Examination Schedule and the Syllabus for the 3rd Food Analyst Examination

I. **Schedule of the Examination:**

1. Theory: One Day

Paper	Sub part	Subject	Marks	Number of Multiple Choice Questions
Paper- I	A	Food Laws and Standards in India,	40	40
	B	Planning Organization and set up of Food Analyst Laboratory, NABL/ISO/IEC-17025:2005	10	10
	C	Principles of food preservation, Processing and Packaging, labeling/claims and principles of nutrition.	25	25
	D	Food Hygiene, Sanitation, CODEX. (SPS/TBT) International Food Control Systems. WHO/FAO, HACCP, Quality Control Tools, GLP,GHP.GMP.	25	25
	Total		**100**	**100**
Paper-II	A	Food Chemistry	30	30
	B	Food Additives, Antioxidants& Contaminants	20	20
	C	Instrumental methods of analysis	20	20
	D	Food Microbiology	30	30
	Total		**100**	**100**
	• **Each Multiple choice question (MCQ) will carry one mark for each correct answer.** • **There will be negative marking for incorrect answers. 0.25 marks will be deducted for each incorrect answer** • **Total duration for each paper will be of 2Hours.** • **Qualifying marks for theory examination will be 35% in each theory paper(Paper-I and Paper-II) separately with minimum aggregate of 40% in both papers. Results of the Theory papers would be declared on the same day evening.** • **Candidates who will qualify the Paper-I and Paper-II (Theory Papers) will only be allowed to appear in Paper-III (Practical & Viva-voce).**			

2. Schedule of Practical examination: Two days (10.00 AM to 5.00 PM)

(Candidates who will score minimum 35% in each theory paper (Paper-I and Paper-II) separately with minimum aggregate of 40% and above in both theory papers will only qualify for appearing in Paper-III i.e. Practical and Viva -Voce).

Duration of Practical including viva- voce		**Two days**	
	Particular	**Weightage (%)**	**Marks**
Paper -III	Method of Analysis	30	60
	Practical Proficiency	60	120
	viva- voce	10	20
	Total	**100**	**200**
Aggregate passing marks for Paper –III examination will be 50%.			

FOOD ANALYST EXAMINATION -2016

THEORY PAPERS

PAPER- I: Food Laws and Standards in India, Planning Organization and set up of Food Analyst Laboratory Including NABL/ISO/IEC-17025:2005 Accreditation

A. Food Laws and Standards in India*:

a. Food Safety and Standards (FSS) Act, 2006, FSS Rules and Regulations,
b. Agricultural Produce Act, 1937 (Grading and Marketing)
c. Export (Quality Control & Inspection), Act, 1963 and Rules
d. Bureau of Indian Standards relevant to food safety
e. Legal Metrology Act
f. International Food Control Systems/ Laws, Regulations and Standards/ Guidelines with regard to Food Safety: CODEX (SPS/TBT),OIE,IPPC.

*80% weightage may be given to (a.) and 20% to other (b to f)while framing the questions.

B. Planning Organization and set up of Food Analyst Laboratory including NABL/ ISO/IEC-17025:2005

C. Principles of Food Preservation, Processing and Packaging, Labeling/Claims and Principles of Nutrition

a. Food preservation and processing their principles, methodology and technology.
b. Principles of Packaging and various Food Packaging materials: rigid and flexible such as plastic films, metal containers, glass containers, paper and card board containers, jute containers, etc.
c. Basic principles of nutrition and role of various nutrients in human metabolism; Essential amino acids and fatty acids, Protein Efficiency Ratio (PER), Nutrition deficiency diseases.
d. Labelling requirements as per Food Safety Standards (Packaging and Labelling) Regulations,2011

D. Food Hygiene and Sanitation, HACCP, Quality Control Tools, GLP, GHP, GMP, FSMS

PAPER – II: Food Chemistry, Food Microbiology, Food Additives & Contaminants and instrumentation in food analysis

(A) Food Chemistry and Food Additives, Contaminants and Adulterants:

Food Chemistry

a. Knowledge of Basic chemistry of major food components- Water, Carbohydrates, Protein and Fats; definition, composition, structure, functional properties, their behaviour under conditions of particular relevance to food processing.
b. Chemistry of Macronutrients and Micronutrients (Majorly Vitamins and Minerals); Food Pigments, Food flavors, Enzymes, Enzymatic and non-enzymatic browning; Water soluble and Fat soluble vitamins, Role of minerals in nutrition, Anti-nutrients
c. Standards of Quality and Safety of Food & Food Products laid down in the FSS Regulations, 2011 including current food safety issues like Antibiotic residues in Honey, Milk, Fish, Meat and Poultry products.
d. Nutraceuticals, Functional Foods, Food Supplements, Dietary Supplements, Genetically Modified Foods.

Food Additives, Antioxidants, Contaminants and Adulterants:

a. **Analytical Chemistry**: Statistical Analysis, Standard Deviation, Sampling Procedures, General Description on " Sampling of Foods", Calibration and Standardization, Sub- Sampling and its procedures, LOD, LOQ, Internal standards, Quality Assurance, Setting-up of Food Laboratory, Reference standards, Certified Reference Materials etc.
    i. Theory of common test: pH Meter, Digital Analyzer, Auto-Analyzer etc
    ii. Food composition and proximate analysis of foods

b. **Food additives**: Chemistry, role and application of Preservatives, Emulsifying and Stabilizing agents, buffering agents, bleaching, maturing agents and starch modifiers, Food colors, flavors, anti-caking agent, Antioxidants etc.

c. **Food contaminants**: Their occurrence, composition, physiological, significance in foods, Limit of Detection and Limit of Quantification and detection.

    i. Metals and toxic Metals e.g. Cd, Hg etc.
    ii. Pesticide residues e.g. Dioxin, Aldrin, Malathion etc.
    iii. Mycotoxins, Argemone, Khesari dal, Ergot, Karnal bunt, Dhatura, etc
    iv. Allergens, Antibiotic & hormone residues, Veterinary drug residue, other new contaminants and toxins (For example: Cyclopiazonic acid in Buckwheat flour)
    v. Naturally Occurring Toxic Substances (NOTS) and Deoxynivalenol (DON)

(B) Food Microbiology and instrumentation in food analysis:

Instrumentation in food analysis

I. Instrumentation and methods of analysis of food products.

   a. Chromatography, including GLC, TLC, Paper & Column, LC-MS-MS, GC-MS-MS, HPLC, AAS, ICP-MS
   b. UV-Vis Spectrophotometer, IR-Spectrophotometer and Fluorescence Spectrophotometer

II. Atomic Absorption spectroscopy for determination of heavy metal contaminants in foods such as Lead, Cadmium, Mercury, Arsenic, Zinc, Copper, Tin, etc.

(C) Food Microbiology

a. Food Microbiology, food spoilage organism and their control, microbiology of dairy products, Fruits and Vegetables and their processed Products ,Meat and Meat products, fish and fish products, egg and egg products, spices & condiments, food borne intoxicants and infection.

b. Microbial Contaminants (For example: Bacteria, Yeasts and Molds) their composition, physiological, significance in foods and detection their of.

PRACTICAL EXAM WITH VIVA-VOCE

Paper-III: PRACTICAL

1. Physical, Chemical, Microbiological (including microscopic examination as required) examination of the food and food products as described under FSS Regulation, 2011.

2. Proximate analysis of food.

3. Detection and estimation of various contaminants in foods.

4. Any other type of food analysis as required under FSS Act, 2006 and FSS Regulation, 2011.

5. Theory of Practical's/Instrumentations:

    i. Quantifications of Melamine Analysis, Herbicides, pesticides and Synthetic Color.
    ii. Antibiotic, Antibacterial drug residues in Food.
    iii. Specialized Veterinary Samples received from Ante-mortem and Post- mortem inspection
    iv. Gel Electrophoresis, ELISA, PCR, RT-PCR, r-PCR, Antibiotic and Hormone residues, Melamine, GM food analysis method.
    v. Fatty acid profile, PUFA, MUFA, Cholesterol

- **Indicative list of Analysis**

i. Analysis of Artificial sweeteners e.g. Aspartame in diet drinks and light foodstuffs.

ii. Aflatoxins and Mycotoxins contamination in Food

iii. Quantification of preservatives like SO_2, Benzoic acid, Synthetic colors in foods.

iv. Melamine in milk and milk products

v. Principles and detailed method of Pesticides Analysis (Organochlorine and Nitrogen, Sulhpur containing) compounds Sub ppb level in Food stuffs including Fruits and Vegetables.

vi. Samples received (Referral/Appellate samples) from Designated Officer under Section 40 (C) of FSS Act, 2006.

- **Indicative list of instruments required**

1. HPLC High Performance with UV-Vis Detector
2. HPLC with UV-VIS and Fluorescence Detector – Amino Acid for system and for Protein Analysis.
3. HPLC with Evaporating Light Scattering Detector (ELSD) - For Sugar Analysis
4. LC-QQQ MS/MS (Triple Quadrupole Detector)
   (1 for Pesticide, 1 for Aflatoxins and 1 for Antibiotics)
5. LC-QToF- Quadrupole Time of Flight) 1 No. for Non –Target Pesticide Analysis.
6. Ion Chromatograph
7. PCR &RTPCR – Real Time Polymerase Reaction system –for GM food and Pathogen Detection
8. GCMS –QQQ (MS/MS) Gas Chromatograph Triple Quad system- Pesticide Analyzer
9. GCMS – QQQ (MS/MS) Gas Chromatograph Triple Quad System – for Dioxins, Polycyclic aromatic hydrocarbons (PAH) and polychlorinated biphenyls (PCB) analysis
10. GC- QToF system for Non Target Compounds Analysis
11. GCMS Single Quad with ECD and FPD Detector
12. GC with FID, ECD, NPD Detector
13. DNA Sequencer
14. Bio-analyzer- DNA/RNA/Protein Analysis
15. Colony Counter
16. Fourier Transform Infrared spectroscopy (FTIR)
17. Graphite Furnace Atomic Absorption (GFAA) spectrophotometer
18. LC-ICP-MS (liquid chromatography-Inductively Coupled Plasma -Mass Spectrometry)
19. UV-Vis Spectrophotometer
20. Kjeldahl Digester system
21. Gel Electrophoresis system
22. Flow Cytometer
23. Imaging System- Microscope
24. Nuclear Magnetic Resonance (NMR)system

25. Microbiological ELISA
26. Micro Wave Digesters
27. Rotary Evaporator
28. Balances
29. pH meter
30. Hot Plate
31. Centrifuges
32. Oven
33. Refrigerator
34. Deep Freezer
35. Water Bath, etc.

Suggested Readings:

- Handbook of analysis and quality control for fruit and vegetable products. By S. Rangana
- Preservatives of Fruits and Vegetables by G.L. Tandon, G.S. Siddappa, Girdhari Lal
- Food Science, Chemistry and Experimental Foods by M.S. Swaminathan
- Essentials of Food and Nutrition by M.S. Swaminathan
- Food Microbiology, By Frazier
- Handbook of Food Toxicology and Toxins, By J.P. Felix D'Mello
- Food Contaminants: Mycotoxins and Food Allergens by Gordon S. Shephard
- Basic food microbiology, George J.Banwart
- Food Processing: Principles and Applications, By J. Scott Smith, Y.H. Hui
- Food Science by P Norman, N. Potter, Joseph H. Hotchkiss
- Fennema's Food Chemistry, By Damodaran, S, Parkin, K.L., and Fennema, O.R. (2008) 4th Edition, CRC Press
- Food Chemistry by Belitz, H-D., Grosch, W. &Schieberle,p.
- Principles of Food Chemistry, By DeMan, J.M (1999) 3rd Ed. Aspen Publishers