

BT611 – FOOD

BIOTECHNOLOGY

FINAL TERM IMPORTANT QUESTIONS

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

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1. Write 3 food safety hazards.

Three food safety hazards are:

1. **Biological hazards** – caused by microorganisms such as bacteria (e.g., *Salmonella*, *E. coli*), viruses, or parasites that can contaminate food.
2. **Chemical hazards** – include harmful substances like pesticide residues, cleaning agents, food additives used in excess, or toxins.
3. **Physical hazards** – foreign objects in food such as glass pieces, metal fragments, stones, or plastic that can cause injury.

2. Name some food allergens.

Some common food allergens include: Milk, Eggs, Peanuts, Tree nuts (such as almonds, walnuts, and cashews), Wheat, Soy, Fish, and Shellfish.

3. What is retro gradation?

Retro gradation is the process in which gelatinized starch molecules, mainly amylose and amylopectin, re-associate and recrystallize when a cooked starch-based food is cooled or stored. This leads to changes such as increased firmness, loss of softness, and sometimes water separation (syneresis), commonly observed in foods like bread, rice, and cooked cereals.

4. Name alcohols produced by yeast.

Alcohols produced by yeast include Ethanol, Glycerol, and Fusel alcohols such as amyl alcohol, propanol, and butanol.

5. How breakdown of pectin affect properties and structure of fruits?

The breakdown of pectin affects the properties and structure of fruits in the following ways:

- It causes softening of fruit tissue by weakening the middle lamella that holds plant cells together.
- Loss of firmness and crispness occurs, making fruits softer and sometimes mushy.
- Increased juice release due to reduced cell wall integrity.
- It contributes to fruit ripening and over-ripening, influencing texture and mouthfeel.

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6. Food spoilage bacteria are classified by their end products and effects produced. Name them.

Food spoilage bacteria, based on their end products and effects, are classified as: Fermentative bacteria, Proteolytic bacteria, Lipolytic bacteria, Saccharolytic bacteria.

7. Define components of GMP.

Components of Good Manufacturing Practices (GMP) include:

- **Personnel hygiene and training** – ensuring workers follow hygienic practices and are properly trained.
- **Premises and equipment** – proper design, maintenance, and sanitation of buildings and machinery.
- **Raw material control** – quality and safety of incoming ingredients.
- **Process control** – standardized procedures to ensure consistent and safe production.
- **Cleaning and sanitation** – regular cleaning to prevent contamination.
- **Documentation and record keeping** – written procedures and records for traceability and accountability.

8. Write applications of starch in food.

Applications of starch in food include:

- Thickening agent in soups, sauces, and gravies
- Gelling agent in puddings, custards, and desserts
- Stabilizer to improve texture and prevent separation
- Bulking agent in bakery and confectionery products
- Moisture retention to improve softness and shelf life of foods

9. What factors influence growth and survival of probiotics?

Factors that influence the growth and survival of probiotics include:

- Temperature during processing and storage
- pH of the food and gastrointestinal tract
- Oxygen level (many probiotics are oxygen-sensitive)
- Availability of nutrients and prebiotics
- Moisture content and storage conditions

10. Write name of five food additives.

Five food additives are: Sodium benzoate, Citric acid, Monosodium glutamate (MSG), Tartrazine, Lecithin.

11. What is cellulose? Write its importance.

Cellulose is a complex carbohydrate (polysaccharide) made of long chains of glucose molecules linked by β -1,4-glycosidic bonds. It is the main structural component of plant cell walls.

Importance of cellulose:

- Provides structural support to plants.
- Acts as dietary fiber in human nutrition, aiding digestion and preventing constipation.
- Helps in regulating blood sugar and reducing cholesterol.
- Used in the food industry as a thickener, stabilizer, and in making edible films.

12. Name ten trace elements.

Ten trace elements (essential minerals required in very small amounts) are: Iron (Fe), Zinc (Zn), Copper (Cu), Manganese (Mn), Selenium (Se), Iodine (I), Chromium (Cr), Molybdenum (Mo), Fluorine (F), Cobalt (Co).

13. Write composition of food matrix.

The food matrix refers to the complex physical and chemical structure of a food, including how nutrients and other components are organized and interact. Its composition includes:

- **Water** – the major component in most foods, affecting texture and stability.
- **Carbohydrates** – such as starch, sugars, and dietary fiber.
- **Proteins** – contributing to structure, texture, and nutritional value.
- **Fats and lipids** – providing energy, flavor, and mouthfeel.
- **Vitamins and minerals** – essential nutrients present in varying amounts.
- **Non-nutritive components** – like phytochemicals, pigments, and flavor compounds.

14. What are the cheese milk pretreatment?

Cheese milk pretreatments are processes applied to milk before cheese making to improve yield, texture, flavor, and safety. They include:

1. **Standardization** – adjusting fat and solids-not-fat content to achieve consistent cheese quality.
2. **Pasteurization** – heating milk to destroy harmful microorganisms.
3. **Homogenization** – breaking down fat globules for uniform texture (used in some cheese types).
4. **Addition of starter cultures** – introducing beneficial bacteria for fermentation and flavor development.
5. **Filtration or clarification** – removing impurities and somatic cells to improve milk quality.
6. **Cooling** – bringing milk to the optimal temperature for rennet addition and fermentation.

15. Staphylococcus aureus makes an enterotoxin. What are symptoms?

Staphylococcus aureus produces enterotoxins that cause food poisoning. Symptoms usually appear 1–6 hours after ingestion and include: Nausea, Vomiting, Abdominal cramps, Diarrhea, Sometimes mild fever.

16. Write the agar used for fungi and mould in dairy products.

The agar commonly used for fungi and mould in dairy products is Potato Dextrose Agar (PDA). Other options include:

- **Sabouraud Dextrose Agar (SDA)** – especially for yeasts and moulds
- **Czapek Dox Agar** – for certain filamentous fungi

17. Name three alkaline compounds.

Three alkaline (basic) compounds are: Sodium hydroxide (NaOH), Potassium carbonate (K₂CO₃), Calcium hydroxide (Ca(OH)₂).

18. Write three steps in market research process.

Three key steps in the market research process are:

1. **Defining the problem and research objectives** – identifying what information is needed and why.
2. **Collecting data** – gathering information through surveys, interviews, observations, or secondary sources.
3. **Analyzing and interpreting data** – processing the data to draw meaningful insights and make informed decisions.

19. Define types of botulism.

Botulism is a serious illness caused by the toxin of *Clostridium botulinum*. Its types are classified based on the source of toxin exposure:

1. **Foodborne botulism** – caused by eating foods contaminated with the botulinum toxin (e.g., improperly canned foods).
2. **Infant botulism** – occurs when *C. botulinum* spores grow in the intestines of infants, producing toxin.
3. **Wound botulism** – caused by toxin production in infected wounds.
4. **Inhalation botulism** – rare, caused by inhaling aerosolized botulinum toxin (usually in lab or bioterrorism exposure).

20. Write a note on Aldehyde Production.

Aldehyde Production in foods refers to the formation of aldehyde compounds, which are important for flavor, aroma, and chemical reactions in food systems.

- **Sources:** Aldehydes are mainly produced during lipid oxidation, fermentation, Maillard reactions, and enzymatic reactions in foods. For example, oxidation of unsaturated fatty acids in oils can produce hexanal, giving a grassy flavor.
- **Role in foods:** They contribute to flavor and aroma in baked goods, dairy, fruits, and fermented products.
- **Impact on quality:** While small amounts enhance flavor, excessive aldehyde formation can lead to off-flavors and spoilage.
- **Control:** Proper storage, antioxidant use, and controlled processing help minimize undesirable aldehyde formation.

21. What role does Lipases play in the production of flavors?

Lipases are enzymes that break down fats (triglycerides) into free fatty acids and glycerol. In food production, they play a key role in flavor development:

- **Flavor formation in cheese:** Free fatty acids released by lipases undergo further reactions (like oxidation or esterification) to produce characteristic cheese flavors such as sharp, nutty, or creamy notes.
- **Butter and dairy products:** Lipases contribute to buttery and creamy flavors by releasing short-chain fatty acids like butyric acid.
- **Fermented foods:** They help generate complex flavor compounds in products like fermented meats and yogurt.

22. How lipases are added in dried eggs?

In dried eggs, lipases are added to develop flavor during storage or processing, especially for products like cheese-flavored powders or specialty egg products. The process is usually:

1. **Selection of lipase** – typically microbial or fungal lipases that are safe for food use.
2. **Incorporation** – lipase is blended into liquid egg before drying (spray-drying or drum-drying).
3. **Drying** – the egg is dried carefully to preserve enzyme activity.
4. **Storage/maturation** – during storage, the lipase gradually hydrolyzes egg lipids, releasing free fatty acids that contribute to flavor development.

23. What is honey, butter and toffee like flavor?

Honey, butter, and toffee-like flavors are descriptive terms for characteristic sweet and rich flavors in foods, often developed through chemical reactions during processing or fermentation:

1. **Honey-like flavor** – sweet, floral, and slightly fruity; often arises from caramelization of sugars or natural sugar content in foods.
2. **Butter-like flavor** – creamy, rich, and slightly fatty; mainly produced by lipase activity releasing short-chain fatty acids (like butyric acid) or diacetyl formation during fermentation.
3. **Toffee-like flavor** – sweet, caramelized, and slightly burnt; formed by Maillard reactions between sugars and amino acids or thermal caramelization of sugars.

24. Write examples of conveyors and elevators in handling solid food.

Examples of conveyors and elevators used in handling solid food:

Conveyors:

- **Belt conveyors** – for transporting packaged or bulk food like grains, snacks, or fruits.
- **Screw (auger) conveyors** – for moving powders, grains, or semi-solid foods like dough.
- **Roller conveyors** – for boxes or trays of food products in processing lines.
- **Vibrating conveyors** – for gentle movement of fragile items like nuts or chips.

Elevators:

- **Bucket elevators** – for lifting grains, seeds, or pellets vertically.
- **Pneumatic elevators** – using air pressure to move light solids like flour or powdered sugar.
- **Chain elevators** – for moving heavy bulk items like potatoes or root vegetables.

25. Write a note on Risk Analysis of Food Safety.

Risk Analysis of Food Safety is a systematic approach used to identify, assess, and manage hazards in the food chain to protect public health. It consists of three interconnected components:

1. **Risk Assessment** – A scientific evaluation of potential hazards in food, including:
 - Hazard identification (biological, chemical, or physical hazards)
 - Hazard characterization (severity of health effects)
 - Exposure assessment (how much and how often people consume the hazard)
 - Risk characterization (overall probability and impact of adverse effects)
2. **Risk Management** – Decisions and actions taken to control or reduce risks, such as setting food safety standards, regulations, or monitoring procedures.
3. **Risk Communication** – Sharing information about food risks and safety measures with stakeholders, consumers, and the public to ensure informed choices.

26. Write classification of bacteria used in food spoilage.

Classification of bacteria involved in food spoilage is usually based on the type of food they spoil, the metabolic end products, or their environmental preferences. Common classifications include:

1. Based on end products and effects:

- **Proteolytic bacteria** – break down proteins, causing putrefaction and foul odors (e.g., *Pseudomonas*, *Clostridium*).
- **Lipolytic bacteria** – hydrolyze fats, leading to rancidity (e.g., *Pseudomonas*, *Bacillus*).
- **Saccharolytic (fermentative) bacteria** – ferment sugars, producing acids and gas, leading to souring (e.g., *Lactobacillus*, *Leuconostoc*).

2. Based on environmental growth conditions:

- **Psychrophilic bacteria** – grow at low temperatures, spoil refrigerated foods.
- **Mesophilic bacteria** – grow at moderate temperatures, spoil room-temperature foods.
- **Thermophilic bacteria** – grow at high temperatures, spoil heat-processed foods.

3. Based on oxygen requirement:

- **Aerobic bacteria** – require oxygen (e.g., *Pseudomonas*).
- **Anaerobic bacteria** – grow without oxygen (e.g., *Clostridium*).
- **Facultative anaerobes** – can grow with or without oxygen (e.g., *Lactobacillus*).

27. Write seven principles of HACCP.

The seven principles of HACCP (Hazard Analysis and Critical Control Points) are:

1. **Conduct a hazard analysis** – Identify biological, chemical, and physical hazards in the food production process.
2. **Determine critical control points (CCPs)** – Identify stages where hazards can be prevented, eliminated, or reduced to safe levels.
3. **Establish critical limits** – Set maximum or minimum values (e.g., temperature, time, pH) for each CCP to ensure safety.
4. **Monitor CCPs** – Implement procedures to regularly check that each CCP stays within its critical limits.
5. **Establish corrective actions** – Define steps to take if a CCP deviates from its critical limit.
6. **Verify the system** – Confirm that the HACCP plan is effective through audits, testing, and validation.
7. **Record keeping and documentation** – Maintain detailed records of hazards, CCP monitoring, corrective actions, and verification activities.

28. What is purpose of food additives?

The purpose of food additives is to improve the safety, quality, and appeal of foods. They are used to:

- **Preserve food** – prevent spoilage by microorganisms (e.g., preservatives like sodium benzoate).
- **Enhance flavor and aroma** – improve taste or smell (e.g., flavor enhancers like MSG).
- **Improve appearance** – add or restore color and brightness (e.g., food colorings).
- **Maintain texture and consistency** – act as stabilizers, emulsifiers, or thickeners (e.g., lecithin, pectin).
- **Extend shelf life** – prevent oxidation and maintain freshness (e.g., antioxidants like ascorbic acid).
- **Aid processing** – improve functionality during manufacturing (e.g., anti-caking agents, bleaching agents).

29. What are different types of fermented food depending on sources of desirable microorganism?

Fermented foods can be classified based on the source of the desirable microorganisms involved in fermentation:

- **Naturally fermented foods (spontaneous fermentation)** – Microorganisms are naturally present in raw materials or the environment. Examples: Sauerkraut, kimchi, sourdough bread, some traditional cheeses.
- **Back-slopped or starter culture fermentation** – A portion of a previous successful fermentation is added to start a new batch. Examples: Yogurt (using previous batch as starter), fermented sausages.
- **Commercial starter culture fermentation** – Pure, selected strains of microorganisms are deliberately added to ensure consistent quality and safety. Examples: Industrial yogurt, cheese, beer, wine.

30. Write main issues of hygiene design.

The main issues of hygienic design in food processing and handling are focused on preventing contamination and ensuring food safety. They include:

1. **Cleanability** – Equipment and surfaces should be easy to clean and sanitize without leaving residues.
2. **Material selection** – Use corrosion-resistant, non-toxic, and food-grade materials (e.g., stainless steel).
3. **Elimination of contamination niches** – Avoid cracks, crevices, and dead ends where microbes can grow.
4. **Proper drainage** – Prevent water accumulation that can harbor bacteria.
5. **Avoiding cross-contamination** – Separate raw and cooked product areas, and use proper flow design.
6. **Ease of maintenance** – Equipment should allow safe maintenance without contaminating food.
7. **Ventilation and air control** – Reduce airborne contamination and maintain suitable humidity.
8. **Temperature control** – Ensure design allows proper heating, cooling, or freezing to control microbial growth.

31. What are oxidizing enzymes?

Oxidizing enzymes are enzymes that catalyze oxidation reactions in food, often leading to changes in color, flavor, or nutritional quality. They usually act by transferring electrons from a substrate to oxygen or other molecules.

Examples and roles in foods:

- **Polyphenol oxidase (PPO)** – causes browning in cut fruits and vegetables (e.g., apples, potatoes).
- **Peroxidase** – involved in oxidation of phenolic compounds; used as an indicator of proper pasteurization in milk.
- **Laccase** – oxidizes phenolic compounds, sometimes affecting wine, juice, or processed foods.

32. Write a brief note on Vitamin E.

Vitamin E is a fat-soluble vitamin that serves as a powerful antioxidant, protecting cells and tissues from oxidative damage caused by free radicals. Its main forms are tocopherols and tocotrienols, with α -tocopherol being the most biologically active in humans. Vitamin E plays an important role in maintaining healthy cell membranes, supporting immune function, and promoting skin and eye health. It is naturally found in foods such as vegetable oils, nuts, seeds, and green leafy vegetables. Although deficiency is rare, it can lead to neuromuscular problems, hemolytic anemia, and weakened immunity. In addition to its health benefits, Vitamin E is also used in food products to prevent lipid oxidation, thereby improving the shelf life of oils and fat-containing foods.

33. Write a note on origin of hazards.

Origin of hazards in food refers to the sources from which biological, chemical, or physical contaminants enter the food chain, potentially causing harm to consumers.

- **Biological hazards** originate from microorganisms such as bacteria, viruses, fungi, and parasites, which can contaminate food through poor hygiene, infected animals, or contaminated water.
- **Chemical hazards** come from added substances or environmental contaminants, including pesticides, food additives, cleaning agents, heavy metals, or toxins produced naturally in food.
- **Physical hazards** arise from foreign objects like glass, metal, plastic, stones, or wood fragments that may accidentally enter food during production, processing, or handling.

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34. Write applications of edible vaccines.

Applications of edible vaccines involve using genetically modified plants to deliver vaccines orally, offering several advantages in disease prevention:

- **Prevention of infectious diseases** – Edible vaccines can protect against diseases such as hepatitis B, cholera, and rotavirus by stimulating immunity in the gut.
- **Oral immunization** – They allow easy administration without needles, improving compliance and accessibility, especially in children.
- **Cost-effective mass vaccination** – Growing vaccine-producing plants reduces production and storage costs, making vaccines more affordable for developing countries.
- **Rapid response to outbreaks** – Plants can be engineered quickly to produce vaccines against emerging pathogens.
- **Mucosal immunity** – Because they are ingested, edible vaccines stimulate local gut immunity, which is important for pathogens entering through the digestive tract.

35. How probiotics are administered?

Probiotics are administered in ways that allow the beneficial microorganisms to reach the gut alive and provide health benefits. Common methods include:

- **Dairy products** – such as yogurt, kefir, cheese, and fermented milk drinks.
- **Non-dairy beverages** – like probiotic juices, smoothies, or soy-based drinks.
- **Dietary supplements** – capsules, tablets, or powders containing concentrated probiotic strains.
- **Functional foods** – foods fortified with probiotics, including cereals, snack bars, or chocolate.
- **Infant formulas** – some formulas are enriched with probiotics to support gut health in babies.

36. Name three major colorants.

Three major food colorants are:

1. **Carotenoids** – natural pigments giving yellow, orange, or red colors (e.g., β -carotene, paprika extract).
2. **Anthocyanins** – water-soluble pigments responsible for red, blue, or purple colors in fruits and vegetables (e.g., blueberry, red cabbage).
3. **Chlorophylls** – green pigments found in plants (e.g., spinach, green herbs).

37. Why fats are used in food production?

Fats are used in food production because they contribute to multiple important qualities of foods:

- **Energy source** – provide a concentrated form of calories.
- **Flavor and aroma** – enhance taste and carry fat-soluble flavors.
- **Texture and mouthfeel** – give creaminess, smoothness, and tenderness to baked goods, chocolates, and dairy products.
- **Cooking properties** – act as heat transfer medium in frying and baking.
- **Emulsification and stability** – help mix water and oil in products like mayonnaise or dressings.
- **Shelf-life improvement** – fats can carry antioxidants to reduce rancidity and maintain quality.

38. Write process of processed cereal.

The process of producing processed cereals (like breakfast flakes or puffed cereals) generally involves several key steps:

1. **Cleaning and sorting** – Raw grains (wheat, corn, rice, oats, etc.) are cleaned to remove dust, stones, husks, and other impurities.
2. **Conditioning or tempering** – Grains are moistened or steamed to soften the bran and make starch more workable for processing.
3. **Cooking or gelatinization** – Grains are cooked with steam or hot water to gelatinize starch, making it digestible and improving texture.
4. **Shaping or flaking** – Cooked grains are rolled into flakes, extruded into shapes, or puffed under high pressure and temperature.
5. **Drying or toasting** – Reduces moisture content to extend shelf life and achieve the desired crispness.
6. **Cooling** – Prevents condensation and preserves texture after drying.
7. **Enrichment and flavoring** – Vitamins, minerals, sugar, or flavorings may be added to improve nutrition and taste.
8. **Packaging** – Processed cereal is packed in moisture-proof containers to maintain freshness and prevent contamination.

39. What are fat solvents? Explain.

Fat solvents are substances that can dissolve or extract fats and oils from foods or other materials. They are commonly used in food processing, laboratory analysis, and industrial applications to separate lipids from solids or mixtures.

Explanation:

- Fat molecules are non-polar, so fat solvents are usually non-polar or slightly polar organic solvents that can interact with lipids.
- Common fat solvents include hexane, petroleum ether, chloroform, ether, and ethanol (for some polar lipids).
- In the food industry, fat solvents are used to extract oils from seeds (like soybean, sunflower, or peanuts) and to analyze fat content in foods.
- Safety considerations are important, especially in food applications, to ensure no toxic residues remain in the final product.

40. How the quality of food made better?

The quality of food can be improved by controlling factors that affect its safety, nutrition, taste, appearance, and shelf life. Methods include:

- **Good hygiene and sanitation** – proper handling, cleaning, and storage to prevent contamination.
- **Use of quality raw materials** – fresh, safe, and high-nutrient ingredients improve final product quality.
- **Controlled processing conditions** – correct temperature, time, and methods preserve nutrients, flavor, and texture.
- **Addition of food additives** – preservatives, antioxidants, stabilizers, and flavor enhancers maintain freshness, color, and taste.
- **Packaging** – using appropriate materials to protect food from moisture, light, oxygen, and microbes.
- **Fortification and enrichment** – adding vitamins and minerals to enhance nutritional value.
- **Regular quality testing** – monitoring microbial load, chemical composition, and sensory properties ensures consistent quality.

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41. What ingredients are required for cheese making?

The main ingredients required for cheese making are:

1. **Milk** – the primary raw material, usually from cow, goat, or sheep.
2. **Starter cultures** – beneficial bacteria that ferment lactose to lactic acid, aiding coagulation and flavor development.
3. **Rennet or coagulants** – enzymes (like chymosin) that curdle the milk and form curds.
4. **Salt** – for flavor, preservation, and controlling microbial growth.
5. **Optional additives** – such as calcium chloride (improves coagulation), annatto (coloring), or herbs/spices for flavor.

42. Write a note on transgenic plants.

Transgenic plants are plants that have been genetically modified to contain genes from other species to express desirable traits. This is done using biotechnology techniques such as gene cloning and transformation.

- **Purpose:** Transgenic plants are developed to improve yield, resistance to pests and diseases, tolerance to environmental stresses, or to enhance nutritional content.
- **Examples:**
 - **Bt cotton** – contains a gene from *Bacillus thuringiensis* for insect resistance.
 - **Golden rice** – enriched with beta-carotene (pro-vitamin A) to prevent vitamin A deficiency.
 - **Herbicide-tolerant soybeans** – resistant to certain herbicides for easier weed control.
- **Advantages:** Increased crop productivity, reduced pesticide use, and improved nutritional quality.
- **Concerns:** Potential environmental impact, gene transfer to wild plants, and public acceptance issues.

43. What is food sciences?

Food science is the study of the physical, chemical, biological, and microbiological aspects of food and how they affect its safety, quality, nutrition, and processing. It involves understanding:

- **Composition of food** – proteins, carbohydrates, fats, vitamins, minerals, and water.
- **Food processing and preservation** – methods to extend shelf life, improve safety, and maintain quality.
- **Food safety and microbiology** – controlling pathogens, spoilage organisms, and hazards.
- **Sensory properties** – taste, texture, aroma, and appearance.
- **Nutrition and health** – how food contributes to diet, growth, and disease prevention.

44. Write steps for sanitizing food.

Steps for sanitizing food involve cleaning and reducing harmful microorganisms to safe levels, ensuring the food is safe for consumption. The main steps are:

1. **Pre-cleaning** – Remove visible dirt, debris, and residues from fruits, vegetables, or food surfaces.
2. **Washing** – Rinse with clean, potable water to remove remaining soil and contaminants.
3. **Application of sanitizer** – Use approved chemical sanitizers (e.g., chlorine solution, iodine, or organic acids) to kill or reduce microbes.
4. **Contact time** – Allow the sanitizer to remain on the food or surface for the recommended duration to be effective.
5. **Rinsing (if required)** – Some sanitizers require rinsing with clean water to remove residues.
6. **Drying** – Allow food or surfaces to air-dry or use clean materials to prevent microbial growth from moisture.

45. Write importance of inorganic phosphate compounds in cheese.

Inorganic phosphate compounds are important in cheese making because they help control texture, moisture, and functionality of the product.

- **pH control and buffering** – Phosphates help maintain the right acidity during coagulation and ripening, ensuring proper curd formation.
- **Moisture retention** – They improve water-holding capacity in cheese, giving a soft and smooth texture.
- **Protein interaction** – Phosphates interact with casein proteins to stabilize the structure and prevent excessive curd shrinkage.
- **Emulsification** – In processed cheese, phosphates act as emulsifying salts, helping fat and protein blend uniformly for a creamy consistency.

46. What is the role of refractometer in food?

A refractometer is an instrument used in the food industry to measure the concentration of dissolved solids (like sugars, salts, or acids) in liquids.

Roles in food:

- **Determining sugar content** – Used in juices, soft drinks, honey, and syrup to measure °Brix (percent sugar by weight).
- **Quality control** – Ensures products have consistent sweetness, concentration, and texture.
- **Monitoring fermentation** – Tracks sugar consumption in brewing, winemaking, and yogurt production.
- **Detecting adulteration** – Identifies if water or other substances have been added, affecting concentration.

47. How milk is treated in yogurt fermentation?

In yogurt fermentation, milk is treated in several steps to prepare it for fermentation and ensure proper texture, flavor, and safety:

1. **Standardization** – Adjusting the fat and solids-not-fat content of milk to achieve consistent yogurt quality.
2. **Pasteurization** – Heating milk (typically 85°C for 30 minutes or 90–95°C for 5–10 minutes) to kill harmful microbes and denature whey proteins, which improves yogurt texture.
3. **Cooling** – Bringing the milk down to the fermentation temperature (usually 40–45°C), suitable for starter cultures.
4. **Inoculation** – Adding starter cultures (like *Lactobacillus bulgaricus* and *Streptococcus thermophilus*) that ferment lactose into lactic acid.
5. **Fermentation** – Allowing the milk to incubate at the appropriate temperature until it reaches the desired pH (~4.5) and consistency.

48. How synthetic flavors are better than natural flavors?

Synthetic flavors are often considered better than natural flavors in certain aspects of food production due to:

- **Consistency** – They provide a uniform taste and aroma in every batch, unlike natural flavors, which can vary due to season or source.
- **Cost-effectiveness** – Synthetic flavors are usually cheaper to produce than extracting natural flavors from raw materials.
- **Availability** – Can be produced year-round in large quantities, independent of crop harvests.
- **Stability** – More stable during processing, heating, or storage, maintaining flavor over time.
- **Variety** – Allow creation of flavors not easily obtained from nature, expanding product options.

49. What are Food Laws and Regulations as far as food quality concerns?

Food laws and regulations are legal frameworks designed to ensure the safety, quality, and authenticity of food for consumers. They set standards and guidelines for production, processing, labeling, and marketing of foods.

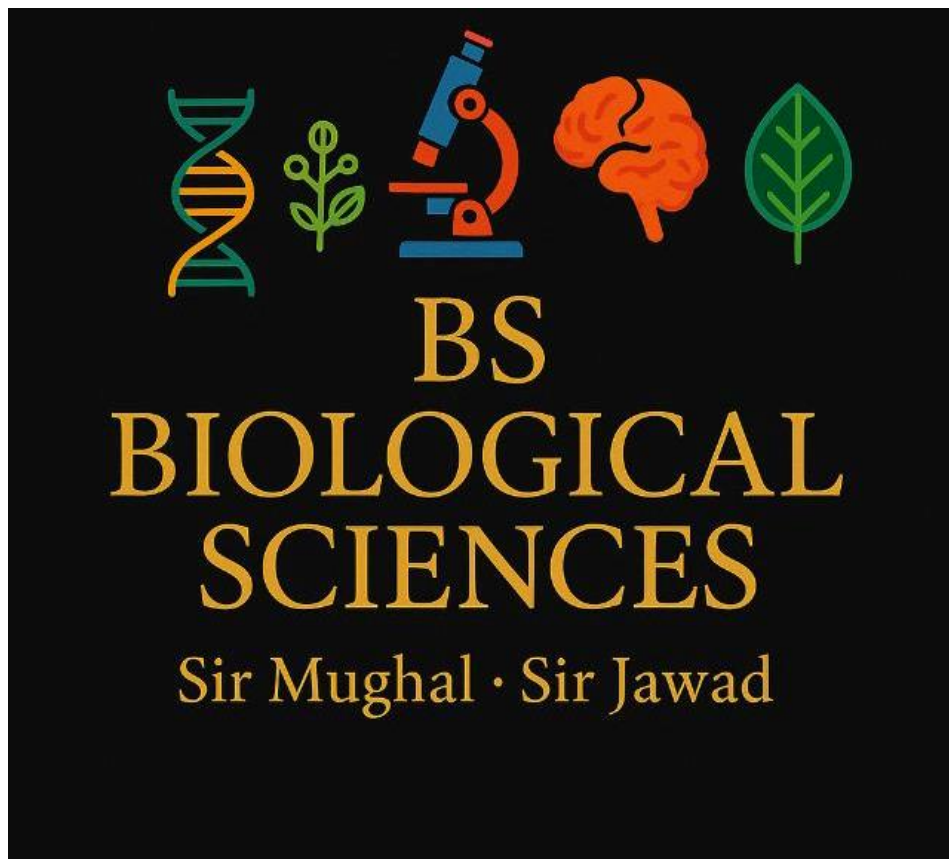
From a food quality perspective, these laws and regulations:

- **Define quality standards** – Specify acceptable levels of nutrients, additives, contaminants, and microbiological safety.
- **Ensure hygiene and safety** – Mandate proper handling, storage, and processing to prevent foodborne illnesses.
- **Control labeling and claims** – Require accurate ingredient lists, nutrition information, and health claims to protect consumers.
- **Regulate additives and preservatives** – Specify which chemicals can be used and at what levels to maintain safety and quality.
- **Prevent adulteration and fraud** – Prohibit misleading or harmful practices that compromise food quality.
- **Facilitate trade and compliance** – Harmonize standards nationally and internationally to maintain quality in domestic and exported foods.

50. What is the effect of inorganic phosphate in starch degradation?

The effect of inorganic phosphate in starch degradation is mainly related to enhancing the breakdown of starch molecules and improving functional properties:

- **Catalyzes hydrolysis** – Phosphate groups can help enzymes like amylases act more efficiently on starch, breaking it into sugars.
- **Increases water solubility** – Phosphorylation of starch makes it more soluble, facilitating its digestion and processing.
- **Prevents retrogradation** – Phosphate groups interfere with the reassociation of starch molecules, reducing gel hardening during cooling.
- **Improves texture in food products** – In products like sauces, puddings, and processed foods, phosphate-treated starch provides smoothness, stability, and clarity.



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