

BT611 – FOOD BIOTECHNOLOGY

MID TERM IMPORTANT QUESTIONS

Prepared by: *Sir Mughal*

Admin: **BS Biological Sciences** (One place to all your solutions)

For timely updates, join our Main Group: <https://chat.whatsapp.com/DWXwJpXahbxFVQutey8JXN>

Click to join the subject group: <https://chat.whatsapp.com/DRHw0YVagB5EyjkC4ytNrf>

1. Define food spoilage and its causes.

Food spoilage is the process in which food becomes unfit, unsafe, or undesirable for consumption due to changes in appearance, taste, smell, or texture. These changes are usually caused by the growth of microorganisms, chemical reactions, or physical damage.

Causes of Food Spoilage

1. Microbial Activity: Bacteria, yeasts, and molds are the most common causes. They break down food components, producing off-odors, slime, discoloration, and toxins.

2. Enzymatic Reactions: Natural enzymes present in food continue to act after harvesting or slaughter. They cause browning (e.g., in fruits), softening, and deterioration of flavor.

3. Chemical Reactions: Oxidation of fats leading to rancidity. Loss of nutrients (e.g., vitamins) due to exposure to air, light, or heat.

4. Physical Damage: Bruising, crushing, or cracking of food exposes internal tissues and speeds up spoilage. Damaged packaging can also allow contaminants to enter.

5. Environmental Factors:

- Temperature (warmth promotes microbial growth)
- Humidity (encourages mold growth)
- Light (can degrade fats and vitamins)
- Oxygen (supports oxidation and aerobic microbes)

Sir Mughal: <https://wa.me/923132310940>

Sir Jawad: <https://wa.me/923036100859>

2. Define enzymes and explain their role in food.

Enzymes are biological catalysts—specialized proteins that speed up chemical reactions without being used up in the process. They are naturally present in plants, animals, and microorganisms.

Role of Enzymes in Food

1. Ripening of Fruits and Vegetables: Enzymes such as pectinases, amylases, and cellulases soften tissues and convert starch into sugars. This affects texture, sweetness, and color.

2. Browning Reactions: Polyphenol oxidase (PPO) causes enzymatic browning in apples, bananas, potatoes, etc. Exposure to air activates the enzyme, leading to brown pigments.

3. Food Spoilage: Natural enzymes continue to act after harvesting or slaughtering. They break down proteins, fats, and carbohydrates, causing off-flavors, softening, and discoloration.

4. Food Processing Applications

- **In dairy:** Rennin and lipases are used in cheese making.
- **In baking:** Amylases improve dough quality and texture.
- **In juice production:** Pectinases clarify juices.
- **In brewing:** Enzymes help convert starch to fermentable sugars.

5. Improving Nutrient Availability: Enzymes break complex molecules into simpler, digestible ones during fermentation (e.g., in yogurt or fermented vegetables).

3. What is fermentation? Give two applications.

Fermentation is a biological process in which microorganisms such as bacteria, yeasts, or molds break down sugars in the absence of oxygen to produce useful products like acids, alcohol, or gases. It is widely used in food preservation and processing.

Applications of Fermentation (Any Two)

- **Production of Yogurt and Cheese:** Lactic acid bacteria ferment milk sugars into lactic acid, giving dairy products their texture and flavor.
- **Bread Making:** Yeast ferments sugars in dough, producing carbon dioxide that makes the bread rise.

4. Define carbohydrates. Explain their types with example.

Carbohydrates are organic compounds made of carbon, hydrogen, and oxygen. They are the main source of energy for the body and are found in foods like grains, fruits, vegetables, and dairy products.

Types of Carbohydrates

Carbohydrates are mainly classified into three types:

1. Monosaccharides (Simple Sugars)

These are the basic units of carbohydrates and cannot be broken down further.

Examples:

- **Glucose** (found in grapes, blood sugar)
- **Fructose** (found in fruits, honey)
- **Galactose** (part of milk sugar)

Sir Mughal: <https://wa.me/923132310940>

Sir Jawad: <https://wa.me/923036100859>

2. Disaccharides (Double Sugars)

Formed by the combination of two monosaccharides.

Examples:

- **Sucrose** = Glucose + Fructose (table sugar)
- **Lactose** = Glucose + Galactose (milk sugar)
- **Maltose** = Glucose + Glucose (malt, germinating grains)

3. Polysaccharides (Complex Carbohydrates)

These are long chains of monosaccharides; they provide long-term energy and structural support in plants.

Examples:

- **Starch** (potatoes, rice, wheat)
- **Glycogen** (stored in liver and muscles)
- **Cellulose** (plant cell walls; dietary fiber)

5. Define raw milk diseases.

Raw Milk Diseases – Definition

Raw milk diseases are illnesses caused by consuming unpasteurized or untreated milk that contains harmful microorganisms. Since raw milk is not heated to kill pathogens, it can carry bacteria, viruses, and parasites that lead to foodborne infections. These diseases may include infections such as tuberculosis, brucellosis, salmonellosis, Listeriosis, and others transmitted through contaminated milk. Here are the major diseases caused by drinking raw (unpasteurized) milk:

Major Raw Milk Diseases

1. Tuberculosis (TB)

- Caused by *Mycobacterium bovis* present in infected cattle.
- Can lead to fever, weight loss, and chronic cough.

2. Brucellosis

- Caused by *Brucella* species.
- Symptoms include fever, joint pain, fatigue, and muscle aches.

3. Salmonellosis

- Caused by *Salmonella* bacteria.
- Leads to diarrhea, vomiting, abdominal cramps, and fever.

4. Listeriosis

- Caused by *Listeria monocytogenes*.
- Serious for pregnant women, newborns, elderly, and immunocompromised individuals.

5. E. coli Infection

- Caused by pathogenic *E. coli* strains (e.g., O157:H7).
- Can cause severe abdominal pain, bloody diarrhea, and kidney damage.

6. Campylobacteriosis

- Caused by *Campylobacter* bacteria.
- Symptoms include fever, diarrhea, and stomach cramps.

Sir Mughal: <https://wa.me/923132310940>

Sir Jawad: <https://wa.me/923036100859>

7. Q Fever

- Caused by *Coxiella burnetii*.
- Leads to high fever, fatigue, headache, and muscle pain.

6. Write names of fermenters in desired microorganisms.

Fermenters and Their Desired Microorganisms

1. Stirred-Tank Fermenter (STF)

- **Microorganisms:** *Saccharomyces cerevisiae* (yeast), *Lactobacillus* spp., *Bacillus* spp.
- **Used for:** Alcohol, enzymes, lactic acid, antibiotics.

2. Air-Lift Fermenter

- **Microorganisms:** Fungi like *Aspergillus niger*, *Rhizopus* spp.
- **Used for:** Citric acid, fungal enzymes.

3. Anaerobic Fermenter

- **Microorganisms:** *Clostridium* spp., *Bifidobacterium* spp.
- **Used for:** Butanol, acetone, methane, probiotics.

4. Batch Fermenter

- **Microorganisms:** Yeasts, bacteria, and molds used in batch culture.
- **Used for:** Bread yeast, antibiotics, organic acids.

5. Continuous Fermenter

- **Microorganisms:** *Lactobacillus*, *E. coli*, and industrial strains.
- **Used for:** Large-scale biochemical production.

6. Solid-State Fermenter (SSF)

- **Microorganisms:** *Rhizopus*, *Aspergillus*, *Penicillium* species.
- **Used for:** Enzymes, citric acid, fermented foods.

7. Photobioreactor

- **Microorganisms:** Algae such as *Chlorella* and *Spirulina*.
- **Used for:** Pigments, proteins, biofuels.

7. Write a short note on Vitamin E.

Vitamin E is a fat-soluble antioxidant that protects body cells from damage caused by free radicals. It plays an important role in maintaining healthy skin, eyes, and the immune system. The most active form of Vitamin E in the body is α -tocopherol.

Functions

- Prevents oxidative damage to cells
- Supports immune function
- Helps maintain healthy skin and eyes
- Protects fats in cell membranes from rancidity

Sources

- Vegetable oils (sunflower, safflower, wheat germ oil)
- Nuts and seeds (almonds, peanuts)
- Green leafy vegetables
- Whole grains

Sir Mughal: <https://wa.me/923132310940>

Sir Jawad: <https://wa.me/923036100859>

Deficiency

Deficiency is rare but may cause muscle weakness, vision problems, and impaired immunity, especially in people with fat-absorption disorders.

8. Name the ingredients used in making cheese.

Ingredients Used in Making Cheese

- Milk (cow, goat, or buffalo)
- Starter culture (lactic acid-producing bacteria)
- Rennet (enzyme used for coagulation)
- Salt (for flavor and preservation)

9. What is cellulose?

Cellulose is a complex carbohydrate (polysaccharide) made of long chains of glucose molecules linked together. It is the main structural component of plant cell walls, providing rigidity and strength. Humans cannot digest cellulose, but it acts as dietary fiber, aiding digestion and bowel movement. Sources are: Vegetables, fruits, whole grains, and plant-based foods.

10. Define phenylethylamine.

Phenylethylamine is a naturally occurring organic compound that functions as a stimulant in the nervous system. It is found in foods like chocolate and is also produced in the human body. PEA can influence mood, alertness, and feelings of pleasure by affecting neurotransmitter activity in the brain.

11. What factors are responsible for changes in texture and characteristics of yoghurt?

Factors Responsible for Changes in Texture and Characteristics of Yoghurt

The texture, flavor, and overall quality of yoghurt can be influenced by several factors:

1. Type of Milk

- Fat content and protein levels in milk affect creaminess and thickness.
- Skim milk produces thinner yoghurt, while full-fat milk gives a creamier texture.

2. Starter Culture

- The type and activity of lactic acid bacteria (e.g., *Lactobacillus bulgaricus*, *Streptococcus thermophilus*) affect acidity, flavor, and texture.

3. Fermentation Time and Temperature

- Longer fermentation increases acidity and firmness.
- Optimal temperature ensures proper bacterial growth; too high or low can affect taste and texture.

4. Milk Treatment

- Heat treatment (pasteurization and homogenization) denatures proteins, improving gel formation and smoothness.

5. Additives

- Thickeners (like gelatin or pectin) or stabilizers can modify texture and consistency.
- Sugar and flavorings can also affect mouthfeel and taste.

6. Storage Conditions

- Temperature and duration of storage influence consistency, separation of whey, and overall quality.

12.Cereals are used in many different products. Write the names.

Products Made from Cereals

Cereals are versatile and used to make a wide variety of food products, including:

1. **Flour-based products** – Bread, pasta, noodles, cakes, biscuits, chapati, pastries
2. **Breakfast cereals** – Cornflakes, oatmeal, muesli, puffed rice
3. **Snacks** – Crackers, savory biscuits, extruded snacks
4. **Beverages** – Beer, malted drinks, rice-based drinks
5. **Fermented foods** – Idli, dosa, sourdough
6. **Animal feed** – Cereal bran, grains, and by-products
7. **Other processed foods** – Starch, corn syrup, cereal bars, baby foods

13.Give the steps for fermentation of food.

Steps for Fermentation of Food

The fermentation process generally involves the following steps:

1. **Selection and Preparation of Raw Material**

- Choose the food substrate (milk, grains, fruits, vegetables) and clean or process it as needed.
- Example: Milk is pasteurized; grains may be cooked or mashed.

2. **Inoculation with Microorganisms**

- Add a starter culture of desired microorganisms such as bacteria, yeast, or mold.
- Example: *Lactobacillus* in yoghurt, *Saccharomyces cerevisiae* in bread.

3. **Fermentation (Incubation)**

- Maintain the food under suitable temperature, pH, and oxygen conditions for microbial growth.
- Microorganisms metabolize sugars to produce acids, alcohol, or gases.

4. **Monitoring**

- Check pH, acidity, and microbial growth to ensure proper fermentation.

5. **Termination of Fermentation**

- Stop the process when the desired flavor, texture, or product quality is achieved.
- Methods: Cooling, pasteurization, or removal of microorganisms.

6. **Packaging and Storage**

Sir Mughal: <https://wa.me/923132310940>

Sir Jawad: <https://wa.me/923036100859>

- Pack the fermented product under hygienic conditions and store at the appropriate temperature to preserve quality.

14. Write steps of yoghurt formation.

Steps of Yoghurt Formation

1. Milk Preparation

- Use fresh milk (cow, buffalo, or goat).
- Heat the milk to 85–90 °C for a few minutes to kill harmful microbes and denature proteins for better texture.
- Cool the milk to about 40–45 °C.

2. Inoculation with Starter Culture

- Add yoghurt starter culture containing *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.
- Mix well to ensure even distribution of bacteria.

3. Fermentation (Incubation)

- Keep the inoculated milk at 40–45 °C for 4–6 hours.
- Bacteria ferment lactose into lactic acid, lowering pH, causing milk to coagulate and form yoghurt.

4. Cooling and Storage

- Once desired acidity and texture are achieved, cool the yoghurt to stop fermentation.
- Store at refrigeration temperature to maintain quality and prolong shelf life.

15. Write characteristics of bran.

Characteristics of Bran

Bran is the outer layer of cereal grains and has the following characteristics:

1. **High in Fiber** – Contains cellulose and hemicellulose, aiding digestion and bowel movement.
2. **Rich in Nutrients** – Provides vitamins (especially B-complex), minerals, and proteins.
3. **Coarse and Hard Texture** – Gives a rough texture; not easily digested by humans.
4. **Contains Antioxidants** – Phenolic compounds help protect the body from oxidative stress.
5. **Used in Food and Feed** – Improves nutritional value of baked goods and livestock feed.

Bran is commonly obtained from wheat, rice, and other cereal grains.

16. Write the role of proteolytic enzymes in fish's spoilage.

Role of Proteolytic Enzymes in Fish Spoilage

Proteolytic enzymes are protein-digesting enzymes naturally present in fish tissues and produced by microorganisms. Their role in fish spoilage includes:

- **Breakdown of Proteins:** Proteolytic enzymes degrade muscle proteins into smaller peptides and amino acids.
- **Formation of Off-Odors and Flavors:** Protein breakdown produces amines, ammonia, and sulfur compounds, causing a fishy smell and unpleasant taste.
- **Texture Softening:** Muscle structure deteriorates, making fish soft, mushy, and less firm.
- **Acceleration of Microbial Spoilage:** Protein degradation provides nutrients for spoilage bacteria, speeding up decomposition.
- **Overall Deterioration:** Combined action of proteolytic enzymes and microbes makes fish unsafe and unfit for consumption.

17. What is standardization for cheese?

Standardization of Milk for Cheese

Standardization is the process of adjusting the fat content of milk to a desired level before cheese production. This ensures that the cheese has a consistent quality, texture, and yield.

Purpose:

- To produce cheese with uniform fat content.
- To improve texture, flavor, and shelf life.
- To optimize cheese yield from the milk.

Example:

- If raw milk has 3% fat but the cheese requires 4%, cream may be added to achieve the desired fat content.

18. Name common cereal foods.

Common Cereal Foods

Cereal foods are products made from grains. Common examples include:

- **Wheat products:** Bread, chapati, pasta, biscuits, cakes
- **Rice products:** Cooked rice, rice flour, rice noodles
- **Maize (corn) products:** Cornflakes, popcorn, cornmeal
- **Oats:** Oatmeal, porridge, muesli
- **Barley:** Barley soup, malted drinks
- **Millets:** Roti, porridge, fermented foods

These cereals are staple foods and provide carbohydrates, fiber, and some proteins.

BS
BIOLOGICAL
SCIENCES
Sir Mughal • Sir Jawad

0313-2310940

0303-6100859

Sir Mughal: <https://wa.me/923132310940>
Sir Jawad: <https://wa.me/923036100859>