MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION
B.Sc. (Hons) Agriculture

Semester: VI (New) **Term** : II **Academic Year:** 2023-24
Course No: FST-362 **Title:** Principles of Food science & Nutrition
Credits: 2 (2+0)
Day & Date: **Time:** **Total Marks:** 80

Note : 1. Solve **ANY EIGHT** questions from **SECTION "A"**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q. 1. State and Explain chemical properties of food. Marks

Ans: The forces holding together the atoms or ions in a species constitute a chemical bond. 2

1) Octet Rule
2) The Ionic bond 6
3) The covalent bond
4) Polar and Non-polar
5) The Hydrogen bond

Q.2. Enlist and explain physical properties of food

Ans: Foods are generally complex materials. The properties of their components determine the quality of food. 2

1) Solutions
2) Vapour Pressure
3) Boiling Point 6
4) Freezing point
5) Osmatic Pressure
6) Viscosity
7) Surface and Interfacial Tensions
8) Specific gravity

Q.3. Explain in short chemistry of carbohydrates

Ans: Carbohydrates are widely distributed in nature in the form of sugars, starches, cellulose and other complex substances. They contain carbon, hydrogen and oxygen. 2

1) Monosaccharaides
a) Properties of Monosaccharide's
b) Monosaccharide Derivatives: 6
i) Amino sugars
ii) Deoxy sugars
iii) Glycosides
2) Oligosaccharides
3) Functions of sugars in Foods

i) Browning Reactions (Nonenymic)
ii) Caramelization
iii) Maillard reaction

4) Polysaccharides:

Properties of polysaccharides:

i) Gelatinization
ii) Modified starches

2) Dextrin
3) Glycogen
4) Cellulose
5) Hemicellulose
6) Pectic substance
7) Gums

Q.4. Explain chemistry of protein in brief.

Ans: It is derived from a greek word "proteios" which means principle or prime. 2

1) Amino Acids
i) Classification of amino acids
a) Nonpolar R groups
1) Alanine, 2) Valine, 3) Leucine, 4) Isoleucine, 5) Proline, 6) Phenylalanine, 7) Tryptophan,8) Methionine 6
b) Polar uncharged R groups
1) Glycine, 2) Serine, 3) Threonine, 4) Cysteine, 5) Tyrosine, 6) Asparagine, 7) Glutamine.
c) Negatively charged R group:
1) Aspartic acid, 2) Glutamic acid
d) Positively charged R groups:
1) Lysine, 2) Arginine 3) Histidine
ii) Properties of amino acids
2) Proteins
i) Denaturation
ii) Protein Gels
iii) Nutritional Importance

Q.5. Define Vitamin? Explain Fat soluble vitamin

Ans: Vitamins are low-molecular-weight organic substances necessary in small amounts in the diet of higher animals for growth, maintenance of health and reproduction. 2

I) Classification of Vitamins:
i) Fat soluble vitamins. 6
ii) Water soluble Vitamins.

Fat soluble vitamin are those vitamins which are easily soluble in fats , it is as follows:

a) Vitamin A
b) Vitamin D (Calciferol)
c) Vitamin E (Tocopherol)
d) Vitamin K

Q.6. Enlist the most common micro-organisms of food, elaborate yeast and bacteria

Ans: The most common micro-organism to food is bacteria and fungi. 2

1) Bacteria
2) Molds
3) Yeast
4) Viruses
5) Parasitic Organism

1) Bacteria : Bacteria are unicellular micro- organisms that are approximately one micro meter(10^{-3}mm) in diameter. Bacteria produce various pigments which range from shades of yellow to dark pigments such as brown or black. 6

2) Yeasts: The are unicellular & differ from bacteria in their large cell size and morphology,& because they produce buds during the process of reproduction by division. Yeast spread through air. Yeast colonies are generally moist or slimy in appearance and creamy white colored. Food that is highly contaminated with yeasts will frequently have a slightly fruity odour.

Cestodes are flatworms that inhabit the intestinal tract, heart and lungs of animals.

Trematodes are non segmented flatworms that possess a mouth & oral sucker & depend on a snail as n intermediate hot before infecting humans by being ingested in drinking water or aquatic plants.

Nematodes also can be transmitted from animals to humans.

Protozoa are microscopic single –celled animals, which can be taken in with food or water to cause human illness.

Q.7. How food is preserved and processed by heat? Explain its various methods in brief

Ans: The application of heat to food is so universal that "processing" and "heating" are considered as synonymous. The purpose of heat treatment in food preservation is to kill the microorganisms and inactivate the enzymes.Various methods have been developed to achieve this purpose without bringing about other undesirable effects in foods. 2

6.

i) Effect of heat on microorganisms
ii) Thermal Death Time (TDT) curve
iii) Environmental Factors
iv) Canning: Placing food in a sealable container. Following steps is to be included in canning:
   a) Receiving, cleaning, grading and inspecting of raw commodity.
   b) Blanching to inactivate enzymes.
   c) Placing in the container it added brine or syrup and deaeration of the products.
   d) Heating in a retort, under 1.05kg/cm^{2}pressue using steam for metal cans or pressurized water for glass container.
   e) Partial cooling under pressure in the retort.
   f) Additional cooling by water sprays or in a cooking tank.
   g) Labeling, racking and distributing.
v) Pasteurization

Q.8. Enlist different national programmes adopted for improving nutritional status of community. Explain national anemia control programme.

Ans: The person suffers from the symptoms of a particular vitamin or mineral deficiency disorder, if one does not consume diet adequate in that nutrient for quite some time. One obvious way to prevent such disorder is to consume diet rich in vitamin and minerals. However, poor people cannot afford this foods as they are too expensive. It is not possible for government to make these foods available to poor or needy on regular basis. 2

1) National prophylaxis programme for prevention of nutritional blindness.
2) The national anaemia control programme. 6
3) Iodine prophylaxis programme.

Anaemia is another major nutritional problem affecting the health of the people in the country. It is particularly serious among the women of child bearing age (especially during pregnancy and lactation) and young children.

Surveys done by various research organizations including the World Health Organization (WHO) have shown that in our country as many as 50% of preschool children of poor communities are anemic. In case of women particularly during pregnancy, as many as 70% or even more of them are likely to be anemic (haemoglobin level less than 10g per 100 ml).The anemia among women tends to increase with increasing number of pregnancies. Anaemia has certain harmful consequences. It reduce the capacity of work. Anemic mothers often give birth to low birth weight babies, it can even lead to death of the mother.

Objectives:

i) Promotion of regular consumption of foods rich in iron.
ii) Provision of iron and folate supplements in the form of tablets to the "high risk" groups.
iii) Identification and treatment of severely anemic cases.

Supply of iron-folic acid tablets to the target population constitutes the main input

Q.9. What is food fortification? Explain in brief.

Ans: Food fortification and Enrichment: 2

The term food fortification is defined as a process of adding one or more dietary essentials to a food.

i) Enrichment
ii) Fortification
iii) Nutrification
iv) Restoration 6
v) Standardization
vi) Supplementation

Advantages of Fortification:

i) minimum risk of excess intake of nutrient.
ii) safe , quick and cheap method of ensuring availability of a nutrient.
iii) introduction through existing marketing and distribution system without any extra efforts.
iv) every segment affected population gets necessary amount of nutrient.
v) synthetic nutrients used in food fortification become available just after absorption in the intestinal tract.

Q.10. Enlist the nutritional problems caused by vitamin deficiencies and explain in short about thiamine and ascorbic acid deficiency.

Ans: Vitamins are very essential to support growth & development in our body. They are not synthesized by our body and body and so need to be supplied in the daily diets in small quantities to satisfy the requirements & maintain good health. 2

1) Beriberi
a) Cardiac beriberi
b) Dry beriberi. 6
2) Scurvy

Section "B"

Q.11. **Fill in the blanks**

1) Freezing point of a material is the temperature at which it changes from liquid to solid. 1
2) Folic acid comes from the Latin word. 1
3) Spectrophotometers are used for a more reliable measurement of colour 1
4) Anthocyanin's pigments are responsible for the red, purple and blue colour of fruits. 1
5) Foams are dispersions of gas bubbles in a liquid which is the continuous phase 1
6) 1g of Carbohydrates gives 4 kcal of energy. 1
7) Canning is a process use for inactivating enzymes in blanching 1
8) The generic name of polysaccharides is "glycan" 1

Q.12. **State True or False.**

1) Molds are multicellular micro-organisms with mycelia morphology. (true) 1
2) Rheology deals with Elasticity, Plasticity and Viscosity.(true) 1
3) Beriberi is not caused by the deficiency of vitamin B. (False) 1
4) Recommended dietary allowances, are estimates of nutrients to be consumed daily.(true) 1
5) Lathyrismis caused due to excess consumption of cereals.(False) 1
6) Hedonic rating relates to pleasurable or unpleasurable experiences.(True) 1
7) Green pigments involved in photosynthesis in plants and microorganisms are xanthophyll.(False) 1
8) Lactic acid bacteria are useful bacteria. (True) 1

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