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

Semester	: VI (New)	Term	: II	Academic Year	: 2022-23
Course No.	: FST 362	Title	: Principles of Food Science and Nutrition		
Credits	: 2 (2+0)				
Day & Date	:	Time (hrs.)	: 3 hrs.	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.

Q.1 Define food. Give the objectives of food science and write in detail any three physical properties of food. Marks

Ans

Food : Food is that which nourishes the body. OR 1

Food is essential for growth, maintenance, repair and reproduction. It gives protection against various diseases.

Objectives of food science: 3

1.To understand the functions of food.

2.To know how to select foods to meet our need for nutrients.

3. To understand the nature, composition of food.

4.To learn the methods of food preparation.

5.The economic management of food budget to meet family needs efficiently.

6.To understand the properties of foods.

7.To maintain quality and safety of foods.

8.To improve digestibility of foods.

9.To study food microbiology.

Physical properties of food 1

1. Shape and size
2. Density
3. Specific gravity
4. Porosity
5. Surface area
6. Specific weight
7. Viscosity
8. Volume

Explanation of any three 3

Q.2 Explain sensory properties of food. 8

Ans

1. Appearance: Appearance refers to the shape, size, condition, and color of a product. A colorimeter is a device that measures the color of foods in terms of hue, value, and chroma. Colored lights may be used in a sensory evaluation to prevent color from influencing a taste panel. The appearance of a food can be evaluated in terms of color, surface characteristics such as smoothness of a surface, dry surface, glossy surface or the exterior appearance such as lump formation, thickness or thinness, layering etc.

2. Flavor: Flavour is composed of two subcategories, which are taste and odour. Flavor of a food is judged on the basis of the sensory message resulting from the

combination of taste and aroma. The temperature at which the food is served may have a very important influence on the ability to detect taste and to evaluate flavor. The extremes, whether very hot or cold, limit the ability of people to judge food accurately. The best temperature range for flavor evaluation is 20-30°C. However, some foods like ice creams should be evaluated at their serving temperature rather than at the temperature range ideal for detecting taste and odour.

3. Taste: Individuals respond to a product on the basis of their sensory perception and judge the product quality differently. The auditory sense is the least used in appreciation of food quality, however, the senses for taste stimulation has a strong influence on the acceptability of food quality. Taste is sensed by taste buds, which you may already know by now, are located in the papillae on the tongue. Taste buds are located in the epithelium and on the parts of the tongue where the food contacts the most during chewing and swallowing. Taste sensations which the taste buds register are sweet, salt, sour and bitter. Taste buds near the tip of the tongue are more sensitive to sweet and salt, those on the sides to sour and those near the back to bitter

4. Texture: Texture is how a food product feels to the fingers, tongue, teeth, and palate. The textural qualities of a food have a relationship to the appearance of a product, as described previously and to its evaluation in the mouth as well.

Mouth-feel would include the textural qualities of a food perceived in the mouth.

Chewiness-the ability to slide without breaking

Graininess-the size of the particles

Brittleness-how easily a food breaks apart

Firmness-food's resistance to pressure

Consistency-the thinness or thickness

5.Aroma/Odour: It is the sensation that results when olfactory receptors in the nose are stimulated by particular chemicals in a gaseous form. eg. Floral, Rotten, Perfumed, Acrid, Musty, Fragrant, Scented, Pungent etc.

6. Sound: You can judge the food quality aspects by hearing its sound. eg. Crispy/Crunchy sound of waters.

Q.3 Enlist the components of food, write about physical properties and importance of water.

Ans

Components of food: Water, Carbohydrates, Protein fats, Vitamins, mineral, flavours, colours, bioactives, important reactions 2

Physical properties 3

Density

Viscosity

Vapour pressure

Thermal conductivity

Thermal diffusibility

Expansion on freezing

Surface tension

Heat capacity.

Solvent power.

Melting/Boiling point. 3

Importance of water

Seve as medium in which substances undergo fundamental changes.

Provides H for reduction of CO_2 in photosynthesis.

Water is necessary reactant for hydrolytic splitting of carbohydrates, fats proteins.

Solvent and dispersion medium for all protoplasmic constituents.

Act as transporting medium for all cell nutrients.

Absorption, secretion and excretion not possible without water.

Q.4 Define carbohydrates and give its classification.

Ans Carbohydrates are polyhydroxy aldehyde or ketone and their derivatives. 2

Classification

1.Monosachharides: Called simple sugars, 6

Posses free aldehyde (CHO) or free ketone (C=O) group,

Can not further hydrolyzed in to smaller units,

General formula CnH_2nOn or Cn $(H_2O)n$

Monosachharides are subdivided in to,

Trioses

Tetroses

Pentoses

Hexoses

Heptoses

2. **Oligosachharides:** Compound sugar.

Yield 2-10 molecules of monosachharide units on hydrolysis.

Disachharides: Yield two monosachharides on hydrolysis

Reducing disachharide: Maltose

Non reducing disachharide: Sucrose

Trisachharides : Raffinose

Tetrasachharides: Stachyose

3. **Polysachharides:** Glycons

Classification on the basis of function

a) Storage-Starch, glycogen

b) Structural- Cellulose, Pectin

On the basis of composition

a) **Homopolysachharides**

Homopolysachharides on hydrolysis gives single monosachharide units.

Pentosan: Contain pentoses

Hexosan: Contain hexoses

Glucosan: Polymer of glucose eg. Starch, glycogen

Fructosan: Polymer of fructose, inulin

Galactan: Polymer of galactose, galacatn

Mannans: Polymer of mannans

b) **Heteropolysachharides**

On hydrolysis yield mixture of different monosachharides.eg. hyaluronic acid, chondroitin, gum, agar, pectin.

Q.5 Explain in detail the functions and sources of vitamins.

Ans 8

Vitamin	Sources	Functions
Thiamine-B1	Whole cereals, legumes, Vegetables, fruits, Animal : Meat, fish, milk	Part of an enzyme needed for energy metabolism. Proper functioning of nerves and muscles, Controlling energy metabolism
Riboflavin-	Milk and milk products, leafy	Part of an enzyme needed for

B2	green vegetables, whole grain foods	energy metabolism. Important for normal vision and skin health.
Niacin-B3	Meat, egg, fish, whole grain cereals, vegetables, leafy green vegetables, peanut butter	Part of an enzyme needed for energy metabolism. Important for nervous system, digestive system and skin health.
Pantothenic acid	Widespread in foods, dried yeast, liver, rice, *etc.*	Part of an enzyme needed for energy metabolism, essential for synthesis of cholesterol and sterol.
Biotin	Widespread in foods, dried yeast, liver, rice, *etc.*	Part of an enzyme needed for energy metabolism, essential for maintaining skin structure and health of nervous system
Pyridoxine vit. B6	Meat, fish, poultry, vegetables, fruits.	Part of an enzyme needed for protein metabolism. Helps to make red blood cells.
Folic acid	Leafy green vegetables and legumes , seeds, orange juice	Part of an enzyme needed for making DNA and making new cells. helps in health of skin and essential for nucleoprotein synthesis
Cobalamin (vit B 12)	Meat, poultry, fish, eggs, milk, not found in plant foods.	Important to nerve function. Part of an enzyme needed for making new cells, essential for maturation of red blood corpuscles.
Ascorbic acid (vit. C)	Found only in fruits and vegetables, especially citrus. tomato, strawberry, mango	Antioxidant. Part of an enzyme needed for protein metabolism, formation of collagen essential for wound healing *etc.*
Vitamin A	Found in yellow and orange fruits like mango, papaya, vegetables like carrot, pumpkin, green leafy vegetables, spinach, coriander, milk and milk products, egg yolk, fish, fish liver oil	Normal vision, Growth of skeletal and soft tissues, needed for proper tooth structure, maintain proper reproductive function in male, *etc*
Vitamin D	Natural source sunlight, vanaspati ghee, egg yolk, fish, fish liver oil	Absorption of Calcium and phosphorus, maintain concentration of calcium and phosphorus in blood, mineralization and calcification of bone, *etc*
Vitamin E	Cereals wheat and rice Pulses black gram, green gram, Bengal gram, green leafy vegetables Animals : Meat, eggs, dairy products	Required for normal reproduction. Act as antioxidant
Vitamin K	Green leafy vegetables, cabbage, spinach, tomato, cauliflower, soyaoil, Animal: Egg yolk, milk	Helps in blood clotting

Q.6 Enlist the groups of important bacteria. Discuss any four of them. 4

Ans
1. Lactic acid forming bacteria
2. Acetic acid forming bacteria
3. Buteric acid forming bacteria
4. Propionic acid
5. Proteolytic bacteria
6. Lipolytic bacteria
7. Saccharolytic bacteria
8. Pectinolytic bacteria
9. Thermophylic bacteria
10. Thermoduric bacteria
11. Psychrotrophic bacteria
12. Halophilic bacteria
13. Osmophyllic or Sacharrophilic bacteria
14. Pigmented bacteria
15. Slime or rope forming bacteria
16. Gas forming bacteria
17. Coliform and Fecal Coliform group

Explanation of any four bacterial groups 4

Q.7 What is food preservation? Write the principles of food preservation and methods of drying.

Ans **Definition** : Process of treating and handling food in such a way as to stop or greatly slow down spoilage and prevent food borne illness while maintaining nutritional value, texture and flavor. 1

Principles of food preservation

1. Prevention or delay of microbial decomposition of food
   By keeping out micro organisms 4
   By removal of microorganisms
   By hindering the growth or activity of microorganisms
   By killing the micro organisms.
2. Prevention or delay of self decomposition of food.
   By destruction or inactivation of food enzymes
   By prevention or delay of purely chemical reactions
3. Prevention of damage by insects, animals, mechanical causes etc.

Methods of drying

1. Solar drying
2. Drying by mechanical dryer 3
3. Forced- draft drying systems
4. Drum drying
5. Spray drying
6. Freeze drying etc.

Q.8 Define malnutrition. Explain causes and prevention of malnutrition.

Ans **Definition** : It is the condition of the body resulting from a lack of one or more essential nutrients or due to excessive nutrient supply. 1

Causes for under nutrition

1. Poverty
2. Population explosion
3. Ignorance and illiteracy
4. Infections
5. Low food availability and uneven distribution of food
6. Poor post harvest handling of food
7. Policies

(Explanation) 2

Causes for over nutrition

1. Excessive intake of lipids
2. Excessive intake of carbohydrates
3. Excessive intake of proteins

(Explanation) 3

Prevention of malnutrition

1. Action at family level.: Nutritional education
2. Action at community level: Empowerment and participation of women.
3. Action at National level: Suggested by FAO / WHO are as follows.

   Rural development.

   Increase in Agricultural production, distribution and storage

   Stabilization of production

   Nutrition related health services.
4. Action at International level: The multilateral World food programme

Q.9 What is fortification of food? Write its benefits and types. 2

Ans **Definition** : Fortification is the addition of key vitamins and minerals such as iron, iodine, zinc, vitamins A and D to staple foods such as rice, wheat, oil, milk and salt to improve their nutritional content. 3

Benefits of fortification

1. Since the nutrients are added to staple foods that are widely consumed.
2. Fortification is a safe method of improving nutrition among people. The addition of micronutrients to food does not pose a health risk to people.
3. It does not require any changes in food habits and patterns of people. It is a socio culturally acceptable way to deliver nutrients to people.
4. It does not alter the characteristics of food- the taste, the feel, the look.
5. It can be implemented quickly. Show results in short period of time.
6. This method is cost effective.
7. Every one rupee spent on fortification results in 9 rupees in benefits to the country.
8. It has high benefit to cost ratio.

3

Types of food fortification

1. Mass fortification
2. Targeted fortification
3. Market driven fortification
4. Household / Community fortification
5. Bio-fortification

(Explanation)

Q.10 What is menu planning? Give principles of planning diets and discuss protein metabolism.

Ans

Definition : Menu planning is the process of planning and scheduling intake of meals for general or specific individual requirements. 2

Principles of planning diets

1. Meal planning should meet nutritional requirements.
2. Meal pattern must fulfill family needs
3. Meal planning should save time and energy.
4. Meal planning should satisfy the budget of family
5. Meal plan should give maximum nutrients.
6. Consideration for individual likes and dislikes.
7. Meal planning should provide variety.
8. Meal should give satisfy
9. Meal planning should be according to availability of foods.

3

The metabolism of protein can be discussed as under,

1.Breakdown and synthesis of protein.

2. Nitrogen balance.

3. Oxidation of amino acids

(Explanation) 3

SECTION 'B'

Q.11 Define the following terms. 1Mark each

Ans

1 **Health** : A state of complete physical, mental and social wellbeing.

2 **Nutrition:** The process of taking in food and using it for growth, metabolism and repair.

3 **Under nutrition:** It is defined as insufficient intake of energy and nutrients to meet an individual's needs to maintain good health.

4 **Nutrient:** It is a chemical component needed by the body to provide energy, to build and repair tissues and to regulate life processes.

5 **Metabolism:** It is a chemical processes of transforming foods in to other substance to sustain life.

6 **Absorption:** It is a process where the nutrients from foods are absorbed by the body in to the bloodstreams.

7 **Food microbiology:** It is the science concerned with study of the microorganisms that inhibit, create or contaminate food.

8 **Food spoilage:** Process in which food deteriorates to the point that it is not edible to humans or its quality of edibility becomes reduced.

Q.12 State true or false. 1 Mark each

Ans

1) Microorganisms that easily grown and tolerate high temperature are known as thermophilic microorganisms.----**True**
2) Goiter is caused due to deficiency of iodine--- **True**
3) Osteomalacia disease occurs due to lack of vitamin D.---**True**
4) The introduction of high yielding varieties of seeds after 1965 along with increased use of fertilizers and better irrigation is collectively known as yellow revolution.---**False**
5) Mid day meal programme started in 1970.---**False**
6) Long form of WHO is World Health Organization.---**True**
7) Antoine Lavoisier is father of nutrition.---**True**
8) World food day is celebrated on 5th December every year.---**False**

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