of rice and vegetables (varieties & hybrids)
- Foundation and certified seed production of important cereals (Rice, wheat and maize), pulses (Cowpea, mung, urd, pigeonpea, field bean and soyabean), oilseeds (Sesame, coconut, sunflower, groundnut), fodder (Guinea grass, napier grass and lucern), and vegetables (Bhindi, tomato, brinjal, chillies and cucurbitaceous vegetables).
- Seed Act and Seed Act enforcement- Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories. Seeds Control Order 1983 and Seed Bill 2004, IPR- Intellectual Property Rights
- Seed dormancy, internal and external factors affecting dormancy in seeds. Seed drying. Seed processing and their steps. Seed treatment, its importance, methods of application. Seed packing. Seed sampling and testing. Seed storage: general principles, stages and factors affecting seed longevity during storage.
- Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies. Participatory seed production and seed village concept
- Duties and powers of seed inspectors, offences and penalties; Seed Control Order 1983, Seed Act 2000 and other issues related to seed quality regulation.
- Establishing a seed testing laboratory; Seed testing procedures for quality assessment
- Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment, Cleaning and grading - methods and equipments; cleaners and separators, colour sorter, Drying - principles, classificationconduction, convection and radiation driers, moisture contents, theory of grain drying;
- Seed packing and seed storage, factors affecting seed longevity during storage and conditions required for good storage,
- General principles of seed storage, measures for pest and disease control, temperature control, Seed marketing, marketing structure, marketing organization; Factors affecting seed marketing.
- Drying Constant and falling rate of drying, efficiency of drying; Types of dryers-mechanical dryers - working principles; Material handling equipment; conveyer and elevators, working and selection; Effect of temperature, Relative humidity and gas

composition on storage, Storage structures - traditional modified and controlled atmosphere structures

- Storage, grain storage, types of storage structures- traditional, improved and modern storage structures.
- Physical analysis of Field and Horticultural crops
- Moisture tests of Field and Horticultural crops
- IPR- definition, concepts and components; IPR policies and issues in Indian scenario
- Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights
- GM crops

Module III : PLANT PROTECTION (6 Marks)

- Distribution, bio ecology, nature and symptoms of damage and management strategies of major insect pests of Field crops: rice, wheat, maize, sorghum, ragi, sugarcane, cotton and oil seeds – groundnut, sesamum, castor, sunflower and mustard, pulses. Vegetable crops: solanaceous ,cruciferous , leafy vegetables polyhouse vegetables; tuber crops , fruit crops, plantation crops, ornamentals, medicinal and aromatic plants and stored products pests, IPM
- Major nematode parasites and management in cereals (rice), millets (sorghum, and maize), pulses (redgram, blackgram, greengram and cowpea),oilseeds (castor and gingelly), vegetables (tomato, brinjal, bhindi, chilli potato, beet root and carrot), fruits (banana, citrus, grapevine and papaya), spices and plantation crops (turmeric, pepper, betelvine and coconut), Polyhouse vegetables, Tuber crops (coleus, diascorea, sweet potato).
- Principles and methods of plant disease management- symptoms, etiology, disease cycle and management of diseases of rice, wheat, sugarcane, groundnut, pulses, vegetables, tubers, citrus, mango, banana, grapevine, pineapple, papaya, guava, sapota, cashew, apple, coconut, arecanut, cocoa, black pepper, ginger, cardamom, tree spices, oil palm, betelvine, coffee, tea, rubber and ornamentals.Methods of control: IDM
- Post harvest pest and disease management – fruits and vegetables
- Pests of stored products- introduction, causes of storage losses
- Coleopteran and lepidopteran pests of stored products
- Management of stored product pests – preventive and curative methods
- Rodent management - principles and methods of control-physical, biological and mechanical methods.
- Rodenticides - acute poisons, chronic poisons, fumigants. Fumigation, baits, baiting and rat proofing

Module IV : POST HARVEST MANAGEMENT (6 Marks)

- Indian fruit and vegetable processing industry- Importance, problems & prospects- Physiology of maturity, ripening and senescence in fruits and vegetables and their chemical composition, -
- Post harvest losses - Pre and postharvest factors causing loss and spoilage- Post harvest management 68 techniques
- Pre-cooling- grading and sorting- other operations- washing-sanitization- heat treatments-waxing- curing etc. Storage systems and storage disorders- Packaging technologyGovernment policies, regulations and specifications
- Marketing systems- Export promotion agenciesPrinciples and methods of preservation-drying and dehydration - Thermal processing- Preservation by ionizing radiations, chemical methods and fermentation- Recent advances in food preservation techniques-

- Post harvest technology of coconut, Arecanut, Oil palm, Rubber, Tea, Coffee, Cocoa & cashew, pepper, cardamom, ginger, turmeric, chilies, Tree spices, essential oil yielding crops and cut flowers- Industrial waste utilization **.**
- Fruits and Vegetable Processing: Thermal processing, steps in canning of different fruits, and vegetables; Dehydration and dehydrated products. Solar drying. Intermediate moisture foods.Technology Squash, Crush, Syrup, Jam, Jelly, Marmalade, pickles, chutneys and sauces. Beverages, tea, cocoa and coffee processing.
- Physiology of maturity, ripening and senescence in cereals, pulses, fruits and vegetables, spices and condiments, tea, coffee, cashew, sugarcane.
- Maturity indices and harvesting of vegetables for vegetable purpose and seed purpose.
- Post harvest losses, phases of loss and measures to reduce the losses, post harvest handling, respiration and storage preservation and preservatives used in fruits and vegetables
- Winnowing- working principle, Cleaning- principles & properties, effectiveness of cleaning,
- Different cleaners and separators- length separator, cyclone separator, specific gravity separator, colour sorter, separators based on surface texture, working principles,
- Drying, principles, classification- conduction, convection and radiation driers, moisture contents, theory of grain drying.
- Drying- Constant and falling rate of drying, efficiency of drying.
- Types of dryers- mechanical dryers, batch, continuous, mixing and non mixing dryers- working principles.
- Fruits and vegetables- cleaning and grading, methods of grading, equipment for grading of fruits and vegetables.
- Storage of fruits and vegetables- Effect of temperature, Relative humidity and gas composition, traditional storages, Modified and Controlled atmosphere storage structures.
- Size reduction- Principles and equipment for size reduction.

Module V: AGRICULTURAL MARKETING (5 Marks)

- Agricultural Marketing – concepts and definitions – scope – subject matter
- Market and Marketing-meaning-definition-elements of a market
- Classification of market-based on commodity, location, volume of business, time, competition
- Agricultural Marketing-approaches-functional (Exchange function, physical marketing function, facilitating functions)-institutional (agencies, channels)-commodity
- Producer's surplus-meaning-types-marketable and marketed surplus importance- factors affecting
- Marketing efficiency-meaning-definition-estimation of marketing costs/margins for farm commodities-measures to improve marketing efficiency and tools for risk management-co-operative marketing futures trading-contract farming
- International trade-Domestic Vs International trade-theories of international trade-theory of absolute advantage
- Globalization and Liberalization-WTO-AOA (market access, domestic support, export subsidies)
- Agricultural price policy in India-objectives-role of CACP in agricultural price policy-Administered prices (support price, procurement price, levy price, statutory minimum price, issue price)

Module VI: FOOD CHEMISTRY AND MICROBIOLOGY (6 marks)

Food Chemistry: CARBOHYDRATES- Definition, classification, Sources, properties and functions. Disaccharides, Trisaccharides and polysaccharides. LIPIDS- Definition, classification, Sources and functions. Chemistry, Occurrence, Composition and properties . PROTEINS- Definition, classification, Sources and functions. Chemistry of amino acids and proteins. Major food proteins and their sources. Determination of proteins. ENZYMES- Definition, classification and Chemical nature. PIGMENTS AND FLAVOURS- Definition, classification, Sources and functions. Occurrence, chemistry, and changes during processing. VITAMINS- Definition, classification, Sources and functions,. MINERALS- Definition, classification, Sources and functions.

Food Microbiology: Historical Development, Morphology and General cytology of Microorganism, Physiology and Reproduction of Microorganisms, Growth and destruction and control of microorganisms, Food borne illness. Microorganisms in Atmosphere, Food Products and their control. Recent advances in food microbial technology .

Module VII: FOOD PROCESSING AND PRESERVATION (6 marks)

Food processing industries/institutions/food scientists of importance in India. Food attributes viz. colour, texture, flavour, nutritive value and consumer preferences. Causes of food spoilage, sources of microbial contamination of foods, food borne illnesses, water activity and its relation to spoilage of foods. Spoilage of processed products and their detection. Principles and methods of food preservation. Methods of food preservation such as heat processing, pasteurization, canning, dehydration, freezing, freeze drying, fermentation, and chemical additives. Refrigerated and modified atmosphere storage. Aseptic processing, hurdle technology. Use of non-thermal food processing technologies

Module VIII: TECHNOLOGY OF PLANT AND ANIMAL FOODS (5 Marks)

Technology of Milk and Milk Products: Dairy plant operations-pasteurization, standardization, homogenization, sterilization, storage, transport and distribution Technology of cream, butter, ghee, cheese, condensed milk, evaporated milk, whole and skimmed milk powder, ice-cream, butter khoa, and paneer.

Technology of Meat / Fish / Poultry Products: Chemistry and microscopic structure of meat tissue. Ante-mortem inspection. Slaughter and dressing of various animals and poultry . Post mortem examination. Rigor mortis. Factors affecting meat quality. Curing, smoking, freezing,canning and dehydration of meat, poultry and their products. Structure and composition of egg and factors effecting quality. Preservation of eggs. Quality indices of fish.

Food grain Processing: Structure, composition of different grains like wheat, rice, barley, oat, maize and millets. Anti-nutritional factors in food grains and oilseeds. Milling of grains. Technology of Breads, Biscuits, cakes, doughnuts, buns, pasta goods, extruded, confectionary products, breakfast and snack foods. Rheology of wheat and rice flour. Oilseeds: edible oilseeds, composition and oilseed processing. Protein concentrates, isolates and their use in high protein foods.

Module IX: FOOD ANALYSIS AND QUALITY ASSURANCE (5 marks)

- Theory and principles of pH meter, EC meter, Colorimeter, spectrophotometer, chromatographic techniques, polarimeter, AAS, flame photometer and flourimeter.

- Quality- Definition, Quality attributes-physical, chemical, nutritional, microbial and sensory. Objectives, importance and functions of quality control. Quality systems and tools used for quality assurance.

- Principles and practices of food plant sanitation. Food and hygiene regulations. Environment and waste management. Food adulteration, food safety. Sensory evaluation, panel screening, selection methods. Total quality management in food industry. Quality assurance ,Quality control, Quality evaluation and Quality audits. ISO 9000, 22000 . Food safety and HACCP principles. GMP, GHP, SSOP and SOP. ISO standards for Quality control labs. Food Safety and Standards Act 2006 International & national food laws and regulations. Food quality measurements- destructive and non destructive methods- principles.; HACCP, GAP, GMP, and quality standards.

PART II

MODULE-1 FOOD MICROBIOLOGY (Total 5 Marks)

- **Unit 1-Spoilage of food and food Borne Diseases (5 Marks)**

- Food borne pathogens and their control. Spoilage organisms in food and food products. Types of organisms in meat and meat products, sea foods, fruits and vegetables ,milk and dairy products.Microbial infection and intoxication.Food intoxication- Staphylococcal intoxication, botulism.Food infection- *Salmonellosis, Clostridium perfringens, Bacillus cereus* gastroenteritis*, E. coli* infection and others

MODULE-2 FOOD SAFETY & QUALITY ASSURANCE (Total 20 Marks)

Unit -2 HACCP (10Marks)

- Microbial quality control: determination of microorganisms in foods by cultural, microscopic, physical, chemical methods. Statistical quality control in food industry. History of HACCP, seven principles of HACCP,HACCP –Manuel ,preparation, validation, implementation- internal audit, verification audit, deficiencies, corrective and preventive actions, Implementation of HACCP.

Unit-3 . Quality Control & Standard Tests for Quality Assessment. (10Marks)

- Definition, Statistical Quality Control: Definition, How to determine the need for SQC and the Control chart – definition, uses, process control. Standard tests for quality assessment, Microanalytical tests, Microbiological tests, Histological tests, Standard test methods.

MODULE-3-FOOD SAFETY AND ALLIED LAWS (Total 25 MARKS)

Unit 4.General principles for food safety and hygiene (5 Marks)

- Principles of food safety and quality - Food Safety System - Quality attributes - Total Quality
- Management. Good Hygienic Practices, Good Manufacturing Practices - Risk Analysis, Risk
- Management, Risk Assessment, Risk Communication - Traceability and authentication.

Unit 5. General principles for food safety regulation at national/regional level (5 Marks)

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- The Structure of Food Law, Food Regulation, Laws and Regulations to Prevent Adulteration and Cross Contamination, Microbial Contamination, Hygienic Practice, Chemical and Environmental Contamination, Food Additives, Labeling, Food Laws and Regulations at the International Level for Harmonization.

Unit 6. National standards (10 Marks)

- Food Safety and Standard Authority of India regulations - Agricultural and Processed food Export Development Authority - Marine Product Export Development Authority - Export Inspection council and Export Inspection Agency. International food standards., Trends in Food Standardization,

Unit-7 . International bodies dealing in standardization (5 Marks)

- International Standardization Organization (ISO), Joint FAO/WHO Food Standards Program. Codex Alimentarius Commission (CAC), Other International Organizations.
- Active in Food Standard Harmonization. Advantages of Utilizing International Standards.
- Rapid Alert system.

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