

**B.Sc.(Hons) FNS Sem.-7 Examination****FNS-412****Advance in Micronutrients****December-2025****Time : 2.30 Hours]****[Max.Marks : 70**

**Instructions:** Illustrate your answers with neat diagrams wherever necessary.

**Q. 1 Write the following**

- (i) Discuss in brief: public health programs focussing on micronutrient deficiencies in India. (7 Marks)
- (ii) What are the future directions in micronutrient research? Explain its application. (7 Marks)

**OR**

- (i) What is food fortification? Explain strategies for micronutrient fortification in foods with examples. (7 Marks)
- (ii) Write a short note about case studies on successful micronutrient interventions. (7 Marks)

**Q. 2 Write the following**

- (i) Explain the health implications of ensuring high bioavailability and efficacy of essential minerals in the human diet. In your response, discuss how deficiencies in iron, calcium and iodine contribute to specific health conditions such as iron deficiency anaemia, osteoporosis, and thyroid dysfunction. Additionally, evaluate the broader role of mineral sufficiency in supporting metabolic performance, immune function, and overall well-being. (7 Marks)
- (ii) Analyse the interplay between dietary inhibitors (such as phytates, oxalates or polyphenols) and enhancers (such as ascorbic acid, certain amino acids or fermentation products) on mineral bioavailability in whole foods. Propose practical dietary strategies or food-processing techniques that can maximize mineral uptake without compromising overall nutrient balance. (7 Marks)

**OR**

- (i) Analyze how host physiology and life stage factors-gastric acidity, digestive enzyme activity, gut health, age, pregnancy status, and chronic gastrointestinal disorders-influence mineral bioavailability. Explain the mechanism by which each (7 Marks)

factor alters absorption efficiency and discuss implications for targeted supplementation or dietary advice.

- (ii) Discuss the various forms of food fortification used to combat micronutrient deficiencies in populations. In your answer, explain the mechanisms, target groups, and implementation strategies of forms of different food fortification. Highlight the advantages and limitations of each approach in terms of scalability, sustainability, and public health impact. (7 Marks)

**Q. 3 Write the following**

- (i) Describe how micronutrient imbalances contribute to the progression of neurodegenerative disorder like Alzheimer's and Parkinson's disease and the role of any 3 micronutrient for the regulation of these disorders. (7 Marks)
- (ii) Obesity is described as a disorder associated with paradoxical micronutrient deficiencies. Explain this paradox by detailing the roles and common deficiencies of Vitamin D, Iron, and Zinc in individuals with obesity, including antagonistic relationship between Sodium and Potassium in regulating hypertension (7 Marks)

**OR**

- (i) Discuss the specific roles of vitamin A, C, D, and E in regulating both the innate and adaptive immune systems. Provide at least one key function for each vitamin that demonstrates its importance for a robust immune response. (7 Marks)
- (ii) Explain the interconnected roles of Calcium, Vitamin D, and Vitamin K in maintaining bone formation and homeostasis, and discuss how imbalances in Phosphorous and Potassium intake can negatively impact skeletal health. (7 Marks)

**Q. 4 Write the following**

- (i) Provide an overview of the classification of vitamins. (7 Marks)
- (ii) Discuss recent advances in understanding the functions of vitamins. (7 Marks)

**OR**

- (i) Write about recent studies on vitamin deficiencies and toxicity. (7 Marks)

- (ii) Write a short note on innovations in vitamin supplementation and fortification. (7 Marks)

**Q 5. Attempt any seven out of twelve** (14 Marks)

- (i) Which major mineral is a key component of ATP and nucleic acids.  
(1) Calcium (2) Magnesium (3) Phosphorous (4) Sulfur
- (ii) A deficiency of which trace mineral can lead to impaired taste and smell perception.  
(1) Selenium (2) Zinc (3) Iron (4) Copper
- (iii) Give full forms of (a) LML (b) MTL
- (iv) Give full forms of (a) ICDS (b) TPDS
- (v) What is targeted fortification? Give example for the same.
- (vi) Define with example: voluntary fortification.
- (vii) What are two benefits of food fortification?
- (viii) Why is high-dose supplementation of Vitamin C specifically risky for patients with chronic kidney disease?
- (ix) How Vitamin C enhances the bioavailability of non-heme iron in the stomach?
- (x) Fluoride's primary role in the body involves: Immune function.  
(1) True (2) False
- (xi) Name one innovative technology used to enhance the stability or bioavailability of vitamins in fortified foods.
- (xii) Why is folic acid supplementation especially critical for women in the early stages of pregnancy?

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