FAQs

1. **Explain the content of Iron in Human body and the forms present in.**
   Ans: The human body contains ~2-4g iron, or ~38mg iron/kg body weight (BW) for women and ~50mg iron/kg BW for men. Iron exists in a complex form in our body. It is present as
   i.Iron porphyrin compounds-hemoglobin (65%) in RBC, myoglobin (10%) in muscle.
   ii.Enzymes (1-5%)–peroxidases, succinase dehydrogenase and cytochrome oxidase.
   iii.Transport and storage forms (20%): transferrin and ferritin.
   The total amount of iron found in a person not only is related to BW but also is influenced by other physiological conditions, including age, gender, pregnancy, and state of growth.

2. Discuss the functions of iron.
Ans: The chief functions of iron in the body are :
1.Iron forms a part of the protein–haemoglobin which carries oxygen to different parts of the body.
2.It forms a part of the myoglobin in muscles which makes oxygen available for muscle contraction.
3.Iron is necessary for the utilization of energy as part of the cells metabolic machinery.
4.As part of enzymes iron catalyzes many important reactions in the body. Examples are
i.Conversion of β-carotene to active form of Vitamin-A
ii.Synthesis of carnitine, purines, collagen
iii.Detoxification of drugs in the liver

3. What are the Deficiency disorders of Iron? Who are at risk of Iron deficiency?
Ans: Iron deficiency occurs most often due to inadequate iron intake. Iron intake is frequently inadequate in four population groups:
Infants and young children (6 months to about 4 years), because of the low iron content of milk and other preferred foods, rapid growth rate, and insufficient body reserves of iron to meet needs beyond about 6 months
adolescents in their early growth spurt, because of rapid growth and the needs of expanding red blood cell mass
females during childbearing years, because of menstrual iron losses
pregnant women, because of their expanding blood volume, the demands of fetus and placenta, and blood losses to be incurred in childbirth
In addition, many nonpregnant females during childbearing years fall short of the RDA for iron because of restricted energy intake and inadequate consumption of iron-rich foods. Figure depicts the gradual depletion of iron content in the body and demonstrates the fact that anemia does not occur until iron depletion is severe. Iron deficiency can occur without anemia. Dietary iron deficiency leads to nutritional anaemia.

Figure 1: Sequential changes in iron status associated with iron depletion

4. Define Nutritional Anemia and its manifestations.

Ans: Nutritional anaemia is defined as the condition that results from the inability of the erythropoetic tissue to maintain a normal haemoglobin concentration. Anaemia occurs when the haemoglobin level falls below 12gm/dl in adult man and woman. During pregnancy haemoglobin level below 11gm/dl is termed anaemia. The major cause of anemia in India is because of Iron and folic acid deficiency.

Nutritional anemia is manifested as:

1.Reduced Haemoglobin level

2.Defects in the structure, function of the epithelial tissues

3.Paleness of skin and the inside of the lower eyelid is pale pink

4.Finger nails becoming thin and flat and eventually (spoon shaped nails) koilonychia develops.

5.Progressive untreated anaemia results in cardiovascular and respiratory changes leading to cardiac failure. The general symptoms include lassitude, fatigue, breathlessness on exertion, palpitations, dizziness, sleeplessness, dimmness of vision, and increased susceptibility to infection.

Symptoms of iron deficiency, mostly demonstrated in children, include pallor, listlessness, behavioral disturbances, impaired performance in some cognitive tasks, some irreversible impairment of learning ability, and short attention span.

5. What happens when Iron is excess in body?

Ans: Accidental iron overload has been observed in young children following excessive ingestion of iron pills or vitamin/mineral pills. Other people susceptible to iron overload have a genetic disorder known as hemochromatosis. In most people with hemochromatosis iron absorption generally continues, despite high iron stores. The absorbed iron is progressively deposited within joints and tissues, especially the liver, heart, and pancreas, causing extensive organ damage and ultimately organ failure.

6. Discuss Zinc under the following headings.

a.Distribution in Human body

b.Functions

Ans: a. Distribution of Zinc in Human body: The human body contains ~1.5-2.5g of zinc. Zinc is found in all organs and tissues and in body fluids. Largest stores of Zinc is present in the bones. Zinc forms a constituent of the blood. Zinc is an important element performing a range of function in the body as it is a cofactor for a number of enzymes.

b. Functions: Zinc functions in association with more than 300different enzymes. It participates in reactions involving either synthesis/degradation of major metabolites-carbohydrates, lipids, proteins-and nucleic acids. It plays important structural role in brain cells. Zinc is involved in the stabilization of protein and nucleic acid structure as well as in transport processes, immune function and expression of genetic information. It plays a major role in the synthesis of DNA and

proteins, and a constituent of the hormone insulin. Zinc appears in the crystalline structure of bone, in bone enzymes. It is thought to be needed for adequate osteoblastic activity, formation of bone enzymes such as alkaline phosphatase and calcification.

7. Discuss Zinc under the following headings.
a.Deficiency
b.Excess

Ans: a. Deficiency: Some population groups, especially the elderly and vegetarians, have been found to consume less than adequate amounts of zinc. Conditions associated with an increased need for intake include alcoholism, chronic illness, stress, trauma, surgery and malabsorption. Signs and symptoms of zinc deficiency are growth retardation, skeletal abnormalities, defective collagen synthesis or cross-linking, poor wound healing, dermatitis, delayed sexual maturation in children, hypogeusia (blunting of sense of taste), alopecia (hair loss), impaired immune function and impaired protein synthesis.
b. Excess: Excessive intake of zinc can cause toxicity. An acute toxicity with 1-2g zinc sulfate (225–450mg zinc) can produce a metallic taste, nausea, vomiting, epigastric pain, abdominal cramps and bloody diarrhea.

8. What is Wilson's disease?
Ans: Wilson's disease, a genetic disorder characterized by copper toxicity, results from mutation(s) in the gene coding. In Wilson's disease, copper accumulates in organs, resulting in disturbed function of organs, especially the liver, kidneys, and brain. Kayser-Fleischer (greenish gold) rings caused by copper deposition also are visible in the cornea.

9. Explain Fluoride under the following headings
a.Functions
b.Deficiency
c.Excess
Ans: Fluoride is found in natural element in nearly all drinking water and soil and in the human body in trace amounts. Fluoride is not considered an essential nutrient, but it is clearly recognized as important for the health of bones and teeth.
a. Functions: Fluoride is essential for tooth enamel. Fluoride incorporation into enamel produces more stable apatite crystals. Fluoride also acts as an antibacterial agent in the oral cavity, serving as an enzyme inhibitor.
b. Deficiency: Fluoride deficiency in test animals has been reported to result in curtailed growth, infertility and anemia. In humans, an optimal level of fluoride helps to reduce the incidence of dental caries and perhaps also to maintain the integrity of skeletal tissue.
c. Excess: Chronic toxicity of fluoride, called fluorosis, is characterized by changes in

bone, kidney, nerve and muscle function. Dental fluorosis or mottling of teeth has been observed in children receiving 2-8mg fluoride/kg BW. Acute toxicity manifests as nausea, vomiting, diarrhea, acidosis, and cardiac arrhythmias.

10. What are the Symptoms and signs of Manganese deficiency?
Ans: Manganese deficiency is associated with striking and diverse physiological malfunctions. Symptoms and signs of deficiency included nausea, vomiting, dermatitis, decreased serum manganese, decreased fecal manganese excretion, increased serum calcium, phosphorus, and alkaline phosphatase, decreased growth of hair and nails; changes in hair and beard color; poor bone formation and skeletal defects; and altered carbohydrate and lipid metabolism.

11. What are the effects of excess intake of Chromium?
Ans: Oral supplementation of upto about 1,000µg of chromium appears to be safe. Toxicity is associated with exposure to chromium absorbed through the skin, enter the body through inhalation, or be ingested. Inhalation of or direct contact with chromium may result in respiratory disease or in dermatitis and skin ulcerations. Liver damage may also occur. Ingesting chromium leads to severe acidosis, gastrointestinal hemorrhage, hepatic injury, renal failure and death.

12. What is Iodine Deficiency Disorder? What are the signs and symptoms of Iodine Deficiency Disorder?

Ans: Iodine deficiency in the diet causes enlargement of the thyroid gland called as "goitre", as well as a wide spectrum of disorders, which are termed as iodine deficiency disorders (IDD). IDD includes abortion, stillbirths, low birth weight, cretinism, neonatal chemical hypothyroidism, psycho-motor defects, impaired coordination, mental retardation and hypothyroidism.
Goitre occurs in people staying in hilly regions where the iodine content of water and soil is comparatively less. Goitre can be treated by administration of iodine. If treatment is given in early stages goitre can be corrected.
Severe iodine deficiency in children leads to hypothyroidism resulting in retarded physical and mental growth. This condition is known as cretinism.

13. Discuss the functions and deficiencies of Molybdenum.
Ans: The need for molybdenum was established in humans through the observation that a genetic deficiency of specific enzymes that require molybdenum as a cofactor resulted in severe pathology.
a. Functions: Xanthine oxidase, aldehyde oxidase, and sulfite oxidase, all enzymes that catalyze oxidation-reduction reactions, require a prosthetic group containing molybdenum.
b. Deficiency: Molybdenum deficiency has not been established in humans other than patients treated with TPN. Symptoms of molybdenum deficiency include mental changes and abnormalities of sulfur and purine metabolism

14. Discuss the effects on excess intake of Molybdenum and Selenium.

Ans: Molybdenum Excess: Molybdenum appears to be relatively nontoxic, with intake upto 1,500µg/day. However, symptoms such as gout have appeared in some people living in regions that contain high soil molybdenum levels and in those with occupational exposure to molybdenum.

Selenium Excess: Selenium toxicity, also called selenosis, has been observed both in miners and in people who consume excess selenium from supplements. Signs and symptoms of toxicity include nausea, vomiting, fatigue, diarrhea, hair and nail brittleness and loss, paresthesia, interference in sulfur metabolism and inhibition of protein synthesis. Acute poisoning selenium is lethal, with damage occurring to most organ systems. Daily intakes above 700µg/d or acute consumption of 1-7mg Selenium/kg/d results in toxicity in humans.

15. Discuss about Keshan and KashinBeck.

Ans: Selenium deficiency has been associated with two childhood/adolescent endemic diseases, 'Keshan' (cardiomyopathy) and 'KashinBeck' (osteoarthritis). These diseases are found to be prevalent in certain areas where the intake of Selenium is very low, 7-11g/d. Poor intake of Selenium is associated with increased risk of cancer or heart disease.