MP FSO Previous year paper 2014

Q.1 **The first synthetic sweetening agent used was:**

A. Saccharine
B. Cyclamates
C. Aspartame
D. Sucralose

Answer: A

Sol: ✅ (a) Saccharine: • Discovered in 1879, first artificial sweetener. • Non-nutritive and 300–400 times sweeter than sugar. • Used during sugar shortages in World War eras. • Approved for use despite earlier health controversies.
❌ (b) Cyclamates: • Discovered later and banned in some countries over health concerns.
❌ (c) Aspartame: • Introduced in the 1980s, not the first.
❌ (d) Sucralose: • A more recent artificial sweetener, introduced in the 1990s.

Q.2 **Iodized salt contains iodine in the form of:**

A. I_2
B. KIO_3
C. KI
D. NaI

Answer: B

Sol: ✅ (b) KIO_3 (Potassium iodate): • Used to fortify salt in many countries, including India. • More stable than KI in tropical climates. • Prevents iodine deficiency disorders (IDD). • Recommended due to its longer shelf life.
❌ (a) I_2: • Elemental iodine, not used in salt fortification due to instability.
❌ (c) KI: • Also used, but less stable than KIO_3, especially in humid conditions.
❌ (d) NaI: • Rarely used and less stable than KIO_3 in salt iodization.

Q.3 **Jam, jellies, and preserves can be preserved by adding sugar at a concentration of:**

A. 65%
B. 70%
C. 40%
D. 30%

Answer: A

Sol: ✅ (a) 65%: • Sugar concentration at or above 65% helps in osmotic dehydration of microbes. • It inhibits microbial growth and extends shelf life. • Common standard in traditional preservation methods. • Also aids in gel formation in jams and jellies.
❌ (b) 70%: • Excessive sugar may crystallize and affect texture.
❌ (c) 40%: • Too low to effectively inhibit microbial activity.
❌ (d) 30%: • Not sufficient for preservation; prone to spoilage.

Q.4 **After drying moisture content in vegetables should be:**

A. 6–8%
B. 8–10%
C. 10–15%
D. 15–20%

Answer: A

Sol: ✅ The correct moisture content of dried vegetables should ideally be in the range of 6–8%, which ensures product safety and longer shelf life. Drying is a crucial preservation method that removes moisture to prevent microbial activity, enzymatic spoilage, and other deteriorative changes. Microorganisms, including bacteria, yeasts, and molds, require a certain level of water activity to grow and multiply. When the moisture content is

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reduced to below 8%, water activity becomes too low to support microbial growth, making the food microbiologically stable.
Moreover, moisture reduction also slows down enzymatic reactions and oxidation processes that can lead to spoilage and loss of nutrients or color. For vegetables like onions, carrots, and green leafy vegetables, reaching a final moisture content of around 6–8% ensures that they remain crisp, lightweight, and shelf-stable without requiring refrigeration. It's especially important in commercial food processing to standardize this range to maintain quality and consistency across batches.
❌ (b) 8–10% and (c) 10–15% may allow slow microbial growth and enzymatic activity, especially in humid environments, reducing product safety. ❌ (d) 15–20% is far too high and not acceptable for safe long-term storage of dried vegetables.

Q.5 **Agar-agar is used as:**

A. Stabilizer and thickener
B. Antibiotic
C. Colouring agent
D. Nutrient supplement

Answer: A

Sol: ✅ (a) Stabilizer and thickener: • Agar-agar is a hydrocolloid extracted from red algae (*Gelidium* species). • Used as a gelling agent, stabilizer, and thickener in jellies, puddings, ice creams, etc. • Also widely used in microbiological media as a culture base. • It's vegetarian and heat stable, making it a popular gelatin alternative.
❌ (b) Antibiotic: • Agar is inert and has no antimicrobial properties.
❌ (c) Colouring agent: • It's transparent and used for texture, not color.
❌ (d) Nutrient supplement: • Agar lacks essential nutrients; not used as a supplement.

Q.6 **Frozen storage is generally operated at temperature of:**

A. 0°C
B. -18°C
C. -50°C
D. -60°C

Answer: B

Sol: ✅ (b) -18°C: • Standard recommended temperature for frozen storage of foods. • At -18°C, microbial and enzymatic activities are nearly halted. • Ensures preservation of texture, flavor, and nutritional quality. • Recognized globally by Codex Alimentarius and food safety authorities.
❌ (a) 0°C: • Only slows microbial activity; not sufficient for long-term storage.
❌ (c) -50°C and ❌ (d) -60°C: • Ultra-low temperatures used for specific lab or pharmaceutical storage, not food.

Q.7 **Mold inhibitor used in bread is:**

A. Sodium/Calcium propionate
B. Sodium chloride
C. Calcium carbonate
D. None of these

Answer: A

Sol: ✅ (a) Sodium/Calcium propionate: • These are commonly used preservatives in bakery products like bread. • They are effective against mold and some bacteria, prolonging shelf life. • They work by interfering with microbial metabolism in acidic environments. • Generally recognized as safe (GRAS) by food safety authorities.
❌ (b) Sodium chloride: • Acts as a general preservative but not specifically used as an antifungal agent in bread. • It controls moisture but does not inhibit mold effectively.
❌ (c) Calcium carbonate: • Used as a calcium source or pH buffer, not as a mold inhibitor.
❌ (d) None of these: • Incorrect because sodium/calcium propionate is indeed used as a mold inhibitor.

Q.8 **Who developed the process of canning:**

A. Nicolas Appert
B. Louis Pasteur
C. Norman Borlaug
D. Walter Hesse

Answer: A

Sol: ✅ (a) Nicolas Appert: • A French inventor, considered the "father of canning." • Discovered in the early 19th century that food could be preserved by heating and sealing in airtight containers. • His method laid the foundation for modern food preservation. • He won a prize offered by Napoleon for developing a method to preserve food for the army.
❌ (b) Louis Pasteur: • Known for pasteurization and work on germ theory, not canning.
❌ (c) Norman Borlaug: • Known as the father of the Green Revolution; contributed to agricultural productivity.
❌ (d) Walter Hesse: • Introduced agar to microbiology, not related to canning.

Q.9 **Nisin is used as:**

A. Antimicrobial agent
B. Emulsifier
C. Stabilizer
D. Sweetener

Answer: A

Sol: ✅ (a) Antimicrobial agent: • Nisin is a natural preservative produced by *Lactococcus lactis*. • It inhibits Gram-positive bacteria and spores. • Used in cheese, canned foods, and beverages. • Approved by WHO and FAO for food use.
❌ (b) Emulsifier: • Emulsifiers like lecithin aid in mixing oil and water, not microbial inhibition.
❌ (c) Stabilizer: • Stabilizers maintain consistency, not preserve from microbes.
❌ (d) Sweetener: • Nisin has no sweetening properties.

Q.10 **Strong BIS Headquarters is situated in:**

A. Pune
B. Chennai
C. New Delhi
D. Ajmer

Answer: C

Sol: ✅ (c) New Delhi: • The Bureau of Indian Standards (BIS) has its central headquarters in New Delhi. • It operates under the Ministry of Consumer Affairs. • BIS is the national body for standards, certification, and quality assurance. • Key responsibilities include ISI certification and hallmarking.
❌ (a) Pune, (b) Chennai, (d) Ajmer: • These cities host regional offices, not the main headquarters.

Q.11 **In high temperature short time method of pasteurization, milk is heated at:**

A. 72°C for 15 seconds
B. 62°C for 15 seconds
C. 72°C for 30 minutes
D. 62°C for 30 minutes

Answer: A

Sol: ✅ (a) 72°C for 15 seconds: • HTST (High-Temperature Short-Time) pasteurization is widely used in dairy. • It effectively kills *Mycobacterium tuberculosis* and *Coxiella burnetii*, the most heat-resistant non-spore forming pathogen in milk. • Maintains taste, nutrients, and safety. • Preferred for large-scale milk processing.
❌ (b) 62°C for 15 seconds: • Insufficient time and temperature for pasteurization.
❌ (c) 72°C for 30 minutes: • Excessive duration that may degrade milk quality.
❌ (d) 62°C for 30 minutes: • Refers to LTLT (Low-Temperature Long-Time) method, not HTST.

Q.12 **Bitterness in colocasia is due to:**

A. Calcium oxalate
B. Calcium chloride
C. Potassium oxalate
D. Calcium carbonate

Answer: A

Sol: ✅ (a) Calcium oxalate: • Colocasia (taro) contains needle-shaped raphides of calcium oxalate. • These crystals cause bitterness and irritation in the mouth and throat. • Cooking or soaking neutralizes the oxalate content. • Consumption without proper cooking may cause throat itchiness.
❌ (b) Calcium chloride: • Used in food processing but not naturally found in colocasia.
❌ (c) Potassium oxalate: • Not the main compound in colocasia responsible for bitterness.
❌ (d) Calcium carbonate: • Present in chalk or antacids; not related to colocasia's bitterness.

Q.13 **Tocopherol is an example of:**

A. Anticaking agent
B. Antioxidant
C. Flavouring agent
D. None of these

Answer: B

Sol: ✅ (b) Antioxidant: • Tocopherol, mainly α-tocopherol, is a natural form of Vitamin E. • Protects fats and oils in foods from oxidation and rancidity. • Also functions as a dietary antioxidant in the human body. • Common in oil-based products like margarine and dressings.
❌ (a) Anticaking agent: • Prevents clumping in powders; examples include silica and talc.
❌ (c) Flavouring agent: • Tocopherol has no significant taste-enhancing properties.
❌ (d) None of these: • Incorrect because tocopherol's antioxidant role is well recognized.

Q.14 **Butylated Hydroxyanisole (BHA) is:**

A. Chelating agent
B. Antioxidant
C. Stabilizer
D. Emulsion

Answer: B

Sol: ✅ (b) Antioxidant: • BHA is a synthetic antioxidant used in food, cosmetics, and pharmaceuticals. • Prevents oxidation of fats and oils, extending product shelf life. • Common in bakery products, snacks, and meat products. • Works by neutralizing free radicals and delaying rancidity.
❌ (a) Chelating agent: • Chelators bind metal ions (e.g., EDTA); BHA doesn't serve this function.
❌ (c) Stabilizer: • Stabilizers maintain consistency but don't act as antioxidants.
❌ (d) Emulsion: • Emulsifiers help mix oil and water phases—not related to BHA's function.

Q.15 **Germination affects nutritive value of legumes by:**

A. Increase in vitamin C content
B. Decrease in trypsin inhibitor activity
C. Increase in enzyme activity
D. All of these

Answer: D

Sol: ✅ Germination significantly improves the nutritive value of legumes in several ways, making option (d) All of these the correct answer. Firstly, vitamin C content increases during germination due to metabolic activation, which synthesizes ascorbic acid in the sprouting seed. This is particularly important as legumes typically lack vitamin C in their raw dry state.
Secondly, trypsin inhibitors, which are anti-nutritional factors that interfere with protein digestion, are reduced during germination. The enzymatic activity during sprouting breaks down these inhibitors, thereby improving protein bioavailability and digestibility. This makes sprouted legumes much healthier for consumption.
Thirdly, germination activates a host of enzymes, such as amylases, proteases, and lipases, which not only break down complex starches, proteins, and fats into simpler absorbable forms but also reduce flatulence-causing oligosaccharides like raffinose and stachyose. Enzyme activity also improves the texture, taste, and digestibility of legumes.
Overall, germination transforms dry legumes into a more nutritionally dense, digestible, and functional food, enhancing the content of certain vitamins, decreasing anti-nutrients, and improving the overall nutrient absorption. Therefore, all the mentioned effects are beneficial and accurate outcomes of germination.

Q.16 **Pineapple variety suitable for canning is:**

A. Queen
B. Kew
C. Mauritius
D. Cayenne

Answer: B

Sol: ✅ (b) Kew: • Kew is preferred for canning due to its large size, cylindrical shape, and low fiber content. • It has high juice content and good flavor retention after processing. • Commonly cultivated in India for industrial use.
❌ (a) Queen: • Tasty but smaller, fibrous, not ideal for canning.
❌ (c) Mauritius: • Used for fresh consumption, not preferred in canning.
❌ (d) Cayenne: • Related to Kew but not widely used in India for canning.

Q.17 **Which of the following is non-climacteric type of fruit?**

A. Pineapple
B. Litchi
C. Grape
D. All of these

Answer: D

Sol: ✅ (d) All of these: • Non-climacteric fruits do not continue ripening after harvest. • Pineapple, litchi, and grapes require harvesting at full maturity. • These fruits lack a post-harvest ethylene-induced respiration spike.
❌ (a), (b), (c): • Individually correct, but only (d) includes all.

Q.18 **Richest source of Riboflavin is:**

A. Papaya
B. Mango
C. Bael
D. Karonda

Answer: C

Sol: ✅ (c) Bael: • Bael (Aegle marmelos) is rich in riboflavin (Vitamin B2). • Riboflavin is essential for energy metabolism and cell respiration. • Bael also offers therapeutic properties for digestion and liver health.
❌ (a) Papaya, (b) Mango, (d) Karonda: • Contain less riboflavin compared to Bael.

Q.19 **Cauliflower curds can be stored for a month at:**

A. 0°C with 85–90% RH
B. 15°C with 60–80% RH
C. 15°C with 60–65% RH
D. 20°C with 50–70% RH

Answer: A

Sol: ✅ (a) 0°C with 85–90% RH: Cauliflower is a cool-season vegetable and highly perishable due to its high moisture content and susceptibility to microbial decay and discoloration. Proper storage conditions are essential to extend its shelf life and maintain curd quality. The best way to store cauliflower for up to a month is at 0°C with 85–90% relative humidity (RH). This combination slows down respiration and reduces dehydration, which is critical for preserving texture, flavor, and appearance.
At 0°C, microbial growth is minimized, and enzymatic activities that cause yellowing or browning are significantly reduced. The high RH prevents water loss, preserving freshness and curd compactness. Under these conditions, cauliflower can be stored for 3–4 weeks without substantial quality deterioration.
❌ (b) and ❌ (c) 15°C: These temperatures are too high and accelerate senescence and spoilage. ❌ (d) 20°C: Even more unsuitable for long-term storage, leading to rapid deterioration.
Therefore, 0°C with high RH is ideal for prolonging cauliflower storage life.

Q.20 For curing, sweet potato are kept for 10 days at:

A. 25°C and 85% RH
B. 40°C and 70% RH
C. 80°C and 30% RH
D. 30°C and 80% RH

Answer: D

Sol: ✅ (d) 30°C and 80% RH: Curing is a vital postharvest treatment for root crops like sweet potatoes. It helps to heal mechanical injuries, form suberized protective layers, and reduce microbial infection before storage. The most effective curing conditions for sweet potatoes are 30°C temperature and 80–90% relative humidity for 5–10 days.
These conditions facilitate rapid wound healing and help in the formation of a corky layer that reduces water loss and prevents decay. Curing also converts some starches into sugars, improving sweetness and palatability. After proper curing, sweet potatoes can be stored for several months without significant losses.
❌ (a) 25°C is slightly below the optimum and less efficient. ❌ (b) 40°C can cause heat damage and dehydration. ❌ (c) 80°C and 30% RH are completely unsuitable and will cause product spoilage.
Thus, 30°C with 80% RH is the best practice for curing sweet potatoes.

Q.21 Which is the precursor of Ethylene?

A. Tryptophane
B. Methionine
C. ABA
D. IAA

Answer: B

Sol: ✅ (b) Methionine: • Ethylene, a gaseous plant hormone, plays a vital role in fruit ripening, leaf abscission, and stress responses. • Methionine is the immediate precursor of ethylene in higher plants. • The biosynthesis follows the Yang Cycle, where methionine is converted into S-adenosyl methionine (SAM), which is further converted into 1-aminocyclopropane-1-carboxylic acid (ACC) by ACC synthase. ACC is then converted into ethylene by ACC oxidase. • This cycle ensures a rapid response to developmental and environmental cues.
❌ (a) Tryptophane: • Precursor for auxin (IAA), not ethylene.
❌ (c) ABA (Abscisic Acid) and ❌ (d) IAA (Indole-3-Acetic Acid): • These are plant hormones themselves and not related to ethylene synthesis.

Q.22 Which bean is used for extraction of gum?

A. Broad bean
B. Cluster bean
C. French bean
D. Hyacinth bean

Answer: B

Sol: ✅ (b) Cluster bean: Cluster bean (Cyamopsis tetragonoloba) is used for commercial extraction of guar gum, a galactomannan polysaccharide extracted from guar seeds. Guar gum is a natural thickening, stabilizing, and emulsifying agent used in food, textile, paper, and oil industries.
India is the largest producer of cluster bean and exporter of guar gum. In the food industry, guar gum is used in products like ice creams, yogurts, soups, and sauces. It also has applications in gluten-free baking due to its high water-binding capacity.
❌ (a) Broad bean, ❌ (c) French bean, ❌ (d) Hyacinth bean: These are not commercially used for gum extraction. Thus, cluster bean is the correct answer for gum extraction.

Q.23 Which is the staple vegetable in Indian diet?

A. Tomato
B. Cauliflower
C. Potato
D. Chilli

Answer: C

Sol: ✅ (c) Potato: Potato is the most widely consumed and cultivated staple vegetable in India. It is a dietary staple due to its availability, affordability, high caloric value, and versatility. Rich in carbohydrates, particularly starch, potatoes serve as a base in countless Indian dishes across all regions and socioeconomic groups.
Potatoes are grown year-round in many states like Uttar Pradesh, West Bengal, and Bihar. Due to their neutral flavor and ability to absorb spices, they are an integral part of daily meals from curries to snacks.
❌ (a) Tomato: Used widely but not as a staple. ❌ (b) Cauliflower and ❌ (d) Chilli: More seasonal and used as accompaniments. Thus, potato is rightly recognized as the staple vegetable in the Indian diet.

Q.24 **According to FPO, the maximum limit of SO_2 allowed in squashes and cordials is:**

A. 350 ppm
B. 500 ppm
C. 1000 ppm
D. 600 ppm

Answer: A

Sol: ✅ (a) 350 ppm: According to the Fruit Products Order (FPO), the maximum permissible limit of sulphur dioxide (SO_2) in squashes and cordials is 350 ppm. SO_2 is widely used as a preservative due to its antimicrobial and antioxidant properties, especially in acidic beverages.
Exceeding the limit may cause allergic reactions and flavor alteration, especially in sulfite-sensitive individuals. Regulatory bodies strictly monitor its use to ensure food safety.
❌ (b), ❌ (c), ❌ (d): Higher than safe limits for squashes and cordials. Therefore, 350 ppm is the correct maximum limit for SO_2 in such products.

Q.25 **Toddy from coconut is prepared by:**

A. Deep Frying
B. Fermentation
C. Hydrogenation
D. Oxidation

Answer: B

Sol: ✅ (b) Fermentation: Toddy is an alcoholic beverage obtained by the fermentation of coconut sap. The sap (called neera) is collected from the inflorescence of coconut palms and undergoes natural fermentation within a few hours due to wild yeast and microbes. The process converts sugars into alcohol and carbon dioxide.
Toddy is consumed locally in various regions and is mildly alcoholic. The fermentation can also be controlled or extended to produce vinegar or stronger alcoholic drinks.
❌ (a) Deep Frying, ❌ (c) Hydrogenation, ❌ (d) Oxidation: Not applicable to toddy production. Thus, fermentation is the biological process behind toddy preparation.

Q.26 **Yellow coloured vegetables are rich source of:**

A. Vitamin A
B. Vitamin B
C. Vitamin C
D. Vitamin D

Answer: A

Sol: ✅ (a) Vitamin A: Yellow-colored vegetables like carrots, pumpkin, and sweet potatoes are rich in beta-carotene, a precursor to vitamin A. This vitamin is essential for eye health, immunity, and skin integrity. Beta-carotene gives these vegetables their distinct yellow to orange hue and is converted to vitamin A in the liver.
These vegetables are highly recommended in diets to combat vitamin A deficiency, which is common in developing regions.
❌ (b) Vitamin B, ❌ (c) Vitamin C, ❌ (d) Vitamin D: These may be present but not in significant quantities in yellow vegetables. Therefore, vitamin A is the correct answer.

Q.27 **The toxicity of SO_2 increases at:**

A. Low temperature
B. High temperature
C. Moderate temperature

D. No effect of temperature

Answer: B

Sol: ✅ (b) High temperature: The toxicity of sulphur dioxide (SO_2) increases at high temperatures. Heat accelerates the release and penetration of SO_2 gas into food and biological systems, enhancing its reactivity. High temperatures also cause SO_2 to volatilize more easily, increasing exposure through inhalation or absorption.
This can pose a risk during thermal processing or storage in hot climates, especially to individuals sensitive to sulfites.
❌ (a), ❌ (c), ❌ (d): Not correct; temperature has a significant effect on SO_2 behavior. Hence, SO_2 becomes more toxic under high temperature conditions.

Q.28 **Enzyme responsible for converting pectin into pectic acid is:**

A. Pectinase
B. Proto-pectinase
C. Pectic Methyl Esterase (PME)
D. Poly Galucturonase

Answer: C

Sol: ✅ (c) Pectic Methyl Esterase (PME): PME is an enzyme that acts on pectin, a structural carbohydrate found in plant cell walls, by removing methyl groups from the esterified pectin. This process converts pectin into pectic acid, making it less soluble and often leading to gelling in the presence of calcium.
PME is widely used in the food industry during fruit juice clarification, jam setting, and also occurs naturally during fruit ripening, affecting texture.
❌ (a) Pectinase: A general term; it includes both PME and polygalacturonase. ❌ (b) Proto-pectinase: Converts protopectin to soluble pectin. ❌ (d) Polygalacturonase: Acts after PME to break down pectic acid. Therefore, PME is specifically responsible for converting pectin into pectic acid.

Q.29 **The term 'Climacteric' was first used by:**

A. Gane (1934)
B. Kidd and West (1927)
C. Cruess (1912)
D. Bleekar (1929)

Answer: B

Sol: ✅ (b) Kidd and West (1927): The term 'climacteric' was introduced by Kidd and West in 1927 to describe a significant increase in respiration rate and ethylene production during the ripening of certain fruits like bananas, apples, and mangoes.
Climacteric fruits undergo a spike in metabolic activity that leads to rapid softening, sweetness, and color changes. This phase is key in postharvest handling because it determines storage, transport, and ripening control strategies.
❌ (a), ❌ (c), ❌ (d): Although these scientists made contributions to postharvest physiology, they did not coin the term "climacteric." Thus, Kidd and West are credited with the first use of the term in fruit ripening.

Q.30 **O_2 requirement for Apple storage in Controlled Atmosphere (CA) is:**

A. 2%
B. 3%
C. 5%
D. 7%

Answer: A

Sol: ✅ (a) 2%: In Controlled Atmosphere (CA) storage, oxygen levels are reduced to around 2% and carbon dioxide is increased (typically to 1–3%) to slow down the respiration rate and ethylene activity of apples. These low oxygen levels delay ripening and extend the storage life significantly, allowing apples to stay fresh for up to 6–12 months.
Lowering oxygen to 2% slows metabolic processes, reduces decay, and maintains texture and flavor.
❌ (b), ❌ (c), ❌ (d): Higher O_2 levels accelerate respiration and reduce storage life. Thus, 2% oxygen is ideal for CA storage of apples.

Q.31 **Storage temperature for Asparagus is:**

A. 0–5°C
B. 5–7°C
C. 7–11°C
D. 10–15°C

Answer: A

Sol: ✅ (a) 0–5°C: Asparagus is a highly perishable vegetable due to its high respiration rate. It must be stored at 0–5°C with high relative humidity (90–95%) to slow down respiration, prevent wilting, and extend freshness. Storage at this temperature maintains its tenderness, color, and flavor for several days.
Even short exposure to temperatures above 7°C accelerates deterioration and leads to rapid quality loss.
❌ (b), ❌ (c), ❌ (d): These ranges are too high for safe asparagus storage. Hence, 0–5°C is the optimal range for maintaining asparagus quality postharvest.

Q.32 **Moisture content in dried vegetable is:**

A. 2%
B. 3%
C. 5%
D. 6%

Answer: D

Sol: ✅ (d) 6%: Properly dried vegetables have a final moisture content of around 6%, which is essential to prevent microbial growth and enzymatic spoilage. At this level, the water activity is low enough to inhibit mold, yeast, and bacterial growth, ensuring a longer shelf life during ambient storage.
Higher moisture (above 10%) may lead to spoilage, while lower than 4% may cause overdrying and loss of texture and flavor.
❌ (a), ❌ (b), ❌ (c): Though low moisture is desirable, 6% is considered optimum for most dried vegetables. Hence, 6% moisture content is ideal in dried vegetables.

Q.33 **Vitamin which is not found in Fruits and Vegetables:**

A. Vitamin A
B. Vitamin B_1
C. Vitamin B_6
D. Vitamin B_{12}

Answer: D

Sol: ✅ (d) Vitamin B_{12}: Vitamin B_{12} (cobalamin) is unique among the B-vitamins because it is not synthesized by plants. It is found naturally only in animal-based foods like meat, eggs, dairy, and fish. Fruits and vegetables do not contain vitamin B_{12}, making it a concern for vegetarians and vegans who may need fortified foods or supplements to meet their dietary needs.
❌ (a) Vitamin A: Present as beta-carotene in carrots, mangoes, spinach, etc. ❌ (b) Vitamin B_1 and ❌ (c) B_6: Found in green leafy vegetables, legumes, and whole grains.
Hence, vitamin B_{12} is the correct answer as it is absent in plant-based sources.

Q.34 **As fruits mature, the specific gravity will:**

A. Increase
B. Decrease
C. Remain constant
D. None of these

Answer: A

Sol: ✅ (a) Increase: Specific gravity is defined as the ratio of the density of a substance (fruit) to that of water. In fruit maturation, accumulation of soluble solids like sugars, starches, and organic acids leads to an increase in the density of the fruit. This results in higher specific gravity, which is often used as a maturity or ripeness indicator, especially in fruits like mangoes, pineapples, and papayas.
Increased specific gravity suggests higher dry matter and sugar accumulation — key signs of fruit development. It is a non-destructive, easy-to-use indicator, especially in the field or packing line.
❌ (b), ❌ (c), ❌ (d): These do not reflect the normal physiological progression in maturing fruits. Thus, as fruits mature, specific gravity increases.

Q.35 'Solidity' is the maturity index for:

A. Root vegetables
B. Seed vegetables
C. Leafy vegetables
D. Cucurbits

Answer: C

Sol: ✅ (c) Leafy vegetables: Solidity refers to the ratio of dry matter to the total volume or weight of a product and is commonly used to assess the maturity of leafy vegetables, especially those forming heads, like cabbage and lettuce. As the leaves develop and compact tightly within the head, the solidity increases, indicating better maturity, structure, and marketable quality.
Higher solidity means denser heads, better storage potential, and improved resistance to mechanical damage during transport. This index helps in determining the optimal harvest time, ensuring good texture and quality for consumers.
❌ (a), ❌ (b), ❌ (d): These types of vegetables are not evaluated based on solidity. Therefore, leafy vegetables are assessed for maturity using solidity.

Q.36 Which of the following plant hormone is considered as ripen?

A. Cytokinin
B. GA_3
C. Ethylene
D. IAA

Answer: C

Sol: ✅ (c) Ethylene: Ethylene is a gaseous plant hormone known as the "ripening hormone." It plays a central role in the ripening of climacteric fruits such as bananas, mangoes, tomatoes, and papayas. Ethylene regulates a wide range of physiological processes including fruit ripening, flower wilting, leaf abscission, and senescence. During fruit ripening, ethylene promotes enzymatic activities that lead to softening of tissues, breakdown of starch into sugars (sweetening), degradation of chlorophyll (color change), and development of aroma and flavor.
It is also used commercially for artificial ripening in controlled environments. The application of ethylene helps synchronize ripening and improves market uniformity.
❌ (a) Cytokinin promotes cell division, not ripening. ❌ (b) GA_3 (Gibberellic acid) is involved in stem elongation and seed germination. ❌ (d) IAA (Indole-3-acetic acid) is an auxin involved in apical dominance and cell elongation. Hence, ethylene is the correct answer.

Q.37 Maximum density of water is at a temperature of:

A. 0°C
B. 4°C
C. -4°C
D. -7°C

Answer: B

Sol: ✅ (b) 4°C: Water exhibits a unique property where it reaches its maximum density at 4°C. This anomaly arises due to hydrogen bonding. As water cools from higher temperatures, its molecules come closer together, increasing the density. However, below 4°C, the hydrogen bonds start forming a lattice-like structure (as in ice), which increases the volume and decreases the density.
This is why ice floats on water — it's less dense. The 4°C property is critical in nature, as it ensures that lakes and ponds freeze from the top down, insulating aquatic life below during winters.
❌ Other options do not represent the point of maximum density. So, 4°C is scientifically correct.

Q.38 In onion pink colour is due to:

A. Anthocyanin
B. Carotene
C. Xanthophyll
D. Quercetin

Answer: A

Sol: Pink coloration in onions stems from **anthocyanins**, a class of flavonoid pigments that impart red, purple, and pink hues in many plants. In onion varieties such as red or pink onions, the predominant anthocyanin is cyanidin-3-O-glucoside along with other. These water-soluble pigments accumulate in the epidermal layers of the bulb scales, generating the distinctive pink to red tones.

Other flavonoids like **quercetin** contribute primarily yellow to brown shades, and are abundant in onion skins and outer layers—but not responsible for pink coloration.

Thus, **anthocyanin** is the correct pigment causing the pink color in onions.

Q.39 **Guava fruit is botanically known as:**

A. Drupe
B. Sorosis
C. Berry
D. Pome

Answer: C

Sol: ✅ (c) Berry: Botanically, guava (*Psidium guajava*) is classified as a simple fleshy fruit, specifically a berry. In botanical terms, a berry develops from a single ovary and contains multiple seeds embedded within fleshy pulp. The entire pericarp (outer wall of the ovary) becomes soft and edible. Guava fits this definition well, as its outer skin and fleshy inner part are both edible, and seeds are embedded within. It is a true berry because it develops from a single ovary of a single flower without fusion of other floral parts.
❌ Drupe (e.g., mango) has a single seed with a hard endocarp. ❌ Sorosis (e.g., pineapple) and ❌ Pome (e.g., apple) have different floral origins. Thus, the correct classification is berry.

Q.40 **Secondary metabolites:**

A. are essential to microbe function
B. are by-products of metabolism that are not important to microbe function
C. are products that require additional processing before they can be packaged
D. are harvested during the exponential phase of growth

Answer: B

Sol: ✅ (b) Secondary metabolites are compounds produced during the stationary phase of microbial growth that are not essential for the organism's immediate survival but can provide ecological advantages. These include antibiotics, pigments, alkaloids, and toxins. Unlike primary metabolites (like amino acids or nucleotides), secondary metabolites do not play a direct role in growth, development, or reproduction but can inhibit competitors or enhance survival under stress. Penicillin, for example, is a well-known secondary metabolite produced by the fungus *Penicillium*. ❌ (a) Incorrect—these are not essential for microbial function. ❌ (c) Processing isn't relevant to classification. ❌ (d) They are harvested during the stationary phase, not exponential.

Q.41 **The membrane lipid hypothesis was given by:**

A. Kidd & West
B. James Harrison
C. Raison & Lyons
D. Graham & Patterson

Answer: C

Sol: ✅ (c) The Membrane Lipid Hypothesis was proposed by Raison and Lyons to explain chilling injury in plants. It states that membrane fluidity, regulated by lipid composition, determines a plant's response to low temperatures. Saturated fats solidify faster than unsaturated ones, making membranes rigid and prone to damage at low temperatures. ❌ Other scientists contributed to different postharvest or physiological models.

Q.42 **Hen and Chicken disorder is associated with:**

A. Mango
B. Tomato
C. Grapes

D. Guava

Answer: C

Sol: ✅ (c) The Hen and Chicken disorder is a physiological condition in grapes where clusters show a mix of normal (hen) and underdeveloped (chicken) berries. The smaller berries fail to develop due to poor pollination or nutrient imbalance, especially boron and zinc deficiency. It reduces market quality and yield. Proper micronutrient management can reduce incidence. ❌ All other crops do not exhibit this specific disorder.

Q.43 **The point at which the dried products just become lumpy is known as?**

A. Danger Point
B. Saturated Point
C. Critical Point
D. Safety Point

Answer: C

Sol: ✅ (c) The Critical Point is defined as the moisture content level where dried food products begin to absorb moisture from the air, leading to clumping, lumping, or stickiness. It is crucial in storage and packaging as exceeding this point compromises shelf life, texture, and microbial safety. ❌ Other options like Safety or Danger Point are general terms and not technically accurate.

Q.44 **What is the percentage of sugars in Honey?**

A. 42%
B. 82%
C. 65%
D. 62%

Answer: B

Sol: ✅ (b) Honey contains approximately 80–82% sugars, mostly in the form of fructose (38%) and glucose (31%), with small amounts of maltose and sucrose. The remaining composition includes water (about 17%), enzymes, amino acids, vitamins, and minerals. Its high sugar concentration and low water activity make honey a natural preservative and antimicrobial. ❌ Other percentages understate the actual sugar concentration in honey.

Q.45 **Fungus which mostly grown on grapes:**

A. Geotrichum
B. Penicillium
C. *Botrytis*
D. *Colletotrichum*

Answer: C

Sol: ✅ (c) *Botrytis cinerea* is a fungus that commonly infects grapes, causing gray mold disease. Under humid conditions, it leads to decay, but under controlled drying, it can also cause "noble rot," used in producing high-quality dessert wines. The disease reduces fruit quality, shelf life, and market value. ❌ (a), (b), and (d) are fungi affecting other fruits or vegetables, but not typically dominant on grapes.

Q.46 **Lye peeling is done at a temperature of:**

A. 75°C
B. 84°C
C. 93°C
D. 105°C

Answer: C

Sol: ✅ (c) 93°C is the standard temperature for lye peeling, a process where a hot lye (NaOH) solution is used to remove skins of fruits and vegetables like peaches or tomatoes. It loosens the skin without damaging the pulp and is followed by a neutralizing wash. ❌ Other temperatures are not effective or may damage the product.

Q.47 **Vitamin D is chemically known as:**

A. Retinol
B. Cobalamin
C. Calciferol
D. Tocopherol

Answer: C

Sol: ✅ (c) Calciferol is the chemical name for Vitamin D, including Vitamin D_2 (ergocalciferol) and D_3 (cholecalciferol). It aids calcium absorption and maintains bone health. Deficiency causes rickets in children and osteomalacia in adults. ❌ (a) Retinol is Vitamin A, ❌ (b) Cobalamin is Vitamin B_{12}, ❌ (d) Tocopherol is Vitamin E.

Q.48 **Which of the following is associated with 'browning' disorder?**

A. Apple
B. Cabbage
C. Cauliflower
D. Citrus

Answer: C

Sol: (c) Cauliflower suffers from a physiological disorder called browning, often due to excess moisture, high temperature, or boron deficiency. It leads to brown patches or spots on curds, reducing marketability. Other crops may show different disorders but not specifically this one.

Q.49 **What is the threshold level of ethylene in fruit and vegetable?**

A. 0.01 µL/L
B. 0.02 µL/L
C. 0.03 µL/L
D. 0.04 µL/L

Answer: A

Sol: ✅ (a) The threshold ethylene level that can initiate ripening or senescence in fruits and vegetables is 0.01 µL/L (ppm). Even at such low levels, ethylene can accelerate ripening in climacteric fruits and cause disorders like yellowing or abscission in leafy vegetables. ❌ Higher levels are above threshold and harmful.

Q.50 **Emission of Ethylene during transportation of cut flowers causes a disorder called:**

A. Bud opening
B. Sleepiness
C. Bent neck
D. Calyx splitting

Answer: B

Sol: ✅ (b) Sleepiness: • In floriculture, "sleepiness" refers to wilting or premature senescence due to ethylene. • Ethylene accelerates petal drooping and flower death during transit. • Use of ethylene inhibitors (like silver thiosulfate) helps prevent it.
❌ (a) Bud opening: • Ethylene may promote bud opening, but it's not a disorder.
❌ (c) Bent neck: • Typically results from water stress or air embolism.
❌ (d) Calyx splitting: • Caused by genetic or mechanical factors, not ethylene

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Q.51 For Low Sugar content, potato tubers are stored at:

A. 5°C
B. 10°C
C. 15°C
D. 20°C

Answer: B

Sol: ✅ (b) 10°C: Potato tubers are highly sensitive to storage temperature because it influences sugar content, sprouting, and textural integrity. When stored at low temperatures like 2–5°C, potatoes experience cold-induced sweetening. This results in the conversion of starch into reducing sugars, mainly glucose and fructose, through the activation of amylase enzymes. These sugars, when subjected to frying temperatures, react with amino acids in the Maillard reaction, leading to the formation of acrylamide—a compound considered carcinogenic. Such sweetening also negatively affects color and taste, producing a dark, bitter end product. The ideal temperature to prevent excessive sugar buildup while keeping sprouting under control is around 10°C. At this temperature, the rate of sugar formation is significantly slower compared to lower temperatures, and sprouting can be managed effectively using sprout suppressants like CIPC (chlorpropham). Respiration rate and microbial activity are also reduced, making it suitable for medium to long-term storage. ❌ (a) 5°C: Triggers cold-induced sweetening and leads to unacceptably high sugar content. ❌ (c) 15°C: Promotes sprouting and weight loss due to increased respiration. ❌ (d) 20°C: Completely unsuitable; causes rapid deterioration. Therefore, 10°C is the most effective temperature for maintaining low sugar levels and preserving overall tuber quality.

Q.52 Which chemical is used for controlling sprouting of onions in storage?

A. Maleic Hydrazide (MH)
B. Ethylene (C_2H_4)
C. GA
D. All of these

Answer: A

Sol: ✅ (a) Maleic Hydrazide (MH): Maleic hydrazide is the most widely used chemical for controlling sprouting in onions during storage. It is applied as a foliar spray 10–15 days before harvest when the necks of the bulbs are still green. MH translocates into the bulb tissues and inhibits cell division in meristematic tissues, thereby suppressing sprout development during storage.
This sprout suppression is critical because sprouting leads to moisture loss, quality decline, and reduced market value. MH-treated onions can be stored for 4–6 months under proper conditions (0–2°C, 65–70% RH) without significant sprouting.
❌ (b) Ethylene: While ethylene can suppress sprouting in some crops, it is less effective and not standard for onion storage. ❌ (c) Gibberellic Acid (GA): Promotes growth and is not used for sprout suppression. ❌ (d) All of these: Incorrect, as only MH is specifically and effectively used for this purpose.
Hence, Maleic Hydrazide (MH) is the correct and most effective chemical used for controlling sprouting in onions.

Q.53 Chillies are rich source of:

A. Vitamin A
B. Vitamin C
C. Vitamin A and C
D. Vitamin E

Answer: C

Sol: ✅ (c) Vitamin A and C: Chillies, particularly red chillies, are a rich source of both vitamin A (as beta-carotene) and vitamin C (ascorbic acid). Vitamin A is important for vision, skin health, and immune function, while vitamin C supports immunity and antioxidant defense.
Fresh green chillies are particularly high in vitamin C, whereas mature red chillies have more beta-carotene, giving them their bright red color. Including chillies in the diet can therefore contribute significantly to the intake of these essential vitamins.
❌ (a) and ❌ (b): Each represents only one vitamin; chillies are rich in both. ❌ (d) Vitamin E: Present in small amounts, not significant. Hence, chillies are a dual source of both vitamins A and C.

Q.54 Vegetables are subjected to drying after:

A. Sulfuring
B. Sulphitation
C. Blanching
D. None of these

Answer: C

Sol: ✅ (c) Blanching: Blanching is a crucial pre-drying treatment applied to most vegetables. It involves exposing vegetables to boiling water or steam for a short duration, followed by rapid cooling. This process inactivates enzymes (like peroxidase and catalase) that cause spoilage, preserves color, and improves texture during drying.
Blanching also helps in partially cooking the vegetable, shortening drying time, and enhancing rehydration capacity of the dried product. It is especially important for green vegetables like peas, beans, spinach, and cauliflower.
❌ (a) Sulfuring and ❌ (b) Sulphitation: Used mainly for fruits. ❌ (d) None of these: Incorrect as blanching is standard practice for vegetables. Thus, blanching is the appropriate step before drying vegetables.

Q.55 **Concentration of SO_2 in concentrated juice is:**

A. 500 ppm
B. 1000 ppm
C. 1500 ppm
D. 350 ppm

Answer: C

Sol: ✅ (c) 1500 ppm: In concentrated fruit juices, Sulphur dioxide (SO_2) is added as a preservative to prevent microbial spoilage, browning, and loss of flavor. As these juices have high sugar content and are prone to microbial growth, a higher concentration of SO_2 is permissible. According to the Fruit Products Order (FPO) and food safety standards, the maximum permissible limit of SO_2 in concentrated juices is 1500 ppm.
This high concentration is necessary to ensure stability during storage and transportation, especially in bulk before reconstitution. However, it must be removed or reduced before the final product is consumed or processed into beverages.
❌ (a), ❌ (b), ❌ (d): These are the limits for less concentrated products like squashes, RTS, and cordials. Thus, 1500 ppm is the correct limit for SO_2 in concentrated juices.

Q.56 **Vegetable which is not blanched before drying:**

A. Cauliflower
B. Palak
C. Onion
D. Tomato

Answer: C

Sol: Blanching is a pretreatment process done before drying in most vegetables to stop enzyme activity, preserve natural color, texture, and nutritional value.
Cauliflower is blanched before drying to avoid browning and strong flavor changes.
Palak (spinach) is blanched to preserve its green color and reduce drying time.
Tomato is blanched to loosen skin and maintain flavor during drying.
Onion, however, is not blanched before drying because blanching causes loss of its characteristic flavor and pungency. Onions can be directly sliced and dehydrated without blanching.
Therefore, the correct answer is Onion.

Q.57 **Agricultural Produce (Grading and Marketing) Act (1937) is also:**

A. PFA Act
B. FPO Act
C. Agmark Act
D. ISI Act

Answer: C

Sol: ✅ (c) Agmark Act: The Agricultural Produce (Grading and Marketing) Act, 1937, is commonly known as the Agmark Act. It was enacted to prescribe standards for agricultural and allied commodities to ensure quality and purity for both domestic and export markets.
AGMARK stands for Agricultural Marketing, and it certifies products such as cereals, pulses, edible oils, fruits, vegetables, and honey. The certification is conducted by the Directorate of Marketing and Inspection (DMI) under the Ministry of Agriculture and Farmers Welfare, Government of India.
❌ (a) PFA Act relates to food safety, ❌ (b) FPO relates to fruit products, and ❌ (d) ISI is for industrial standards. Thus, the correct answer is Agmark Act.

Q.58 In cucumber, chilling-injury symptoms occur at:

A. <7°C
B. 7°C
C. 10°C
D. >10°C

Answer: A

Sol: ✅ (a) Cucumber, being a chilling-sensitive crop, shows chilling injury when stored below 7°C. Symptoms include pitting, water-soaked spots, and increased decay. Thus, ideal storage is between 10–12°C. ❌ All higher temperatures are above chilling threshold and safe for cucumbers.

Q.59 Which of the following is a rapid precooling method?

A. Forced air Cooling
B. Hydro Cooling
C. Vacuum Cooling
D. Evaporative Cooling

Answer: B

Sol: ✅ (b) Hydro cooling involves the use of chilled water to rapidly reduce the temperature of harvested produce. It's very effective for crops like sweet corn, carrots, and peaches. It's faster than air cooling due to water's higher heat transfer capacity. ❌ Forced-air and vacuum cooling are also used but hydro cooling is fastest for many crops.

Q.60 What is the operating principle behind oven drying for determining moisture content of foods?

A. Colour change is measured
B. Loss of weight represents loss of water
C. Change in refractive index is measured
D. Change in light absorbance is measured

Answer: B

Sol: ✅ (b) Loss of weight represents loss of water is the fundamental principle of oven drying method for determining moisture content in foods. A known weight of the food sample is kept in a hot air oven at a specific temperature (usually 100–105°C) until it reaches a constant weight. The reduction in weight is attributed to the evaporation of water, and the difference is used to calculate the moisture percentage. This method is simple, widely used, and suitable for grains, vegetables, fruits, and spices. ❌ *(a)*, *(c)*, and *(d)* relate to other techniques like colorimetry, refractometry, or spectrophotometry and are not applicable to oven drying.

Q.61 Degreening is not applicable in:

A. Banana
B. Guava
C. Mango
D. Citrus

Answer: B

Sol: ✅ (b) Guava does not undergo a degreening process because it naturally ripens without significant chlorophyll breakdown in a controlled manner. Degreening is a technique used to enhance the appearance of certain fruits by applying ethylene gas or ethephon, especially when green pigmentation (chlorophyll) masks ripeness. Guava typically shows no major green coloration that needs to be removed to improve its marketability. Its ripening is uniform and does not require external ethylene treatment for color change. ❌ (a) Banana, (c) Mango, and (d) Citrus are commonly subjected to degreening, especially citrus fruits like oranges and lemons, where the peel retains green pigmentation even when internally ripe. Bananas and mangoes may also be degreened to enhance visual appeal and uniformity before marketing.

Q.62 Under normal conditions Orchid can be stored up to 2 weeks at:

A. 2–4°C

B. 5–7°C
C. 7.5–10°C
D. >10°C

Answer: B

Sol: ✅ (b) 5–7°C is considered an optimal temperature range for short-term storage of orchids, particularly up to 2 weeks. Orchids are sensitive ornamental flowers that require cool, humid, and ethylene-free environments to retain their freshness and aesthetic appeal. Temperatures below 5°C may induce chilling injury, while temperatures above 10°C can accelerate respiration and flower senescence. Cold chain maintenance at 5–7°C with 90–95% relative humidity preserves quality, delays wilting, and maintains petal turgidity during transportation or storage. ❌ *(a)* is too cold and may cause chilling injury. ❌ *(c)* and *(d)* are too warm for extended freshness and may reduce vase life.

Q.63 **Which of the following ingredients in chocolate milk comes from seaweed?**

A. Carrageenan
B. Cocoa
C. Sucrose
D. Glucose

Answer: A

Sol: ✅ (a) Carrageenan is a hydrocolloid extracted from red seaweed (Rhodophyta), primarily used as a stabilizer, thickener, and emulsifier in dairy and chocolate milk. It helps to prevent sedimentation of cocoa particles and gives the milk a smooth texture. It's widely accepted as a safe food additive under regulations. ❌ (b) Cocoa is derived from cacao beans, not seaweed. ❌ (c) Sucrose is a sugar obtained from sugarcane or sugar beet. ❌ (d) Glucose is a simple sugar found in many foods but not from seaweed.

Q.64 **Which of the following packages is an example of aseptic packaging?**

A. Tetra Pak drinking boxes
B. Paper bag
C. Milk carton
D. Plastic bread bag

Answer: A

Sol: Aseptic packaging involves sterilizing both the product and the packaging separately and then filling the product into the package in a sterile environment.

Tetra Pak drinking boxes are a classic example of aseptic packaging. The milk or juice inside is sterilized, and the multilayer packaging (paper, plastic, and aluminum) ensures a long shelf life without refrigeration.

Paper bags, milk cartons, and plastic bread bags do not provide complete aseptic conditions; they only protect the product from physical damage or contamination to some extent.

Q.65 **Which of the following analytical methods can be used to distinguish flavour compounds?**

A. Hydrometry
B. Near infrared spectroscopy
C. Polarimetry
D. Gas chromatography

Answer: D

Sol: ✅ (d) Gas chromatography (GC) is the most effective analytical technique used for separating, identifying, and quantifying volatile and semi-volatile compounds, including flavor compounds. It helps in flavor profiling by separating aroma components, which are then detected using detectors like mass spectrometry (GC-MS). This is essential in food quality control, flavor formulation, and detecting adulteration. ❌ (a) Hydrometry measures density and is unrelated to flavor identification. ❌ (b) Near-infrared spectroscopy is more suitable for bulk composition analysis, not specific volatile compounds. ❌ (c) Polarimetry measures optical rotation, useful for sugars but not for flavor profiling.

Q.66 **Which microorganism is commonly associated with fecal contamination?**

A. Clostridium botulinum
B. Campylobacter jejuni
C. Bacillus cereus
D. Trichinella spiralis

Answer: B

Sol: ✅ (b) Campylobacter jejuni is a major bacterial pathogen causing foodborne illness, commonly linked to fecal contamination, especially in undercooked poultry, unpasteurized milk, and contaminated water. It causes campylobacteriosis, characterized by diarrhea, fever, and abdominal cramps. Its presence indicates poor hygiene and potential fecal matter in food handling or water sources. ❌ (a) Clostridium botulinum causes botulism but is related to anaerobic conditions, not fecal contamination. ❌ (c) Bacillus cereus causes food poisoning through spores but is not specifically linked with fecal contamination. ❌ (d) Trichinella spiralis is a parasitic worm found in undercooked pork, not fecal matter.

Q.67 **Which of the following methods is a quick test for sugar content during the early stages of the brewing process for beer?**

A. Hydrometry
B. Babcock test
C. Wet ashing
D. Soxhlet extraction

Answer: A

Sol: ✅ (a) Hydrometry is the most common and rapid method to estimate sugar concentration during brewing. It works on the principle of density measurement — sugar increases the density of liquid wort, and the hydrometer reading correlates with potential alcohol content. Brewers use this to monitor fermentation progress and calculate alcohol by volume (ABV). ❌ (b) Babcock test is used to determine fat content in milk, not sugars. ❌ (c) Wet ashing is a digestion method for mineral analysis, not sugar measurement. ❌ (d) Soxhlet extraction is used for fat/oil extraction, not sugars.

Q.68 **Which of the following microorganisms cannot tolerate oxygen?**

A. *Clostridium botulinum*
B. *Staphylococcus aureus*
C. *Penicillium roquefortii*
D. *E. coli*

Answer: A

Sol: ✅ (a) *Clostridium botulinum* is an obligate anaerobe, meaning it cannot survive in the presence of oxygen. This microorganism is responsible for causing botulism, a serious foodborne illness. It produces neurotoxins under anaerobic (oxygen-free) conditions, typically in canned or vacuum-packed foods where oxygen is absent. Ensuring proper sterilization and oxygen control in packaging is critical to prevent its growth. ❌ (b) *Staphylococcus aureus* is a facultative anaerobe and can grow in both aerobic and anaerobic conditions. ❌ (c) *Penicillium roquefortii* is a mold that requires oxygen to grow and is used in blue cheese production. ❌ (d) *E. coli* is also a facultative anaerobe, capable of surviving in oxygenated environments.

Q.69 **Which of the following processing methods involves heating foods at high temperatures for short periods of time in order to reduce the risk of food poisoning?**

A. Blanching
B. Ohmic heating
C. Irradiation
D. Pasteurization

Answer: D

Sol: ✅ (d) Pasteurization involves heating food, particularly liquids like milk and juice, to a temperature of 60–85°C for a short duration (15 seconds to a few minutes) to kill harmful microbes, especially pathogens like *Listeria*, *Salmonella*, and *E. coli*. It increases shelf life and ensures food safety without significantly affecting quality. ❌ (a) Blanching is used to inactivate enzymes, not for microbial control in finished foods. ❌ (b) Ohmic heating is an emerging technique but less commonly used in traditional food safety processing. ❌ (c) Irradiation involves ionizing radiation, not heat, and while effective, it's not the same as pasteurization.

Q.70 **Which of the following does not have antimicrobial activity?**

A. Chlorophyll
B. Organic acids
C. Spice extracts
D. Hydrogen peroxide

Answer: A

Sol: ✅ (a) Chlorophyll, the green pigment in plants, plays no known antimicrobial role. It primarily functions in photosynthesis. Though it has antioxidant properties, it does not inhibit microbial growth. ❌ (b) Organic acids like citric and lactic acid lower pH, creating an unfavorable environment for microbial growth. ❌ (c) Spice extracts (like cinnamon, clove, and garlic) possess essential oils with proven antimicrobial properties. ❌ (d) Hydrogen peroxide is a strong oxidizer used as a disinfectant against bacteria, viruses, and fungi.

Q.71 **Tomato fruits for canning are harvested at:**

A. Mature green stage
B. Red ripe stage
C. Immature green stage
D. Half-ripe/pink stage

Answer: B

Sol: ✅ (b) Red ripe stage: Tomatoes intended for canning are harvested at the red ripe stage because this stage ensures maximum development of flavor, color, and sugar-acid balance—key attributes for quality canned products. At this stage, the fruit has fully developed lycopene (the red pigment), and its firmness is still adequate for processing.
Unlike tomatoes harvested for transport, which are picked at earlier stages (like mature green or breaker), canning tomatoes must be fully ripened to ensure they provide the desired taste and texture after heat treatment. The thicker flesh and lower moisture content in processing varieties further enhance their suitability for canning.
❌ (a) Mature green and ❌ (c) Immature green: These stages lack full flavor and color development. ❌ (d) Half-ripe/pink: Not optimal; may not produce uniform quality after processing.
Thus, the red ripe stage is ideal for harvesting tomatoes meant for canning.

Q.72 **For longer storage of cucumber fruits, the temperature should be:**

A. 5°C
B. 10°C
C. 20°C
D. 25°C

Answer: C

Sol: ✅ (c) 20°C: Cucumber is a chilling-sensitive crop and cannot tolerate low-temperature storage for extended periods. Although short-term storage at 10°C is common in some facilities, for longer storage, cucumbers must be stored at temperatures above 12°C, ideally around 20°C, to avoid chilling injury. When stored at temperatures below 10°C, cucumbers may exhibit symptoms like surface pitting, water-soaked areas, softening, and poor shelf appearance.
At 20°C, cucumbers maintain acceptable quality for a moderate storage period, especially when combined with high relative humidity (90–95%) to minimize water loss and shriveling. Modified atmosphere packaging (MAP) is also beneficial at this temperature to lower respiration and delay yellowing.
❌ (a) 5°C and ❌ (b) 10°C: Risk of chilling injury, especially beyond a few days. ❌ (d) 25°C: Too warm; accelerates respiration and decay. Thus, 20°C is suitable for longer storage without inducing chilling damage.

Q.73 **The Limiting Amino acid in green vegetables is:**

A. Arginine
B. Lysine
C. Methionine
D. Tryptophan

Answer: B

Sol: ✅ (b) Lysine: In green vegetables, lysine is often the limiting amino acid. A limiting amino acid is the essential amino acid present in the least amount relative to human nutritional requirements. Lysine is critical for protein synthesis, tissue repair, and calcium absorption.
Green leafy vegetables, although rich in other nutrients such as iron, calcium, vitamins, and fiber, generally have low lysine content. This is especially important in vegetarian or vegan diets where protein comes primarily from plant sources. Therefore, legumes or lysine-rich cereals must be combined with leafy vegetables to provide a balanced amino acid profile.
❌ (a) Arginine and ❌ (d) Tryptophan: Typically adequate in vegetables. ❌ (c) Methionine: More limiting in legumes and pulses. Thus, lysine is the most limiting in green vegetables.

Q.74 **Best maturity index of orange is:**

A. TSS
B. Sugar %
C. Acid %
D. Brix : acid ratio

Answer: D

Sol: (d) Brix : acid ratio: The most reliable maturity index for harvesting oranges is the Brix:acid ratio, which reflects the balance between soluble solids (mainly sugars) and titratable acidity. A higher ratio indicates a sweeter and more palatable fruit. The ideal Brix:acid ratio varies among orange varieties but typically falls between 10:1 to 14:1 for commercial harvesting.
Measuring only TSS (°Brix) or sugar percentage can be misleading if acid levels are high, making the fruit taste sour. The combined ratio provides a better estimate of flavor and consumer acceptability.
(a) TSS, (b) Sugar %, and (c) Acid %: Useful, but incomplete on their own.
Thus, the Brix:acid ratio is considered the most accurate index of orange maturity.

Q.75 **Bacteria which is used to absorb ethylene from storage chamber is:**

A. *Agrobacterium*
B. *Mycobacterium*
C. *Bacillus*
D. *Azotobacter*

Answer: B

Sol: ✅ (b) *Mycobacterium*: Ethylene is a plant hormone responsible for ripening and senescence in fruits and vegetables. To prolong the shelf life of produce in storage, ethylene concentration must be reduced. *Mycobacterium* species are known to have the capacity to oxidize ethylene into inactive compounds like ethylene oxide or CO_2 and water, thereby acting as biological scrubbers in storage environments.
These bacteria use ethylene as a carbon source, thus actively degrading it in the controlled atmosphere (CA) or modified atmosphere (MA) storage systems. Their application helps to maintain product firmness, delay over-ripening, and reduce physiological disorders like softening and yellowing.
❌ (a), ❌ (c), ❌ (d): These bacteria do not have ethylene-absorbing properties. Hence, *Mycobacterium* is the correct answer.

Q.76 **Toughening effect on canned bean is due to:**

A. K
B. Ca
C. S
D. None of these

Answer: B

Sol: ✅ (b) Ca: The toughening effect in canned beans is primarily due to the presence of calcium (Ca). During canning, calcium ions form calcium pectate by cross-linking with pectin substances in the cell wall. This reaction strengthens the cell walls and makes the texture firmer or sometimes excessively hard, especially if Ca is added as calcium chloride or calcium lactate in the brine for firmness.
Although calcium is added intentionally in some cases to retain firmness, over-concentration or improper processing may lead to undesirable toughening, making the product less palatable.
❌ (a) Potassium (K), ❌ (c) Sulfur (S): Not responsible for such textural changes. Thus, calcium is the main element causing toughening in canned beans.

Q.77 **During controlled atmospheric storage composition of which of the following set of gases is controlled:**

A. $O_2 + N_2$

B. $CO_2 + N_2$
C. $C_2H_4 + N_2$
D. $CO_2 + O_2$

Answer: D

Sol: ✅ (d) $CO_2 + O_2$: Controlled Atmosphere (CA) Storage is used to extend the shelf life of perishable produce like apples, pears, and kiwifruit by modifying atmospheric gases. The key gases that are actively regulated are oxygen (O_2) and carbon dioxide (CO_2).
O_2 is reduced (typically to 1–3%), and CO_2 is increased (around 1–5%) depending on the commodity. This slows down respiration, delays ethylene production, and inhibits microbial activity, allowing storage for several months with minimal quality loss.
❌ (a), ❌ (b), ❌ (c): Nitrogen is used as a filler gas but is not actively controlled. Ethylene is monitored but not maintained as a storage gas. Thus, CO_2 and O_2 are the gases controlled in CA storage.

Q.78 **The term "three quarterful or full three quarter" is used to denote fruit maturity in:**

A. Banana
B. Mango
C. Tomato
D. Pineapple

Answer: A

Sol: ✅ (a) Banana The phrase "three quarterful or full three quarter" refers to the maturity index used in bananas, particularly for harvesting intended for ripening and export. It indicates the degree of fullness or roundness of the fruit fingers, which reflects the pulp development inside.
At the three-quarter stage, the banana fingers appear more rounded and less angular, suggesting that the fruit is mature enough to develop proper flavor and texture during post-harvest ripening. This index is widely used in banana plantations for timing harvest to ensure optimal post-harvest shelf life and eating quality.
❌ (b) Mango, ❌ (c) Tomato, ❌ (d) Pineapple: These fruits use different maturity indices like shoulder formation, color change, or Brix levels. Therefore, the term specifically applies to bananas.

Q.79 **At which pH fruits and vegetables are divided into acidic and non-acidic for thermal processing:**

A. 4.5
B. 5.5
C. 6.5
D. 7.5

Answer: A

Sol:
✅ (a) 4.5: The critical pH value used to classify foods for thermal processing is 4.5. Foods with a pH below 4.5 are considered acidic (e.g., most fruits), while those with pH above 4.5 are low-acid or non-acidic (e.g., vegetables, meat, dairy).
Acidic foods inhibit Clostridium botulinum growth, so they can be safely processed with less intense methods like water bath canning. In contrast, low-acid foods require pressure canning at higher temperatures to ensure sterility and food safety.
❌ (b), ❌ (c), ❌ (d): These values are incorrect thresholds and not used as classification cutoffs. Therefore, pH 4.5 is the correct dividing line in thermal food processing.

Q.80 **In pre-cooling, water is mostly removed by:**

A. Convection
B. Conduction
C. Radiation
D. None of these

Answer: B

Sol: ✅ (b) Conduction: Pre-cooling is a post-harvest technique used to rapidly remove field heat from freshly harvested fruits and vegetables to slow down metabolic activities and prolong shelf life. Among the mechanisms of heat transfer—conduction, convection, and radiation—conduction plays a key role in the direct transfer of thermal energy from the produce to a colder medium (like chilled water, ice, or air).
In pre-cooling methods like hydrocooling or ice-packing, the heat is conducted from the produce into the cooling agent. Conduction is especially significant when the produce is in direct contact with cold surfaces or substances. For example, in contact ice cooling, conduction allows rapid withdrawal of heat.
❌ (a) Convection: Plays a role in air movement (e.g., forced-air cooling), but not the dominant heat transfer mode. ❌ (c) Radiation: Negligible in pre-cooling. ❌ (d) None of these: Incorrect. Therefore, conduction is the most accurate answer.

Q.81 **Albinism is an important physiological disorder of:**

A. Plum
B. Peach
C. Strawberry
D. Cherry

Answer: C

Sol: ✅ (c) Strawberry: Albinism in strawberries is a physiological disorder marked by incomplete or uneven coloring of the fruit, where the surface remains white or pale instead of developing a full red color. It is commonly observed during hot seasons or when the fruit is overexposed to sunlight. The pigment anthocyanin, responsible for red coloration, is poorly synthesized due to unfavorable environmental conditions, nutrient imbalances (especially potassium deficiency), or genetic factors.
This leads to uneven ripening, making the fruit less marketable. The issue is commonly seen in early-season cultivars or where calcium sprays interfere with pigment development.
❌ (a), ❌ (b), ❌ (d): Albinism is not commonly associated with these fruits. Thus, strawberry is the correct answer.

Q.82 **Calliper grade is the maturity measurement for:**

A. Apple
B. Mango
C. Banana
D. Pineapple

Answer: C

Sol: (c) Banana: Calliper grading is a maturity and size assessment technique primarily used in bananas. It involves measuring the diameter or girth of the banana fingers using a calliper gauge, which helps classify bananas into different grades. This is essential to determine whether the fruit has reached the desirable size and physiological maturity for harvest, especially for export purposes.
Maturity influences post-harvest behavior, shelf life, and fruit development during ripening. Bananas are harvested at the mature green stage, and using calliper grades ensures consistency in marketing and ripening performance.
(a), (b), (d): These fruits are not typically graded using callipers. Hence, banana is the correct option.

Q.83 **Formation of abscission layer is maturity index of:**

A. Tomato
B. Leafy vegetables
C. Melons
D. Onion

Answer: C

Sol: ✅ (c) Melons: The abscission layer is a natural detachment zone that forms between the fruit and the peduncle, indicating maturity in certain fruits, especially melons (like muskmelon or cantaloupe). When melons are physiologically mature, this layer weakens, and the fruit separates easily from the vine—a key harvesting cue in commercial production.
This indicator is reliable for ensuring that the fruit has accumulated enough sugars, aroma compounds, and flavor precursors before harvest. The presence of an abscission layer ensures optimal eating quality and shelf life.
❌ (a) Tomato, ❌ (b) Leafy vegetables, ❌ (d) Onion: These do not rely on abscission layers for maturity assessment.

Q.84 **What is the maturity index for Avocado?**

A. Sugar content

B. Acid content
C. TSS
D. Oil content

Answer: D

Sol: ✅ (d) Oil content: Avocado is a unique fruit known for its high oil content, which develops during maturation. Among the various parameters used to determine fruit maturity, oil content is the most reliable and widely accepted maturity index for avocado. As the fruit matures on the tree, the dry matter content, particularly oil, increases steadily, making it a key marker of physiological development and quality.
Minimum oil content varies by cultivar but is typically around 8% to 12% at harvest. Harvesting avocados too early results in poor flavor and rubbery texture, as the oil content is insufficient. Conversely, overripe avocados may develop off-flavors or decay. Therefore, proper maturity assessment through oil determination ensures the fruit ripens well post-harvest and achieves desired eating quality.
❌ (a) Sugar content: Not a significant maturity marker in avocados due to their low sugar profile. ❌ (b) Acid content and ❌ (c) TSS: Also not key parameters for avocado maturity assessment. Thus, oil content is the best indicator of maturity in avocados.

Q.85 **Which of the following is biodegradable plastic?**

A. Poly propylene
B. LDPE
C. Polythene
D. Polyhydroxy butyrate

Answer: D

Sol: ✅ (d) Polyhydroxy butyrate (PHB): PHB is a biodegradable plastic that belongs to a family of polyhydroxyalkanoates (PHAs), naturally produced by various microorganisms like *Bacillus* species under nutrient-limited conditions. Unlike synthetic plastics like LDPE or polypropylene, PHB is eco-friendly and decomposes in the environment via microbial action into CO_2 and water.
PHB has physical properties similar to polypropylene but degrades naturally, making it suitable for biomedical devices, packaging, and agricultural films. Its biodegradability helps combat the environmental crisis posed by non-degradable plastics.
❌ (a), ❌ (b), ❌ (c): All are synthetic, petroleum-based plastics and are non-biodegradable, contributing to plastic pollution. Hence, PHB is the correct answer.

Q.86 **Which of the following is not an intrinsic factor in food spoilage?**

A. pH
B. Moisture
C. Temperature
D. Available nutrients

Answer: C

Sol: ✅ (c) Temperature: • Temperature is not an intrinsic factor in food spoilage. It is considered an extrinsic factor, which refers to external conditions surrounding the food product. • Temperature affects the rate of microbial growth, enzymatic reactions, and chemical changes in food. For example, higher temperatures can accelerate microbial spoilage, while refrigeration can slow it down. • However, temperature is not inherent to the food itself, and thus cannot be classified as intrinsic.
❌ (a) pH: • pH is an intrinsic factor as it reflects the acidity or alkalinity of the food. Foods with low pH (like citrus fruits) inhibit bacterial growth.
❌ (b) Moisture: • Moisture or water activity (aw) is an intrinsic factor as it represents the amount of free water in food. High moisture content favors microbial growth.
❌ (d) Available nutrients: • Nutrient content is intrinsic, as microbes need nutrients like carbohydrates, proteins, and vitamins to grow and cause spoilage.

Q.87 **What is the percent of acetic acid in commercially available vinegar?**

A. 2%
B. 4%
C. 6%
D. 10%

Answer: C

Sol: ✅ (c) 6% is the correct answer because the typical concentration of acetic acid in commercially available vinegar ranges between 4% and 6%, with 6% being the most common concentration used for culinary purposes, especially in pickling and preserving. Acetic acid, the key component responsible for vinegar's sour taste and pungent smell, is formed through the fermentation of ethanol by acetic acid bacteria (Acetobacter species). This weak organic acid contributes to vinegar's antimicrobial properties and acidity, which help in food preservation.

In food applications, 6% acetic acid concentration provides sufficient acidity to act as a preservative and flavoring agent without being too corrosive or unpleasant for direct use in cooking. It is widely used in households for salad dressings, marinades, chutneys, and pickles. Its concentration is strong enough to inhibit the growth of many spoilage organisms and pathogens, making it effective in extending the shelf life of food.
❌ (a) 2% is too low and would not provide the desired acidity or preservative effect. It would be considered too diluted for commercial vinegar and may not be effective for pickling or microbial control. ❌ (b) 4% is within the range of standard vinegar and is sometimes used, especially in milder varieties like rice vinegar or some flavored vinegars, but 6% is more common in general-purpose distilled vinegar. ❌ (d) 10% acetic acid concentration is too strong for typical food use and is more likely found in industrial-grade vinegar, cleaning products, or agricultural applications. Such high acidity can irritate skin or mucous membranes if not diluted.

Q.88 **Lyophilization is synonymous with:**

A. Freeze-drying
B. Pasteurization
C. Filtration
D. Spoilage

Answer: A

Sol: ✅ (a) Freeze-drying: • Lyophilization is another name for freeze-drying, a dehydration process widely used in food, pharmaceuticals, and biotechnology. • It involves freezing the product first, then reducing the surrounding pressure and adding heat to allow the frozen water in the material to sublime directly from solid to gas. • This technique helps preserve the structure, flavor, and nutritional content of the product, making it ideal for long-term storage. • Common in freeze-drying coffee, fruits, instant meals, and pharmaceuticals.
❌ (b) Pasteurization: • Pasteurization uses mild heat to kill microbes but does not dehydrate or preserve structure like lyophilization.
❌ (c) Filtration: • Filtration removes microbes or particles but does not involve drying or preservation.
❌ (d) Spoilage: • Spoilage is the unwanted deterioration of food, unrelated to preservation or drying techniques.

Q.89 **Grinding and mixing of foods such as sausage and hamburger:**

A. Increase the food surface area
B. Alter cellular structure
C. Distribute contaminating microorganisms throughout the food
D. All of the above

Answer: D

Sol: ✅ (d) All of the above is the correct answer because grinding and mixing processes in meat products such as sausages and hamburgers significantly influence food safety, quality, and microbial load due to multiple physical and biological changes that occur during these operations.
Firstly, grinding increases the surface area of the food. When meat is ground, large muscle tissues are broken down into smaller particles. This expanded surface area exposes more of the internal tissue to environmental conditions, making it easier for microbes to colonize the product. A larger surface area also accelerates oxidation and spoilage if not handled properly.
Secondly, grinding and mixing alter the cellular structure of the meat. This breakdown of muscle and connective tissue results in the release of intracellular contents such as enzymes, water, and nutrients, which can enhance the growth of microorganisms. The structural integrity of the product is compromised, and this disruption can impact not only microbial safety but also texture, color, and flavor of the final product.
Thirdly, these processes distribute any contaminating microorganisms throughout the food. If even a small portion of the raw material is contaminated — say from poor handling, infected cuts, or improper sanitation — the act of mixing and grinding will spread these microorganisms evenly across the entire batch. This increases the risk of widespread spoilage and foodborne illness if the meat is not thoroughly cooked or properly stored afterward.

Q.90 **Amino acids are used as food additives for which of the following reasons?**

A. As natural antibiotics
B. As natural growth inhibitors
C. For nutritive purposes
D. As antioxidants

Answer: C

Sol: ✅ (c) For nutritive purposes: • Amino acids are added to food products mainly to enhance their nutritional profile. • Essential amino acids like lysine, methionine, and tryptophan are added to cereal-based or processed foods to improve protein quality, especially in plant-based diets. • For example, lysine is commonly added to wheat or maize products, which are deficient in this amino acid. • Amino acids are also used in infant formulas, sports nutrition products, and medical nutrition.
❌ (a) As natural antibiotics: • Amino acids do not act as antibiotics; this role is played by compounds like penicillin or streptomycin.
❌ (b) As natural growth inhibitors: • While some peptides have regulatory effects, amino acids are growth promoters, not inhibitors.
❌ (d) As antioxidants: • Though certain amino acids may have mild antioxidant properties, they are not primarily used for this purpose in food.

Q.91 **Antibiotics tend to be:**

A. Primary metabolites
B. Secondary metabolites
C. Tertiary metabolites
D. Quaternary metabolites

Answer: B

Sol: ✅ (b) Secondary metabolites: • Antibiotics like penicillin are secondary metabolites, meaning they are not directly involved in the normal growth, development, or reproduction of an organism. • These compounds are often produced in the stationary phase of microbial growth and serve ecological functions like defense against other organisms. • They are crucial in medical and agricultural applications due to their antimicrobial properties. • Examples: Penicillin, Streptomycin, and Tetracycline.
❌ (a) Primary metabolites: • These include amino acids, nucleotides, and ethanol, which are essential for microbial growth and produced in the exponential phase.
❌ (c) Tertiary metabolites: • This term is rarely used in microbiology and is not typically associated with antibiotics.
❌ (d) Quaternary metabolites: • Not recognized in metabolic classification.

Q.92 **Despite efforts to eliminate spoilage organisms during canning, sometimes canned foods are spoiled. This may be due to:**

A. Spoilage before canning
B. Underprocessing during canning
C. Leakage of contaminated water through can seams during cooling
D. All of the above

Answer: D

Sol: ✅ (d) All of the above: All listed reasons contribute to spoilage in canned foods. Spoilage before canning may occur if raw materials are already contaminated or not handled properly before sealing. Underprocessing refers to insufficient heat treatment, which fails to destroy all pathogens or spoilage organisms, especially spore-forming bacteria like *Clostridium botulinum*. Leakage during cooling can introduce microbes if cooling water enters through imperfect seams or microcracks due to vacuum formation inside the can. These are critical control points in thermal processing, and any lapse may compromise food safety. ❌ (a), (b), (c): Each of these alone contributes, but collectively, they form the complete picture of how spoilage might still occur despite processing.

Q.93 **Louis Pasteur established the modern era of food microbiology in 1857 when he showed that microorganisms cause _____ spoilage:**

A. Beer
B. Wine
C. Juice
D. Milk

Answer: B

Sol: Pasteur's 1857 experiment demonstrated that microorganisms are responsible for the spoilage of wine, particularly by lactic acid bacteria producing souring effects.
This discovery proved that fermentation and spoilage were biological processes caused by microbes, not spontaneous chemical reactions.
It marked the beginning of the modern era of food microbiology and later led to the development of pasteurization techniques for wine, beer, and milk.

Q.94 **The effectiveness of many chemical preservatives depends primarily on the food:**

A. Temperature
B. pH

C. Water content
D. Acidity

Answer: B

Sol: ✅ (b) pH: The activity of most chemical preservatives is significantly influenced by the pH of the food. For example, benzoic acid is more effective at low pH (acidic foods), while others like sorbic acid and propionic acid also exhibit higher antimicrobial activity in acidic environments. This is because at lower pH, these weak acids remain in their undissociated forms, which can penetrate microbial cell membranes more effectively, disrupting internal pH and metabolism. Hence, acidic foods require lower preservative concentrations compared to neutral pH foods. ❌ (a) Temperature: While temperature affects spoilage rate, it's not a deciding factor for preservative action. ❌ (c) Water content: Water activity influences microbial growth but not directly the chemical action of preservatives. ❌ (d) Acidity: Though similar to pH, "acidity" refers more to taste or titratable acidity, whereas pH refers to hydrogen ion concentration, which determines preservative function.

Q.95 **Which type of fermentation is used to produce yogurt?**

A. Mesophilic
B. Thermophilic
C. Therapeutic
D. Yeast-lactic fermentations

Answer: B

Sol: (b) Thermophilic: Yogurt production involves thermophilic lactic acid bacteria such as *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*, which thrive at elevated temperatures around 40–45°C. These bacteria ferment lactose into lactic acid, causing milk proteins to coagulate, giving yogurt its characteristic texture and tangy flavor. Thermophilic fermentation is ideal for commercial yogurt production due to its rapid fermentation and thick consistency. (a) Mesophilic: These bacteria ferment at lower temperatures (~20–30°C), typically used in buttermilk and kefir production. (c) Therapeutic: This is not a fermentation type but a use category. (d) Yeast-lactic fermentations: These are used in alcoholic or mildly carbonated beverages, not yogurt.

Q.96 **Moisture content in intermediate moisture food (IMF) is:**

A. 10–20%
B. 20–25%
C. 20–40%
D. 15–50%

Answer: D

Sol: ✅ (d) 15–50% is the moisture range typically found in Intermediate Moisture Foods (IMFs). These foods have a lower water activity (aw) despite having a relatively high moisture content. They are microbiologically stable at ambient temperature without refrigeration due to the reduced water activity (generally 0.60–0.85), which limits microbial growth. IMFs include products like dried fruits, soft candies, jams, and some pet foods. The advantage of IMF is longer shelf life without the need for preservatives or cold storage, while still maintaining softness and palatability. ❌ Other options present narrower or less accurate moisture ranges.

Q.97 **Which of the following refers to the addition of microorganisms to the diet in order to provide health benefits beyond basic nutritive value?**

A. Antibiotics
B. Prebiotics
C. Probiotics
D. All the above

Answer: B

Sol: ✅ (b) Prebiotics are non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth or activity of one or a limited number of beneficial bacteria in the colon. They are not microorganisms themselves but serve as a food source for probiotics, helping improve gut health. Examples include inulin and oligosaccharides found in foods like bananas, onions, and garlic. ❌ (c) Probiotics, though closely related, are actual live microorganisms such as *Lactobacillus* or *Bifidobacterium* that, when administered in adequate amounts, confer health benefits like improving digestion and immunity. ❌ (a) Antibiotics are drugs used to treat bacterial infections and are not intended for dietary health benefits. ❌ (d) All the above is incorrect because antibiotics are not used to improve health through diet; only prebiotics and probiotics are relevant here.

Q.98 Material suitable for microwave heating:

A. EPP
B. LDPE
C. PET
D. DAIP

Answer: B

Sol: ✅ (b) LDPE (Low-Density Polyethylene) is the correct answer because it is one of the most commonly used plastics that can be safely used for microwave heating, especially when specifically labeled as microwave-safe. LDPE is a flexible thermoplastic with a relatively low melting point (around 105–115°C), which makes it suitable for many types of packaging, including food wraps, squeeze bottles, and containers. Its chemical resistance and thermal stability allow it to handle microwave heating under normal household conditions, though it is important that the specific LDPE product is tested and labeled as microwave safe by manufacturers.
❌ (a) EPP (Expanded Polypropylene): While EPP has excellent heat resistance and is sometimes used for hot food containers, it is generally less flexible and less commonly used in household microwave packaging. It is more often found in industrial or automotive applications.
❌ (c) PET (Polyethylene Terephthalate): PET is a widely used plastic, especially in beverage bottles and food trays, but standard PET is not suitable for microwave heating because it can warp, melt, or release harmful compounds when heated. Only specially engineered microwave-safe PET variants can be used, but these are less common.
❌ (d) DAIP: This option is not a recognized or standard food-grade polymer and does not refer to any known microwave-compatible material, making it incorrect both scientifically and practically.

Q.99 Deep frying of potato chips leads to generation of carcinogen:

A. Acrylamide
B. Acefamide
C. Formamide
D. Antioxidants

Answer: A

Sol: ✅ (a) Acrylamide is a carcinogenic compound formed during high-temperature cooking processes like frying, baking, or roasting of starchy foods. It forms through the Maillard reaction, where the amino acid asparagine reacts with reducing sugars such as glucose and fructose at temperatures above 120°C. Potato chips, due to their high starch content, are particularly susceptible. Health concerns about acrylamide include potential neurotoxicity and cancer risk. As a result, food industries are researching ways to reduce acrylamide content in processed foods. ❌ (b) Acefamide and (c) Formamide are unrelated to cooking or food chemistry. ❌ (d) Antioxidants prevent oxidative damage, not carcinogen formation.

Q.100 Which of the amino acids is not essential in diet?

A. Tyrosine
B. Tryptophan
C. Phenylalanine
D. Lysine

Answer: A

Sol: ✅ (a) Tyrosine is a non-essential amino acid because the body can synthesize it from the essential amino acid phenylalanine. While important for synthesizing neurotransmitters like dopamine and norepinephrine, it does not need to be supplied through diet unless phenylalanine metabolism is impaired (e.g., in phenylketonuria patients). ❌ (b) Tryptophan, (c) Phenylalanine, and (d) Lysine are essential amino acids that must be obtained through diet because the human body cannot synthesize them.

Q.101 Which of the following pairs is not correctly matched?

A. X-ray: Roentgen
B. Radioactivity: Becquerel
C. Microscope: Galileo
D. Oxygen: Joseph Priestley

Answer: C

Sol: ✅ (c) Microscope: Galileo: • This pair is not correctly matched. • While Galileo Galilei improved upon existing telescope designs and developed a compound microscope in the 1600s, he is not credited with the invention of the microscope. • The invention is more accurately attributed to Zacharias Janssen, a Dutch spectacle maker, around 1590. • Hence, attributing the invention of the microscope solely to Galileo is historically

inaccurate.

❌ (a) X-ray: Roentgen: • Correctly matched. • Wilhelm Roentgen discovered X-rays in 1895 and was awarded the first Nobel Prize in Physics in 1901. • The unit of X-ray exposure is also named the roentgen in his honor.

❌ (b) Radioactivity: Becquerel: • Correctly matched. • Henri Becquerel discovered natural radioactivity in 1896 while experimenting with phosphorescent materials and uranium salts. • The SI unit of radioactivity is named the becquerel (Bq).

❌ (d) Oxygen: Joseph Priestley: • Correctly matched. • Joseph Priestley is credited with the discovery of oxygen in 1774. • He isolated the gas by heating mercuric oxide and called it “dephlogisticated air”.

Q.102 **Baking powder contains:**

A. NaCl
B. $NaHCO_3$
C. Na-benzoate
D. NaI

Answer: B

Sol: ✅ (b) $NaHCO_3$ (Sodium bicarbonate) is the main active ingredient in baking powder. Baking powder is a leavening agent used in baking to help doughs and batters rise. It typically contains three components: a base ($NaHCO_3$), one or more acid salts (such as cream of tartar), and a filler like cornstarch to prevent premature reaction and improve stability. When moistened and heated, sodium bicarbonate reacts with the acid in the baking powder, producing carbon dioxide (CO_2) gas. These gas bubbles get trapped in the dough, causing it to expand and become light and porous. This reaction is critical in recipes that do not contain natural acidic ingredients, unlike baking soda, which needs an external acid to function. Baking powder can be single-acting or double-acting, with the latter releasing CO_2 in two stages—for better leavening.

❌ (a) NaCl is table salt, used for flavor but not a leavening agent. ❌ (c) Na-benzoate is a preservative and not used in leavening. ❌ (d) NaI is sodium iodide, used to prevent iodine deficiency, not for baking.

Q.103 **FSSAI stands for:**

A. Food Safety and Standards Authority of India
B. Food Security and Standards Authority of India
C. Food Safety and Security Authority of India
D. Food Safety and Standards Agency of India

Answer: A

Sol: ✅ (a) Food Safety and Standards Authority of India (FSSAI) is the apex body responsible for regulating and supervising food safety and standards in India. Established under the Food Safety and Standards Act, 2006, FSSAI consolidates various food-related laws and ensures that food products are safe for human consumption. It lays down scientific standards for food articles and regulates their manufacture, storage, distribution, sale, and import. FSSAI plays a crucial role in promoting public health by overseeing the implementation of food safety norms, issuing licenses, and conducting inspections and audits.

❌ (b), (c), and (d) are incorrect or misworded versions and not the official full form of FSSAI.

Q.104 **Which one of the following is not a food preservative?**

A. Acetic acid
B. Propionic acid
C. Butyric acid
D. Sorbic acid

Answer: C

Sol: ✅ (c) Butyric acid is primarily known for its unpleasant smell and presence in rancid butter. Although it has some antimicrobial properties, it is not commonly used as a food preservative due to its strong odor and limited effectiveness. It’s more notable in gut health contexts than food preservation.

❌ (a) Acetic acid (in vinegar) is a well-known preservative for pickles and sauces. ❌ (b) Propionic acid is effective against molds and used in bakery products. ❌ (d) Sorbic acid is widely used in cheese, yogurt, and baked goods for preventing mold growth.

Q.105 **Which out of the following is a non-reducing sugar?**

A. Fructose

B. Glucose
C. Mannose
D. Sucrose

Answer: D

Sol: ✅ (d) Sucrose is a non-reducing sugar because it does not have a free aldehyde or ketone group. In sucrose, the reducing groups of both glucose and fructose are involved in the glycosidic bond, preventing them from participating in redox reactions (like Benedict's or Fehling's test).
❌ (a), (b), and (c) – Fructose, glucose, and mannose are reducing sugars as they contain a free carbonyl group that can reduce other compounds and are detectable by standard reducing sugar tests.

Q.106 **Most common toxigenic spoilage in stored groundnuts is:**

A. *Aspergillus flavus*
B. *Aspergillus niger*
C. *Aspergillus oryzae*
D. *Aspergillus albus*

Answer: A

Sol: ✅ (a) *Aspergillus flavus* is the primary fungus responsible for the production of aflatoxins, which are potent carcinogenic mycotoxins. Stored groundnuts (peanuts) are highly susceptible to infection by *A. flavus* under warm and humid conditions. Poor storage practices, such as high moisture content (>10%) and insufficient aeration, promote fungal growth. Aflatoxins pose a serious health risk including liver damage and are strictly regulated in food products globally.
❌ (b) *A. niger* may spoil food but is not a major aflatoxin producer. ❌ (c) *A. oryzae* is beneficial in fermentation, not toxigenic. ❌ (d) *A. albus* is not typically associated with groundnut spoilage.

Q.107 **In cooking oils, the antioxidant added to prevent rancidity is:**

A. Tocopherol
B. Ascorbic acid
C. BHT
D. TBHQ

Answer: C

Sol: ✅ (c) BHT (Butylated HydroxyToluene) is a synthetic antioxidant commonly used in edible fats and oils to prevent rancidity caused by oxidative deterioration. It acts by donating hydrogen atoms to lipid radicals, thereby terminating the chain reactions of lipid peroxidation. BHT is fat-soluble, heat-stable, and effective at very low concentrations, making it ideal for stabilizing frying oils, margarine, and snack foods. Rancidity in oils not only leads to off-flavors and odors but also reduces the nutritional quality of the product and can form potentially harmful compounds.
❌ (a) Tocopherol, or Vitamin E, is a natural antioxidant but less effective in high-temperature applications. ❌ (b) Ascorbic acid (Vitamin C) is water-soluble and less suitable for lipid-based systems. ❌ (d) TBHQ is also used in oils but is more effective for vegetable oils and has specific regulatory restrictions in some regions.

Q.108 **Sauerkraut is the fermented product of:**

A. Cabbage
B. Turnip
C. Raddish
D. Beetroot

Answer: A

Sol: ✅ (a) Cabbage is the raw material for sauerkraut, which is a fermented food product made through lactic acid fermentation. During the process, naturally occurring lactic acid bacteria (like *Lactobacillus plantarum*) convert sugars in cabbage into lactic acid, which acts as a natural preservative and imparts a tangy flavor. This fermentation enhances the shelf life and also improves the digestibility and probiotic content of the product. Sauerkraut is traditionally consumed in European cuisines and offers health benefits like improved gut health and immune support.
❌ Other vegetables like turnip or radish may be fermented but do not produce sauerkraut.

Q.109 **Cold test of fat is a measure of:**

A. Freezing point of oil
B. Viscosity of oil at temperature just above its freezing point
C. Resistance of oil to crystallization
D. Total saturated fat

Answer: C

Sol: ✅ (c) Resistance of oil to crystallization is what the cold test primarily measures. The cold test is a quality check used to determine whether oils (especially salad oils) remain clear and free from crystallization or cloudiness when stored at low temperatures. During the test, oil is cooled to 0°C for 5.5 hours. If the oil remains clear without clouding or forming solid fat crystals, it passes the cold test. This test is critical for determining whether oil is suitable for cold applications like salad dressings. The results reflect how well the oil can resist waxes, high-melting triglycerides, and other crystallizing components that could impact clarity and texture.
❌ (a) and (b) do not accurately capture the crystallization resistance the test is meant for. ❌ (d) Total saturated fat is determined through chemical analysis, not the cold test.

Q.110 **"C" enamel cans are used for:**

A. High acidic food
B. Non-acidic foods
C. Medium-acidic foods
D. Fat rich foods

Answer: A

Sol: ✅ (b) Non-acidic foods are stored in "C" enamel cans which are lined with oleoresinous coatings that resist sulfur staining and interaction with the metal of the can. These cans are used to store meat, fish, and other low-acid foods where there's minimal risk of corrosion. The protective coating helps maintain food quality and extends shelf life during long-term storage and processing.
❌ (a) High acidic foods use R-enamel. ❌ (c) Medium-acidic foods may use different types like C-enamel or others depending on exact pH. ❌ (d) Fat-rich foods require special enamel types to prevent flavor absorption or migration.

Q.111 **AGMARK was promulgated in:**

A. 1937
B. 1954
C. 1935
D. 2009

Answer: A

Sol: ✅ (a) 1937: • AGMARK (Agricultural Produce Grading and Marking Act) was enacted in 1937 under the Agricultural Produce (Grading and Marking) Act. • It is a certification mark employed on agricultural products in India. • The aim is to ensure standardization and quality assurance for consumers and fair prices for farmers. • It was enforced by the Directorate of Marketing and Inspection (DMI), under the Ministry of Agriculture and Farmers Welfare.
❌ (b) 1954: • Not the year of AGMARK enactment; no significant amendment was made in this year regarding AGMARK.
❌ (c) 1935: • Although the legislative process may have begun, AGMARK was officially enacted in 1937.
❌ (d) 2009: • No legislation related to AGMARK was introduced in 2009; however, digital reforms and new certification schemes began in the 2000s.

Q.112 **For manufacturing of pasta, wheat variety used is:**

A. Soft wheat
B. Hard wheat
C. Durum wheat
D. White wheat

Answer: C

Sol: ✅ (c) Durum wheat is the correct variety used for making pasta. Durum wheat (Triticum turgidum var. durum) is a hard wheat variety that has the highest protein content among wheat types and a very strong gluten network. Its endosperm produces a coarse flour called semolina, which is the primary ingredient in high-quality pasta production. The strong gluten structure helps pasta retain its shape during cooking and gives it a firm, al dente texture. The yellowish color of durum semolina also contributes to the attractive golden hue of pasta.
❌ (a) Soft wheat is used for bakery products due to its low protein content. ❌ (b) Hard wheat is suitable for bread but lacks the specific traits of durum. ❌ (d) White wheat is not ideal for pasta due to lower protein and gluten quality.

Q.113 **Which of the following is produced with the combination of apoenzyme and coenzyme?**

A. Holoenzyme
B. Enzyme substrate complex
C. Prosthetic group
D. Enzyme product complex

Answer: A

Sol: ✅ (a) Holoenzyme is the biologically active form of an enzyme consisting of an apoenzyme (the protein portion) and its necessary coenzyme or prosthetic group. Apoenzymes are catalytically inactive on their own and require a non-protein component (coenzyme or metal ion) to function. The coenzyme, which may be organic (like vitamins) or inorganic (like metal ions), binds to the apoenzyme to form a complete and functional holoenzyme. Holoenzymes participate in a variety of biochemical reactions, playing a central role in metabolism and cellular activity.
❌ (b) Enzyme substrate complex is formed when the enzyme binds to its specific substrate. ❌ (c) Prosthetic group is a type of cofactor, not the final active enzyme. ❌ (d) Enzyme product complex refers to the post-reaction intermediate, not the active form.

Q.114 **The enzyme which hydrolyses starch to maltose is:**

A. Protease
B. Amylase
C. Lactase
D. Maltase

Answer: B

Sol: ✅ (b) Amylase is the correct answer. Amylase is an enzyme that catalyzes the hydrolysis of starch, a polysaccharide, into simpler sugars. It acts specifically on the α-1,4 glycosidic bonds found in starch molecules, converting them primarily into maltose, which is a disaccharide composed of two glucose units. This process is essential in both human digestion and industrial applications such as brewing and baking. There are two types of amylase: salivary amylase (ptyalin), which begins starch digestion in the mouth, and pancreatic amylase, which continues the process in the small intestine.
❌ (a) Protease breaks down proteins, not starch. ❌ (c) Lactase hydrolyzes lactose, the sugar found in milk, into glucose and galactose. ❌ (d) Maltase breaks down maltose into two glucose units but doesn't act on starch directly.

Q.115 **Enzymes having slightly different molecular structure but performing identical activity are:**

A. Apoenzymes
B. Isoenzymes
C. Holoenzymes
D. Coenzymes

Answer: B

Sol: ✅ (b) Isoenzymes or isozymes are different molecular forms of an enzyme that catalyze the same reaction but differ slightly in their amino acid sequence, regulatory properties, or kinetic behavior. They may be expressed in different tissues or during different stages of development. A classic example is the enzyme lactate dehydrogenase (LDH), which exists in multiple isoforms found in the heart and muscles. These isoenzymes allow fine-tuning of metabolism in various tissues under differing physiological conditions.
❌ (a) Apoenzymes are the inactive protein portion of enzymes that require cofactors. ❌ (c) Holoenzymes are the active form of enzymes (apoenzyme + cofactor). ❌ (d) Coenzymes are organic non-protein molecules (like vitamins) that assist enzymes in catalysis.

Q.116 **Human insulin is being commercially produced from a transgenic species of:**

A. Escherichia
B. Saccharomyces
C. Rhizobium

D. Mycobacterium

Answer: A

Sol: ✅ (a) Escherichia (specifically E. coli) is the correct answer. Recombinant DNA technology has enabled the production of human insulin by inserting the gene responsible for insulin synthesis into E. coli. This transgenic bacterium then produces insulin in large quantities, which is harvested, purified, and used therapeutically. This method revolutionized diabetes treatment by replacing animal-derived insulin with human-compatible versions, reducing allergic reactions and improving efficacy.
❌ (b) Saccharomyces is used in yeast fermentation but not widely for insulin. ❌ (c) Rhizobium is known for nitrogen fixation in legumes. ❌ (d) Mycobacterium includes disease-causing bacteria like M. tuberculosis.

Q.117 **Ribozyme is:**

A. RNA without phosphate
B. RNA with enzyme activity
C. RNA with sugar
D. RNA with extra phosphate

Answer: B

Sol: ✅ (b) RNA with enzyme activity: • Ribozymes are RNA molecules that have catalytic (enzyme-like) properties. • They were discovered in the 1980s by Thomas Cech and Sidney Altman (Nobel Prize winners). • Ribozymes can catalyze specific biochemical reactions, such as RNA splicing and cleavage. • This discovery challenged the belief that only proteins can act as enzymes.
❌ (a) RNA without phosphate: • All RNA molecules contain phosphate groups as part of the sugar-phosphate backbone.
❌ (c) RNA with sugar: • All RNA contains ribose sugar by definition; this is not unique to ribozymes.
❌ (d) RNA with extra phosphate: • There is no such form; catalytic activity is not due to extra phosphate.

Q.118 **Example of a typical homopolysaccharide is:**

A. Lignin
B. Suberin
C. Inulin
D. Starch

Answer: D

Sol: ✅ (d) Starch is a classic example of a homopolysaccharide composed entirely of glucose units. It consists of two components: amylose (linear) and amylopectin (branched), both of which are polymers of α-D-glucose. Starch is the primary energy storage polysaccharide in plants and serves as a major carbohydrate source in human diets. It is digested by amylase into simpler sugars for absorption.
❌ (a) Lignin is a complex phenolic compound, not a polysaccharide. ❌ (b) Suberin is a fatty substance in plant cell walls. ❌ (c) Inulin is a polysaccharide made of fructose units, a fructan, not a homopolysaccharide.

Q.119 **The catalytic efficiency of two different enzymes can be compared by the:**

A. Molecular size of the enzyme
B. The pH optimum value
C. The Km value
D. Formation of the product

Answer: C

Sol: ✅ (c) The Km value, or Michaelis constant, is a critical parameter in enzyme kinetics that helps compare the catalytic efficiency of enzymes. It represents the substrate concentration at which the reaction rate is half of its maximum velocity (Vmax). A lower Km value indicates a higher affinity of the enzyme for its substrate, suggesting more efficient catalysis at low substrate concentrations. When combined with Vmax to calculate the catalytic efficiency (kcat/Km), it provides a standardized way to compare the performance of different enzymes or the same enzyme under different conditions.
❌ (a) Molecular size doesn't directly relate to catalytic efficiency. ❌ (b) Optimum pH reflects enzyme stability, not efficiency. ❌ (d) Product formation depends on several factors and isn't a standard comparative metric.

Q.120 **Which of the following is not a conjugated protein?**

A. Peptone
B. Phosphoprotein
C. Lipoprotein
D. Chromoprotein

Answer: A

Sol: ✅ (a) Peptone is not a conjugated protein. It is a complex mixture of polypeptides and amino acids formed by the partial digestion of protein, typically used in microbial culture media. Unlike conjugated proteins, it does not have a non-protein prosthetic group attached.
❌ (b) Phosphoprotein has phosphate groups attached. ❌ (c) Lipoprotein contains lipid components. ❌ (d) Chromoprotein includes a pigmented prosthetic group, like hemoglobin with heme.

Q.121 **The "Repeating Unit" of glycogen is:**

A. Fructose
B. Mannose
C. Glucose
D. Galactose

Answer: C

Sol: ✅ (c) Glucose is the repeating unit of glycogen. Glycogen is a highly branched homopolysaccharide that serves as the main storage form of glucose in animals and humans. It is composed entirely of α-D-glucose units linked by α-1,4 glycosidic bonds, with branching occurring via α-1,6 bonds approximately every 8–12 glucose units. This structure allows rapid mobilization of glucose when energy is needed quickly, particularly in the liver and skeletal muscles. Glycogen plays a crucial role in maintaining blood glucose levels and serves as a readily available energy reserve.
❌ (a) Fructose is a monosaccharide found in fruits, not a component of glycogen. ❌ (b) Mannose is involved in glycoprotein synthesis but not in glycogen. ❌ (d) Galactose is part of lactose but not the repeating unit in glycogen.

Q.122 **High value of BOD (Biochemical Oxygen Demand) shows:**

A. Water is normal
B. Water is highly polluted
C. Water is less polluted
D. None of these

Answer: B

Sol: ✅ (b) Water is highly polluted is the correct interpretation of high BOD. Biochemical Oxygen Demand (BOD) is a measure of the amount of oxygen that microorganisms require to break down organic matter in a water sample. A high BOD indicates a large amount of biodegradable material present in the water, usually resulting from pollution such as sewage, industrial waste, or agricultural runoff. This can lead to oxygen depletion, harming aquatic life and indicating poor water quality.
❌ (a) Normal water would have a low BOD (less than 5 mg/L). ❌ (c) Less polluted water has moderate BOD values. ❌ (d) "None of these" is incorrect as option (b) is the correct interpretation.

Q.123 **Which of the following is fermentation process?**

A. Batch process
B. Continuous process
C. Both a and b
D. None of these

Answer: C

Sol: ✅ (c) Both a and b are correct. Fermentation can occur in both batch and continuous processes. In a batch process, all substrates are loaded at the beginning, and the process runs until completion without additional input. It is simple and commonly used in small-scale or artisanal fermentations. In continuous fermentation, substrates are added, and products removed constantly, allowing for a steady state. This is efficient for industrial-scale operations like ethanol, lactic acid, or antibiotic production. Each has advantages: batch is easier to control, while continuous is more productive over time.
❌ (d) "None of these" is incorrect because both methods are well-established in fermentation technology.

Q.124 Who showed that *Saccharomyces cerevisiae* causes fermentation forming products such as beer and buttermilk?

A. Louis Pasteur
B. Alexander Fleming
C. Selman Waksman
D. Schatz

Answer: A

Sol: ✅ (a) Louis Pasteur is credited with demonstrating that *Saccharomyces cerevisiae*, a species of yeast, is responsible for alcoholic fermentation. In the 19th century, Pasteur's experiments disproved the earlier belief that fermentation was purely a chemical process. He proved that microorganisms like yeasts are responsible for converting sugars into ethanol and carbon dioxide during beer and wine production. His work laid the foundation for modern microbiology and fermentation industries, as well as techniques like pasteurization to prevent spoilage.
❌ (b) Alexander Fleming discovered penicillin. ❌ (c) Selman Waksman is known for discovering streptomycin. ❌ (d) Schatz worked under Waksman and helped discover streptomycin but wasn't linked to fermentation.

Q.125 A bioreactor is:

A. Hybridoma
B. Culture containing radioactive isotopes
C. Culture for synthesis of new chemicals
D. Fermentation tank

Answer: D

Sol: ✅ (d) A bioreactor is essentially a fermentation tank or a vessel that provides a controlled environment for the cultivation of microorganisms, cells, or biochemical processes. It supports the optimal conditions—like temperature, pH, oxygen levels, and agitation—for the growth of microbes or cells, typically for industrial production of substances such as antibiotics, enzymes, vaccines, and biofuels. Bioreactors range in size from laboratory scale (liters) to industrial scale (thousands of liters). Stirred tank bioreactors are most common in microbial fermentation, while airlift or packed bed types are used in tissue cultures. The system ensures sterility, proper nutrient supply, and efficient mixing of contents, making it integral to biotechnology and bioprocess engineering.
❌ (a) Hybridoma refers to a cell line used for monoclonal antibody production. ❌ (b) Cultures containing radioactive isotopes are used in research, not directly related to bioreactors. ❌ (c) Chemical synthesis cultures are not the accurate definition of a bioreactor, though related.

Q.126 Enzyme immobilisation is:

A. Conversion of an active enzyme into inactive form
B. Providing enzyme with protective covering
C. Changing a soluble enzyme into insoluble state
D. Changing pH so that enzyme is not able to carry out its function

Answer: B

Sol: ✅ (b) Enzyme immobilisation involves providing enzymes with a protective covering or binding them to a solid support, making them more stable and reusable in industrial processes. It improves enzyme efficiency and resistance to changes in pH and temperature, which is critical in industries like food, pharmaceuticals, and waste treatment. Common methods include entrapment in gels, adsorption on surfaces, or covalent bonding to solid matrices. Immobilised enzymes are used in processes like lactose hydrolysis, glucose isomerization, and antibiotic synthesis. These methods preserve the catalytic activity while reducing enzyme loss and contamination of the product.
❌ (a) and (d) describe enzyme inactivation, which is not the goal of immobilisation. ❌ (c) While the enzyme may become insoluble post-immobilisation, the main intent is not solubility change but reuse and stability.

Q.127 Vinegar is obtained from molasses with the help of:

A. *Rhizopus*
B. *Acetobacter*
C. Yeast
D. Both b and c

Answer: D

Sol: ✅ (d) Both b and c: • Vinegar production from molasses is a two-step fermentation process. • In the first step, yeast (typically *Saccharomyces cerevisiae*) converts the sugars in molasses into ethanol through alcoholic fermentation. • In the second step, Acetobacter (a genus of acetic acid bacteria) oxidizes ethanol into acetic acid, which is the main component of vinegar. • Therefore, both yeast and Acetobacter are essential for vinegar

production.

❌ (a) *Rhizopus*: • This is a fungal genus commonly used for producing organic acids like lactic acid, but not used in vinegar production.

❌ (b) Acetobacter: • Only partially correct; Acetobacter performs the second step but yeast is also needed.

❌ (c) Yeast: • Yeast alone converts sugars to alcohol, but cannot produce vinegar without Acetobacter.

Q.128 **Humulin is:**

A. Carbohydrate
B. Protein
C. Fat
D. Antibiotics

Answer: B

Sol: ✅ (b) Humulin is a form of recombinant human insulin, and it is a protein hormone. It was the first genetically engineered pharmaceutical product approved for human use. Produced using recombinant DNA technology, Humulin is synthesized in genetically modified *Escherichia coli* or *Saccharomyces cerevisiae* that carry the human insulin gene. The hormone plays a vital role in regulating glucose levels in the blood by facilitating glucose uptake into tissues. It is widely used by individuals with diabetes mellitus to maintain glycemic control. Since insulin is a polypeptide made up of two chains (A and B) linked by disulfide bonds, Humulin is purely protein in nature.

❌ (a) Carbohydrates are sugars and are not related to insulin's molecular structure. ❌ (c) Fats are lipids; insulin is not lipid-derived. ❌ (d) Antibiotics are antimicrobial agents, whereas Humulin is a hormone.

Q.129 **Which of the following statements is incorrect regarding Gram-negative bacteria?**

A. Cell wall has a thin peptidoglycan layer
B. Cell wall lipid content is very low
C. Lipopolysaccharide layer is present
D. All of these

Answer: B

Sol: ✅ (b) The statement "Cell wall lipid content is very low" is incorrect. Gram-negative bacteria actually have a high lipid content in their cell wall due to the presence of an outer membrane that is rich in lipopolysaccharides (LPS), phospholipids, and proteins. This outer membrane acts as an additional barrier, making them more resistant to certain antibiotics and detergents compared to Gram-positive bacteria. The thin peptidoglycan layer lies between the inner cytoplasmic membrane and this outer membrane.

✔ (a) Correct: Gram-negative bacteria indeed have a thinner peptidoglycan layer. ✔ (c) Correct: Lipopolysaccharides (LPS) are characteristic of the outer membrane of Gram-negative cells. ❌ (d) "All of these" is incorrect because only (b) is wrong.

Q.130 **Common food poisoning microbes are:**

A. *Clostridium* and *Salmonella*
B. *Clostridium* and *E. coli*
C. *E. coli* and *Salmonella*
D. *Clostridium* and *Streptococcus*

Answer: A

Sol: ✅ (a) *Clostridium* and *Salmonella* are among the most common bacteria responsible for foodborne illnesses worldwide. *Clostridium perfringens* and *Clostridium botulinum* are spore-forming, anaerobic bacteria that can survive harsh conditions, including heating and low oxygen environments. *C. perfringens* often contaminates meat products and causes gastrointestinal illness, while *C. botulinum* can lead to botulism, a potentially fatal paralytic condition linked with improperly canned foods. *Salmonella*, a facultative anaerobe, is another leading cause of bacterial food poisoning. It's commonly associated with poultry, eggs, dairy, and contaminated produce. Infection typically results in symptoms like diarrhea, fever, and abdominal cramps. Both bacteria can be introduced through poor hygiene, inadequate cooking, or improper storage. These microbes thrive in warm, nutrient-rich environments and are particularly dangerous because their toxins are heat-resistant and difficult to eliminate. Proper food handling, hygiene, and cooking are essential to prevent their spread.

❌ (b), (c), and (d) list organisms relevant in microbiology and food hygiene but not the most consistent pair associated with classical food poisoning outbreaks. *E. coli* can cause foodborne illness, particularly strains like O157:H7, but *Clostridium* and *Salmonella* are more universally recognized together as major culprits.

Q.131 **Salmonellosis involves:**

A. An enterotoxin and exotoxin
B. An enterotoxin and cytotoxin
C. An exotoxin and cytotoxin
D. A cytotoxin only

Answer: B

Sol: ✅ (b) Salmonellosis, an infection caused by *Salmonella* species, primarily involves enterotoxins and cytotoxins. *Salmonella enterica*, especially serovars like Typhimurium and Enteritidis, invade the intestinal mucosa and produce toxins that disrupt normal cellular function. The enterotoxin is responsible for fluid secretion, leading to diarrhea, while the cytotoxin damages host cells, contributing to inflammation and mucosal injury. These combined effects lead to symptoms like fever, abdominal pain, vomiting, and diarrhea. In severe cases, the bacteria can enter the bloodstream causing systemic illness. The route of infection is usually through ingestion of contaminated food, especially eggs, poultry, and unpasteurized dairy. Proper cooking, refrigeration, and hygiene can significantly reduce infection risks.
❌ (a) Exotoxins are not typically associated with *Salmonella* infection. ❌ (c), (d) Cytotoxins are involved but not exclusively. The enterotoxin plays a key role in pathogenesis.

Q.132 **One serving of Cheddar cheese (28g) provides ___% of the RDA of calcium:**

A. 10
B. 50
C. 75
D. 20

Answer: D

Sol: ✅ (d) A 28-gram (1-ounce) serving of Cheddar cheese typically provides about 200 milligrams of calcium, which constitutes approximately 20% of the Recommended Dietary Allowance (RDA) for an average adult. Calcium is essential for bone health, nerve transmission, muscle function, and blood clotting. Cheddar cheese is considered a dense source of calcium along with protein and fat. While it contributes significantly to dietary calcium intake, it should be consumed in moderation due to its saturated fat content.
❌ (a), (b), and (c) are overestimations of calcium content for the specified portion size.

Q.133 **The lipid with the lowest energy value for human nutrition is:**

A. Cardiolipin
B. Olestra
C. Margarine
D. Olive oil

Answer: B

Sol: ✅ (b) Olestra is a synthetic fat substitute designed to provide the taste and texture of fat without being absorbed by the digestive system. It passes through the gastrointestinal tract undigested and therefore contributes zero kilocalories to the diet. Olestra is composed of sucrose esters of fatty acids and is resistant to digestion by lipase enzymes. It is commonly used in low-fat or fat-free snack foods like potato chips. However, it has been associated with side effects such as gastrointestinal discomfort and interference with the absorption of fat-soluble vitamins (A, D, E, and K), so manufacturers often fortify such foods accordingly.
❌ (a), (c), and (d) are digestible lipids and contribute approximately 9 kcal/g. Olestra stands apart due to its non-absorbable nature.

Q.134 ***Clostridium perfringens*** **poisoning is associated with:**

A. Meat products
B. Vegetables
C. Canned foods
D. Fish products

Answer: A

Sol: ✅ (a) *Clostridium perfringens* food poisoning is most commonly associated with meat products, particularly those that are cooked in bulk and held at unsafe temperatures. This Gram-positive, anaerobic, spore-forming bacterium can survive cooking and then multiply rapidly if the food is left at room temperature for extended periods. Common sources include beef, poultry, and gravies. The spores germinate and grow in warm, anaerobic conditions, producing an enterotoxin that causes abdominal cramps and diarrhea. The illness has a short incubation period (6–24 hours) and is usually self-limiting within 24–48 hours. Prevention involves rapid cooling of cooked food, maintaining hot foods above 60°C, and reheating foods

thoroughly before serving.
✗ (b) Vegetables can be contaminated but are not the primary source. ✗ (c) Canned foods are more associated with *C. botulinum*. ✗ (d) Fish products are not a primary source for *C. perfringens*.

Q.135 **Class IV milk includes milk used to...**

A. Produce hard cheese and cream cheese
B. Fluid milk
C. Fluid cream and cottage cheese
D. Butter and any product in dried form

Answer: D

Sol: ✅ (d) Class IV milk is categorized as milk that is utilized for manufacturing butter and any dairy product in dried form, such as milk powder, buttermilk powder, or non-fat dry milk. According to the classification system for milk usage in the dairy industry, different classes are designated based on their end product. Class IV milk is one of the lower-value classes but is essential for preserving milk in a storable form. Products in this class have a longer shelf life and are crucial in export or for use during off-seasons. Milk for Class IV is often surplus milk that is dried or churned to maintain market balance. In India and the U.S., this classification helps set milk pricing, allocate resources, and regulate production. ✗ (a) and (c) refer to cheese production, which typically falls under Class III. ✗ (b) refers to Class I milk, which is used for direct consumption in fluid form.

Q.136 **A food must contain less than ___ grams of fat per serving to be considered a low fat food:**

A. 8
B. 6
C. 3
D. 7

Answer: C

Sol: ✅ (c) According to guidelines by the U.S. FDA and adopted by several international regulatory bodies, a food is labeled as "low fat" if it contains less than 3 grams of fat per serving. This rule is designed to help consumers identify foods that can help maintain healthy lipid profiles and reduce the risk of conditions such as heart disease and obesity. This regulation applies to standard serving sizes, and food manufacturers must display fat content clearly on nutritional labels. Foods labeled “low fat” are popular among health-conscious consumers and often form a core part of diet plans. ✗ (a), (b), and (d) exceed the defined limit and would not meet the regulatory standards for “low fat” classification.

Q.137 **Which of the following is a Class II product?**

A. Frozen dessert
B. Butter
C. Fluid milk
D. Cheese

Answer: A

Sol: ✅ (a) Frozen dessert is categorized as a Class II product under Indian food regulation systems like those of the Food Safety and Standards Authority of India (FSSAI). Class II products generally involve more complex processing and may include permitted additives, flavoring agents, or stabilizers. Frozen desserts are made from vegetable oils or fats instead of milk fat (used in ice cream), which places them in a separate classification.
✗ (b), (c), and (d) like butter, fluid milk, and cheese are typically considered Class I or more natural dairy products with fewer additives or processing steps.

Q.138 **_____ is the general name for a class of bacteria that causes mastitis in dairy cattle:**

A. *Lactobacillus*
B. *E. coli*
C. *Staphylococcus*
D. *Lactococcus*

Answer: C

Sol: ✅ (c) The genus *Staphylococcus*, particularly *Staphylococcus aureus*, is a major cause of mastitis in dairy cattle. Mastitis is the inflammation of the mammary gland, often leading to reduced milk yield, altered milk composition, and economic losses. *Staphylococcus* can be contagious or environmental. *S. aureus* spreads during milking and can persist in infected tissues, making treatment difficult. It produces toxins and enzymes that damage mammary tissues. Control measures include good milking hygiene, post-milking teat disinfection, and culling chronically infected animals.
❌ (a) *Lactobacillus* is a beneficial lactic acid bacterium, used in dairy fermentation. ❌ (b) *E. coli* can cause environmental mastitis but is not the primary genus involved. ❌ (d) *Lactococcus* is also beneficial and used in cheese making.

Q.139 _____ is a protein in milk that contains all the essential amino acids:

A. Casein
B. Gluten
C. a and b
D. Whey protein

Answer: A

Sol: ✅ (a) Casein: • Casein is the primary protein in milk, accounting for about 80% of total milk protein. • It is a complete protein, meaning it contains all nine essential amino acids required for human nutrition. • Casein digests slowly and is an excellent protein source for muscle repair and maintenance. • It forms a gel-like structure in the stomach, which makes it ideal for sustained amino acid release.
❌ (b) Gluten: • Gluten is a protein found in wheat and related grains. • It is not present in milk and is not a complete protein, lacking some essential amino acids.
❌ (c) a and b: • Incorrect as only casein is the milk protein that is complete. Gluten is unrelated to milk.
❌ (d) Whey protein: • Whey is also a high-quality milk protein and is complete, but the question asks for the protein, and casein is the predominant one in milk.

Q.140 _____ is a defect in milk that is described as tasting papery:

A. Bitter
B. Flat
C. Oxidized
D. Salty

Answer: C

Sol: ✅ (c) The oxidized flavor defect in milk is commonly described as “papery”, cardboard-like, or metallic. This defect occurs due to the oxidation of unsaturated fatty acids in milk fat, often accelerated by exposure to light, copper, or iron. It is more prevalent in milk stored in transparent containers under fluorescent lighting. Oxidation results in volatile compounds like aldehydes and ketones, which give milk an unpleasant taste and smell. The flavor can develop within hours of exposure and reduces the sensory quality and consumer acceptance of milk. Using light-blocking packaging and minimizing oxygen exposure during processing and storage helps reduce this defect. ❌ (a) Bitter flavor is generally due to proteolysis. ❌ (b) Flat taste may result from low solids or dilution. ❌ (d) Salty taste can come from mastitic milk or mineral imbalances.

Q.141 Most UHT pasteurized milk has a shelf life of ____ days:

A. 10
B. 120
C. 180
D. 50

Answer: C

Sol: ✅ UHT (Ultra-High Temperature) pasteurized milk has a typical shelf life of 180 days (approximately 6 months) when stored in aseptic packaging under ambient conditions. This long shelf life is achieved by subjecting the milk to a temperature of approximately 135–150°C for 2–5 seconds, which destroys both vegetative microbes and spores. After this, the milk is packed into sterile, hermetically sealed containers, preventing recontamination. UHT milk does not require refrigeration until opened, making it especially suitable for regions with limited cold chain infrastructure. However, once opened, it must be refrigerated and consumed within a few days. ❌ Options (a), (b), and (d) underestimate the actual shelf life and are relevant more to pasteurized (non-UHT) milk types.

Q.142 Milk fermentation to produce cheese is done initially by inoculating with:

A. *Saccharomyces cerevisiae*
B. *Streptococcus lactis* and *Lactobacillus* spp.

C. *Acetobacter* and *Gluconobacter*
D. *Lactobacillus bulgaricus* and *Streptococcus thermophilus*

Answer: B

Sol:

✅ The initial fermentation in cheese making is typically initiated by lactic acid bacteria such as *Streptococcus lactis* and *Lactobacillus* spp. These bacteria convert lactose (milk sugar) into lactic acid, which lowers the pH and causes milk proteins (mainly casein) to coagulate, forming the basis of cheese. The acidic environment also helps inhibit spoilage organisms. These starter cultures contribute to texture and flavor development and are essential in the early steps before the addition of rennet (for coagulation) and further ripening. ❌ (a) Yeasts like *Saccharomyces cerevisiae* are used in baking and alcoholic fermentation. ❌ (c) *Acetobacter* is associated with vinegar production. ❌ (d) *Lactobacillus bulgaricus* and *Streptococcus thermophilus* are specific to yogurt production.

Q.143 **Nitrates maintain the red color of preserved meats and:**

A. Are among the most widely used preservatives
B. Inhibit germination of botulism spores
C. Maintain a high osmotic pressure to kill microorganisms
D. Prevent mold

Answer: B

Sol: ✅ Nitrates (NO_3^-) and nitrites (NO_2^-) are used in meat curing primarily because they inhibit the germination and outgrowth of *Clostridium botulinum* spores, which cause botulism, a deadly foodborne illness. Additionally, they help in preserving the pink-red color of cured meats by stabilizing myoglobin, a muscle pigment. Nitrites are more directly responsible for antimicrobial action, especially in anaerobic environments, which are common in processed meat packaging. ❌ (a) While nitrates/nitrites are important, their use is regulated due to toxicity concerns. ❌ (c) Osmotic pressure is more related to salt or sugar content. ❌ (d) Nitrates have limited antifungal activity; they are not primarily used to prevent mold.

Q.144 **During malting, barley and other grains are broken down by:**

A. Heating to 95°C
B. Lagering
C. Amylases
D. Yeasts

Answer: C

Sol:

✅ During malting, amylases (specifically α-amylase and β-amylase) play a central role in breaking down starch into fermentable sugars like maltose and glucose. The malting process involves steeping, germination, and kilning. During germination, enzymes such as amylases are naturally activated in the grain, allowing the breakdown of complex carbohydrates into simpler forms, which are essential for fermentation during brewing or distilling. ❌ (a) Heating to 95°C occurs later during wort boiling, not during the malting phase. ❌ (b) Lagering is a maturation step in brewing. ❌ (d) Yeasts are used in fermentation, not in starch breakdown during malting.

Q.145 **The technique first described to determine the incipient spoilage in meat was:**

A. Homogenate Extract Volume (HEV)
B. Agar Plate Count (APC)
C. Extract Release Volume (ERV)
D. None of the above

Answer: C

Sol: ✅ (c) Extract Release Volume (ERV): • ERV measures water released from meat tissue. • Spoilage reduces ERV due to protein degradation. • It's an early detection technique for incipient spoilage. • Widely used in meat quality control labs.
❌ (a) HEV: • Not a standard spoilage detection method. • Rarely cited in literature.
❌ (b) Agar Plate Count (APC): • Measures microbial load but not incipient spoilage. • Takes longer to show spoilage.
❌ (d) None of the above: • Incorrect as option (c) is correct.

Q.146 **Salting, as a preservative:**

A. Retards growth of *Staphylococcus aureus*
B. Plasmolyzes bacteria and fungi
C. Is used to prevent growth of halophiles
D. All of the above

Answer: B

Sol: ✅ (b) The main antimicrobial action of salt (NaCl) in food preservation comes from its ability to plasmolyze (i.e., draw water out of microbial cells by osmosis), thereby inhibiting their growth or killing them. Most bacteria and fungi require a certain water activity (aw) for growth, and salt lowers this aw, creating a hostile environment. This method is especially effective against spoilage microbes and pathogens in cured meats, pickles, and dried fish. ❌ (a) Salt can inhibit *Staphylococcus aureus*, but it is notably salt-tolerant, and high salt alone may not be sufficient. ❌ (c) Halophiles are salt-loving microbes that may actually thrive in high-salt environments. ❌ (d) is incorrect because (c) is false, making (b) the most accurate and specific option.

Q.147 **In batch fermentation:**

A. Substrates are added to the system all at once and runs until product is harvested
B. Nutrients are continuously fed into the reactor and the product is siphoned off during the run
C. New batches of microorganisms are screened for increased yield
D. Small-scale production is used to synthesize product

Answer: A

Sol: ✅ (a) Substrates are added all at once: • Batch fermentation is a closed system where nutrients are added initially. • No further feeding occurs during the run. • Microorganisms utilize the substrate, and the process ends when the product is ready. • It is commonly used in the production of alcohol, antibiotics, etc.
❌ (b) Nutrients are continuously fed: • This describes fed-batch or continuous fermentation. • Not applicable to batch fermentation.
❌ (c) New batches of microorganisms: • This is related to strain selection, not a fermentation type.
❌ (d) Small-scale production: • This refers to pilot scale, not specifically batch process.

Q.148 **Which of the following is responsible for a musty or earthy flavor?**

A. Actinomycetes
B. Flavobacterium
C. Both a and b
D. Pseudomonas syncyanea

Answer: A

Sol: ✅ (a) Actinomycetes: • Produce geosmin, responsible for musty flavor. • Common in soil and aquatic environments. • Affect water and food flavor profiles. • Often associated with earthy odor in root vegetables.
❌ (b) Flavobacterium: • Can cause off-odor but not musty specifically.
❌ (c) Both a and b: • Only Actinomycetes are linked to musty flavor.
❌ (d) Pseudomonas syncyanea: • Causes spoilage and discoloration, not flavor changes.

Q.149 **Molds causing spoilage of eggs include species of:**

A. *Cladosporium*
B. *Mucor*
C. *Thamnidium*
D. All of these

Answer: D

Sol: ✅ (d) All of these: • *Cladosporium* causes black spots on eggshells. • *Mucor* penetrates the shell and affects albumen. • *Thamnidium* leads to rotting under high humidity. • All are common egg spoilage fungi.
❌ (a), (b), (c): • Each is correct but not complete alone.

Q.150 **Vacuum packaged meats are spoiled by:**

A. *B. thermosphacta*
B. *Lactobacilli*
C. Both a and b
D. None of these

Answer: C

Sol: ✅ (c) Both a and b: • Anaerobic environment in vacuum packs favors these organisms. • *B. thermosphacta* causes souring and slime. • *Lactobacilli* leads to lactic acid production and off-odor. • Common spoilage agents in meat industry.
❌ (a) or (b): • Each is partially correct.
❌ (d): • Incorrect as both microbes are valid spoilage agents.