

**SAURASHTRA UNIVERSITY**  
**RAJKOT**



**FACULTY OF HOME SCIENCE**  
**HOME SCIENCE (FOOD & NUTRITION)**

**Ph.D. Entrance Test— 2022**

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# **RESEARCH METHODOLOGY**

Unit I: Research- Meaning, purpose and approaches

- Exploration, Description, Explanation
- Scientific method and research
- Research Designs –Experimental and Observational
- Quantitative and Qualitative approaches
- Conceptualization and Measurement Variables, concepts and measurement
- Levels of measurement
- Units of analysis

Unit II: Sampling & Tools

- Role of sampling in research
  - Types of sampling
  - Research Tools and Techniques Validity and reliability
  - Interviewing and observational methods
- Unit III: The Research Process
- Defining the problem, research questions, objectives, hypotheses
  - Review of related literature and originality in writing
  - Planning the research
  - Subjects context and ethics
  - Methodology and tools
  - Citation formats: in medical sciences, social sciences

Unit IV: Types of Research Tools (Qualitative and Quantitative)

Quantitative research tools

- Qualitative research tools
- Focus Group Discussion
- Case studies
- Observations-Direct, Spot observations
- Body mapping
- Pile sorting
- Free listing
- Narrations
- In depth interview
- Drawing as dialogue

Unit V: Representation of Data

- Graphical and Diagrammatic Presentation of Data (Bar diagrams, Pie-diagram, Histogram, Frequency Polygon, Smoothed frequency curve and Ogives)
- Tabulation and Classification
- Frequency Distribution

Unit VI: Ethics and Politics of Research

- Identify, define, and analyze ethical issues in the context of human subject research.
- Reasons for conducting ethical review of research, theories and concepts related to ethical decision-making including consequentialism, deontology, respect, dignity, discourse ethics, communitarianism, liberalism and the four principles approach.
- Ethical importance of consent, privacy and confidentiality in research
- Issues of academic fraud and plagiarism, conflicts of interest, authorship and publication

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**SUBJECT: HOME SCIENCE  
(FOOD & NUTRITION)**

## ADVANCED NUTRITIONAL BIOCHEMISTRY

1. **Heteropolysaccharides:** Definition, classification, structure and properties of glycoprotein and proteoglycans.
2. **Plasma Proteins** – Nature, properties and functions
3. **Overview of regulation of intermediary metabolism:** Equilibrium and nonequilibrium reactions, committed steps, allosteric modifications, covalent modulation, cross-over theorem and futile cycles.
4. **Intermediary metabolism:** Reactions, standard free energy changes and regulation.
  - Carbohydrates – glycolysis, gluconeogenesis, citric acid cycle, hexose monophosphate pathway.
  - Lipids, beta-oxidation, de novo synthesis of fatty acids, synthesis and breakdown of unsaturated fatty acids, cholesterol, phospholipids and triacylglycerol
5. **Purines and Pyrimidines** – Synthesis and breakdown.
6. **Nucleic acids** – DNA replication and transcription, DNA repair systems, DNA recombinant Genetic mutation, regulation of gene expression and protein biosynthesis.
7. **Hormones** – Mechanism of action of hormones.

## METHODS OF INVESTIGATION

1. **Introduction to method of analysis:** volumetric analysis, standard substance and solutions, calibration of glassware, standardization of solutions with examples.
2. **Electrolytic dissociation:** Acids, bases, salts, buffers, Henderson – Hasselbach equation. Theory of indicators and principles of measurement of pH
3. **Basics of Instrumentation:** Physico-chemical principles and methodology:  
colorimetry, photometry, fluorimetry, flame photometry and atomic absorptiometry.
4. **Chromatography:** Principles and application in paper (circular, ascending and descending), ion-exchange, column, thin layer, gas liquid and high-performance liquid chromatographic techniques.
5. **Electrophoresis:** Principle and applications in paper and gel electrophoresis.
6. **NMR and its application.**
7. **Immunological Methods:** RIA, ELISA.

## CLINICAL AND THERAPEUTIC NUTRITION

1. Obtaining medical & dietary history of patients.

2. Nutritional support – Techniques and Feeding substrates – tube feeding, Intra venous feeding.
3. Etiopathophysiology, metabolic and clinical aberrations, complications, prevention and recent advances in the medical nutritional management of :
  - Weight imbalances
  - Cardio vascular disorders
  - Diabetes mellitus and other metabolic disorders.
  - GI Tract Disorders
  - Liver and gall bladder, Pancreatic disorders
  - Renal disorders
  - Stress and trauma
  - Cancer
  - Infection AIDS
  - Respiratory problems

□

## **MATERNAL & CHILD NUTRITION**

### 1. Importance of Maternal Nutrition:

- Importance of nutrition prior to and during pregnancy.
- Pre-requisites for successful outcome. Effect of undernutrition on mother and child including pregnancy outcome and Maternal and Child Health – Short term and Long term.
- Physiology and endocrinology of pregnancy and embryonic and fetal growth and development.
- Nutritional requirements during pregnancy
- Adolescent Pregnancy
- Pregnancy and AIDS
- Pregnancy and TB
- Intra-Uterine growth retardation
- Complications of pregnancy and management and importance of antenatal care.
- Congenital malformation, fetal alcohol syndrome and gestational diabetes mellitus.

### 2. Lactation:

- Development of mammary tissue and role of hormones
- Physiology and endocrinology of lactation – Synthesis of milk components, let down reflex, role of hormones, lactational amenorrhea, and effect of breast feeding of maternal health.
- Human milk composition and factors affecting breastfeeding and fertility
- Management of lactation – Prenatal breastfeeding skill education. Rooming in, problems – sore nipples, engorged breast, inverted nipples etc. □ Exclusive breastfeeding

### 3. Growth and development during infancy, childhood.

## ADVANCED NUTRITION-I

1. **Energy:** Energy content of foods. Physiological fuel level-review. Measurement of Energy Expenditure: BMR, RMR, thermic effect of feeding and physical activity, methods of measurement. Estimating energy requirements of individuals and groups. Regulation of energy metabolism: Control of food intake, digestion, absorption and body weight.
2. **Carbohydrates:** Types, classification, digestion, and transport – review, dietary fibre, fructo-oligosaccharides, resistant starch – chemical composition and physiological effects Glycemic index of foods. Sweeteners – nutritive and nonnutritive.
3. **Proteins:** Classification, digestion, absorption and transport – review. Metabolism of proteins: Role of muscle, liver and gastro intestinal tract. Protein quality, methods of evaluating protein quality. Protein and amino acid requirements. Therapeutic applications of specific amino acids: Branched chain, glutamine, arginine, homocysteine, cysteine, taurine.
4. **Lipids:** Classification, digestion, absorption, transport – review. Functions of EFA Role of n-3, n-6 fatty acids in health and disease Requirements of total fat and fatty acids. Trans fatty acids. Prostaglandins.

## FOOD SCIENCE AND TECNOLOGY

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1. **Constituents of Foods: Properties and significance**
2. **Water and Food Dispersions:**
  - Free and bound water
  - Water activity and Food Spoilage**
    - Freezing and ice structure
    - Colloidal salts, stabilization of colloidal systems, Rheology of food dispersions
  - Emulsions: Formation, stability, surfactants and emulsifiers.  Foams: Structure, formation and stabilization.
3. **Polysaccharides, Sugars and Sweeteners**
  - Starch: Structure, gelatinization, methods for following gelatinization changes.
  - Characteristics of some food starches. Effects of ingredients and conditions on gelatinization. Modified food starches.
  - Cellulose, hemicelluloses, pectins, gums.
  - Sugars and Sweeteners: Sugars, syrups, sugar alcohols, potent sweeteners, Sugar products.
  - Sweetener Chemistry related to usage in food products: solubility & crystallization, hygroscopic, fermentation & non-enzymatic browning.
4. **Fats: Functional properties of fat and uses in food preparations. Fat deterioration and antioxidants.**



5. **Enzymes:** Nature of enzymes, stability and action. Proteolytic enzymes, oxidases, lipases, enzymes decomposing carbohydrates and applications.
6. **Beverages:** Synthetic and Natural, alcoholic and non-alcoholic, carbonated and noncarbonated, coffee, tea, cocoa, malted drinks.
7. **Leavened Products:** Leavening agents. Biologically leavened and chemically leavened products. Batters and dough.
8. **Food colorants:** Pigments in animal and plant tissues, Food colours – Types, properties, safety issues
9. **Chemical, physical and nutritional alterations occurring in foods during processing and storage**
10. **Introduction to pre and primary food processing**
11. **Methods of food processing**
12. **Product development and evaluation**

## **Institutional Food Administration**

### **Introduction to Food Service Systems**

- Evolution of the Food service industry
- Characteristics of the various types of food service units

### **2. Approaches to Management**

- Theories of Management

### **3. Management of Resources      Finance**

- Determining the finance needed to establish or run an unit
- Budgets
- Sources of finance
- Planning adequate cash flow

### **Space & Equipment**

- Step in Planning layouts
- Determining equipment
- Maintenance of equipment
- Layout analysis

### **Material**

- Menu planning
- Purchase
- Storage
- Quantity food production
- Service and modes of delivery

### **Staff**

- Manpower planning
- Recruitment, induction, training, motivation and performance appraisal

### **Time and Energy**

- Measures of utilization and conservation

### **4. Cost Accounting / Analysis**

- Food cost analysis

## 5. Marketing and Sales Management

- Marketing strategies
- Sales analysis
- Market Promotion

## 6. Quality Assurance

- Food quality
- Total quality management

## ADVANCED FOOD MICROBIOLOGY

1. Introduction to historical developments in food preservation. Spoilage, infections and legislation.
2. Micro-organisms of importance in Food: Their primary sources in foods, Morphology, cultural characteristics.  
- Factors affecting the growth of microorganisms in food. Intrinsic and Extrinsic parameters that affect microbial growth
3. **Spoilage of different groups of Foods** : Meat, eggs and poultry, fish and other sea foods, canned food.
4. **Food Preservation**: Physical methods – Drying, freeze, drying, , Cold Storage, heat treatment, Irradiation, High pressure processing Chemical Preservatives and natural antimicrobial compounds probiotic bacteria.
5. **Food borne disease**: Bacterial, food-borne important, Mycotoxins.
6. Role of Microbes in fermented foods.

## Advanced Human Physiology

1. **Cell structure and function**: Levels of cellular organization and function organelles, tissues, organs and systems. Brief review: Cell membrane transport across cell, membrane and intercellular communication.
2. **Nervous System**: Review of structure and function of neuron - conduction of nerve impulse, synapses, and role of neurotransmitters - Organization of central and Peripheral nervous system.
3. **Heart and Circulations**-Location and Pericardial Membranes, Chambers—Vessels and Valves, Coronary Vessels, Cardiac Cycle and Heart Sounds, Cardiac Conduction Pathway, Heart Rate, Cardiac Output, Regulation of Heart Rate, , Arteries, Veins, Capillaries, Pathways of Circulation, Velocity of Blood Flow, Blood Pressure, Regulation of Blood Pressure, Aging and the Heart and Vascular System,
4. **Excretory system**: Structure and function of nephron - Urine formation - Role of kidney in maintaining pH of blood - diuretics
5. **Immune system**: Cell mediated and humeral Immunity: Activation of WBC and production of antibodies. Role in inflammation and defense.

## FOOD PROCESSING AND TECHNOLOGY

1. **Physical principles in food processing operations:**  
Thermal processing: Degree of processing of preservation, selecting heat, treatments, heat resistance of micro organisms, nature of heat transfer, protective effects of food constituents, types of thermal treatments.
2. **Rice Technology** - Production, processing, milling of rice, parboiling, processes, by products of rice milling and their utilization. Nutrient loss during processing.
3. **Wheat Technology** - Production, processing, manufacture of breakfast cereals
4. **Pulses** - Production, types of processing of different pulse products - Soyabean Processing.
5. **Technology of oil seeds** - Processing, meal concentrates and isolates.
6. **Mushroom** - Production, processing, utilization.
7. **Meat** - Production, processing, smoking and curing of meat, grading.
8. **Poultry** - Production, preparing poultry for consumption, packaging.
9. **Fish** - Production, effect of handling practices, storage of eggs.
10. **Waste disposal and sanitation:** Waste characteristics, treatments and technologies, food plant sanitation.

## ADVANCED NUTRITION – II

1. Water Regulation of intra and extra cellular volume. Osmolality, water balance and its regulation.
2. Minerals: (Note: For each nutrient sources, bioavailability, metabolism, function, requirements. RDI/ESADDI, deficiency and toxicity, interactions with other nutrients are to be discussed).  
*Macro minerals:* calcium, phosphorus, magnesium, sodium, potassium & chloride.  
*Micro minerals:* Iron, copper, zinc, manganese, iodine, fluoride.  
*Trace minerals:* Selenium, cobalt, chromium, vanadium, silicon, boron, nickel.
3. Vitamins; Historical background, structure, food sources, absorption and transport, metabolism, biochemical function, assessment of status. Interactions with other nutrients Physiological, pharmacological and therapeutic effects, toxicity and deficiency with respect to the following:
  - a) Fat soluble: Vitamins A, D, E & K.
  - b) Water soluble: Thiamine, riboflavin, niacin, biotin, pyridoxine, folic acid, pantothenic acid, ascorbic acid, cyanocobalamin, choline, inositol.
4. Non-nutritive food components with potential health effects: Polyphenols, tannins, phytate, phytoestrogens, cyanogenic compounds, lectins and saponins.
5. Nutritional regulation of gene expression.
6. Nutrition management in special conditions: space travel, high altitudes, low temperatures, submarines.

## FOOD SAFETY AND QUALITY CONTROL

1. Introduction to quality assurance and food safety assurance. Current concepts of quality control.

2. Quality assurance programme : Quality plan, documentation of records, process control and HACCP, hygiene and housekeeping, corrective action, quality and programme and total quality process.
3. Product Evaluation :
  - Sampling for product evaluation and line control. □ Specification and Food standards, International, National □ Mandatory, Voluntary.
  - Sample preparations
  - Reporting results and reliability of analysis.
4. Test for specific raw food ingredients and processed Food including additives:
  - a. Nutrient analysis
  - b. Tests of adulterants
5. Consumer Protection

### **ASSESSMENT OF NUTRITIONAL STATUS**

1. Nutritional assessment as a tool for improving the quality of life of various segments of the population including hospitalized patients.
2. Current methodologies of assessment of nutritional status, their interpretation and comparative applications of the following:
  - Food consumption , Anthropometry
  - Clinical and Laboratory, Rapid Assessment & PRA
  - Functional indicators such as grip strength, respiratory fitness, Harvard Step test, squatting test.
3. Nutritional Surveillance – Basic concepts, uses and setting up of surveillance systems.
4. Monitoring and Evaluation