



**NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT**  
**SYLLABUS FOR THE WRITTEN EXAMINATION FOR THE POST OF**  
**ASSISTANT MANAGERS IN GRADE 'A'**  
**FOOD PROCESSING**

(The syllabus is illustrative and not exhaustive. The syllabus should not be considered as the only source of information while preparing for the examination. Keeping in view the nature of examination, all matters falling within the realm of the subject concerned will have to be studied by the candidate as questions can be asked on all relevant matters under the subject. Candidates appearing for the examination should also prepare themselves for answering questions that may be asked on the current/latest developments/Acts taking place under the subject(s) although those topics may not have been specifically included in the syllabus.)

**General :**

- Agriculture and Livestock, milk production in India, National bodies concerned with trade and export of processed foods in the country, special value addition in food processing, food regulations, specifications, process economics and management, Food & Agro Industries as a means of employment generation, problems of food processing in India.
- Food Chemistry, Food Microbiology, Nutrition
- Proximate composition of foods, chemistry of carbohydrates, proteins and fats, chemistry of food constituents vis-à-vis physical properties of foods, changes in food constituents during processing.
- Moisture and minerals in foods, acid soluble and insoluble ash and their significance.
- Vitamins in foods, role of vitamins, vitamin deficiency diseases.

**Energy Value of Foods, Energy Requirement :**

- Protein quality, protein malnutrition, infant nutrition and infant foods, nutritive value of foods in relation to processing, enzymes and their application in foods.
- Recommended daily allowance of calories, proteins, vitamins, growth kinetics of micro-organisms, identification of micro-organisms.
- Factors influencing the destruction of micro-organisms.
- Micro-organisms in natural products and their control, sources and preventions of contamination.
- Microbiology of atmosphere, water, milk, cereals and cereal products, meat and meat products, fish and fish products, canned foods.
- Food poisoning, food borne infections.

## **Infestation Control and Pesticides :**

Commodity storage, insect, pests and their effects, infestation detection, moulds / their role, rodents / vertebrate pests, pesticides classification / chemistry / formulation, appliances, insect growth regulators, bio-pesticides, fumigants, infestation control and preventive measures, sanitation, ballooning techniques, irradiation, pesticides and health hazards, safety devices, organic foods.

## **General Principles of Food Preservation :**

- Preservation of foods by application of heat, canning, bottling, etc.
- Preservation of food by removal of moisture, water activity and its significance.
- Intermediate moisture foods, prevention of food by refrigeration and freezing.
- Sugar and salt as preserving agents.
- Use of chemicals in food preservation.
- Use of micro-organisms in food preservation.
- Irradiation and microwave heating of food products.

## **Unit Operations :**

- Fluid flow, heat transfer, evaporation, application of evaporation in food industry, types of evaporators, distillation – Routh's Law, Harry's Law, classification of distillation, batch distillation, steam distillation, vacuum distillation and their application in food industries, drying, theory of drying, free moisture, critical moisture content, equilibrium moisture content, heat transfer in drying, types of driers and their respective applications in food industries.
- Material operations, material handling, mixing, kneading, blending, homogenization, separation methods, filtration, centrifugation, size reduction and classification, slicing, dicing, crushing, grinding, classification of equipment and application. Crystallization.

## **Technology of Animal Products :**

- Livestock and poultry population in India
- Meat and poultry industry in India in relation to Nation's economy.
- Types of slaughter, modern abattoir, estimation of animals, meat grading.
- Factors influencing the quality of fresh meat and cured meat.
- Preservation of meat, refrigeration and freezing, thermal processing, dehydration and use of chemicals.
- Meat curing and packaging.
- By-products of meat industry, egg and egg products.
- Fisheries resources of the world.
- Cold storage and freezing preservation, canning of fish and fish products, drying and dehydration of fish.
- Smoking, curing and pickling of fish, fish oils, fish meal.
- By-products of fish processing, fish processing plant sanitation.

## **Dairy Technology :**

### **Factors Affecting Composition of Milk :**

- Composition of milk from various species, production, processing, distribution and storage of liquid milk.
- Technology of evaporated milk, condensed milk, technology of non-fat milk solids, full fat milk powder and instantised milk powder.
- Technology of cheese.
- Fermented milk products, milk plant sanitation, [pasteurization and sterilization.

## **Technology of Food Grains and Legumes :**

### **Wheat Production, Varieties and their Qualities :**

- Milling of wheat, technology of bread, biscuits, crackers, cakes, dough rheology.
- Rice production, varieties and their qualities.
- Cooking quality of rice and methods of studying the same, methods of part boiling, economics of part boiling.
- Cooking quality of new and old rice.
- Rice milling operations, milling machinery, degree of milling.
- By-products of rice milling and their utilisation.
- Processing oil seeds, extraction of oil from oil seeds.
- Refining and bleaching of oils, hydrogenation of oil.
- Legume – production, types of legumes, chemical aspects and quality of legumes, processing, secondary processing of products, utilization of minor pulses.

### **Technology of Fruits and Vegetables :**

- Containers and other packaging materials used in fruit and vegetable preservation. Canning and bottling of fruit and vegetables, quality of raw materials for processing. Fruit syrups, squashes, cordials and nectars, jam, jellies and marmalades, pickles and chutneys.
- Carbonated beverages.
- Vinegar and tomato products.
- Storage and handling of fruits and vegetables.
- By-products from fruits and vegetables.
- Aseptic processing and packaging, processing of mushrooms.

### **Plantation Products and Flavour Technology :**

- Refining and processing of spices, packing of spices, value added products from spices.
- Carbonated beverages.
- Production, processing, grading and marketing of tea, curing, roasting, brewing of coffee, instant coffee – manufacture / production, processing, grading and marketing of cocoa.

- Food plant organization, factors in plant location, plant layout, industrial costing, testing marketing of new product.

**Flavours** – Production, processing, chemical composition, properties, special attributes, flavouring components, extraction, evaluation, quality control and standards, formation of flavours in foods, technology, isolation and identification of flavouring materials, synthetic flavouring agents and problems thereof, flavour evaluation, standards / specifications.

**Packaging Technology** – Evolution, functions, relevance, design, protective packaging, shelf life, permeability, kinetics, various types of packing materials, vacuum / gas / shrink / stretch / industrial packaging, sealing, pouches, packaging standards / regulations / laws / specifications, quality control, packaging and ecosystem.