CUET PG 2025 FOOD SCIENCE AND TECHNOLOGY Question Paper with Solutions

Time Allowed :1 Hour 30 Mins	Maximum Marks :300	Total Questions :75

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The examination duration is 90 minutes. Manage your time effectively to attempt all questions within this period.
2. The total marks for this examination are 300. Aim to maximize your score by strategically answering each question.
3. There are 75 mandatory questions to be attempted in the Agro forestry paper. Ensure that all questions are answered.
4. Questions may appear in a shuffled order. Do not assume a fixed sequence and focus on each question as you proceed.
5. The marking of answers will be displayed as you answer. Use this feature to monitor your performance and adjust your strategy as needed.
6. You may mark questions for review and edit your answers later. Make sure to allocate time for reviewing marked questions before final submission.
7. Be aware of the detailed section and sub-section guidelines provided in the exam. Understanding these will aid in effectively navigating the exam.

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1. The addition of aluminium to the packaging materials for better conduction in microwave is known as _____

(A) Susceptors
(B) Docking
(C) Coating
(D) Lamination

Correct Answer: (A) Susceptors

Solution:

Step 1: Understanding the Concept:
Microwave ovens heat food using microwave radiation, which primarily excites water molecules. This process is very efficient for heating but does not typically brown or crisp the food surface, as conventional ovens do through conduction and convection.

To overcome this, special packaging materials are used.

Step 2: Detailed Explanation:
A **susceptor** is a material used in microwave packaging that absorbs microwave energy and converts it into thermal energy (heat).
It typically consists of a very thin layer of metal, like aluminium particles, vacuum-deposited onto a plastic film (like PET).
This film is then laminated to a paper or paperboard support.
When placed in a microwave, the metallic layer rapidly heats up to high temperatures, which then cooks the food by conduction and radiation, creating browning and crisping effects similar to a conventional oven.
Docking is the process of piercing dough to prevent blistering. **Coating** and **Lamination** are general packaging processes, but the specific technology for this purpose is called a susceptor.

Step 3: Final Answer:
The addition of aluminium to packaging materials for better heat conduction in a microwave is known as a susceptor. Therefore, option (A) is the correct answer.

Quick Tip

Remember that susceptors are designed to create a "conventional oven" effect (browning and crisping) for foods like popcorn, pizza, and french fries when cooked in a microwave. The keyword is converting microwave energy to thermal energy.

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2. Red muscle fibres have _____ myoglobin than white muscle fibre.

(A) higher
(B) lower
(C) dense
(D) thin

Correct Answer: (A) higher

Solution:

Step 1: Understanding the Concept:
Muscle fibres are categorized based on their contraction speed and primary mode of ATP production. The two main types are red (slow-twitch) and white (fast-twitch) muscle fibres.
Myoglobin is an iron- and oxygen-binding protein found in the muscle tissue of vertebrates. Its primary function is to store and supply oxygen to the muscle cells.

Step 2: Detailed Explanation:
Red muscle fibres (Type I) are adapted for sustained, long-duration activities like long-distance running. They rely on aerobic respiration, which requires a constant and abundant

supply of oxygen. To facilitate this, they have a high concentration of myoglobin, which stores oxygen within the muscle cell. The high myoglobin content, along with a rich blood supply, gives these fibres their characteristic red color.
White muscle fibres (Type II) are adapted for short, rapid, powerful bursts of activity like sprinting. They primarily rely on anaerobic glycolysis for energy, which does not require oxygen. Consequently, they have a much lower concentration of myoglobin, giving them a paler or white appearance.

Step 3: Final Answer:
Red muscle fibres are specialized for aerobic activities and thus have a higher concentration of the oxygen-storing protein myoglobin compared to white muscle fibres. Therefore, option (A) is correct.

Quick Tip

Associate the color with the function: **Red** = Rich in myoglobin/oxygen = Endurance (slow-twitch). **White** = Low in myoglobin/oxygen = Speed/Power (fast-twitch). Think of the dark meat (legs) vs. white meat (breast) in a chicken.

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3. Foaming is a functional property attributed to the _____ component of food.

(A) protein
(B) fat
(C) minerals
(D) sugars

Correct Answer: (A) protein

Solution:

Step 1: Understanding the Concept:
Functional properties of food components are the physical and chemical properties that affect the behavior of these components in food systems during preparation, processing, and storage. Foaming is the ability to create a stable mixture of gas dispersed in a liquid.

Step 2: Detailed Explanation:
Proteins are the primary components responsible for foaming in foods. Protein molecules have both hydrophilic (water-attracting) and hydrophobic (water-repelling) parts.
When a protein solution is agitated or whipped, the proteins migrate to the air-liquid interface. They partially unfold (denature) and arrange themselves so that their hydrophobic parts face the air bubbles and their hydrophilic parts face the liquid.
This creates a stable, viscoelastic film around the air bubbles, trapping them and forming a foam. A classic example is the foaming of egg whites (rich in albumin) to make meringue.
Fats generally inhibit foam formation by disrupting the protein film.

Sugars can help stabilize a foam once it's formed by increasing viscosity, but they are not the primary foaming agent.
Minerals do not have foaming properties.

Step 3: Final Answer:
The ability to form and stabilize foams in food is a key functional property of proteins. Therefore, option (A) is correct.

Quick Tip

Associate key food functional properties with their primary macronutrient: Foaming & Gelation → Proteins; Emulsification → Proteins & Fats; Browning → Sugars & Proteins.

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4. Pectin is primarily composed of_____

(A) galactose and glucose
(B) fructose
(C) galacto-pyranosyl uronic acid
(D) amylose

Correct Answer: (C) galacto-pyranosyl uronic acid

Solution:

Step 1: Understanding the Concept:
Pectin is a complex structural polysaccharide found in the primary cell walls of plants, particularly in fruits. It is widely used in the food industry as a gelling agent, thickener, and stabilizer, most notably in jams and jellies.

Step 2: Detailed Explanation:
The main component of the pectin backbone is a linear chain of D-galacturonic acid units linked by α-(1→4) glycosidic bonds.
Galacturonic acid is a sugar acid, an oxidized form of galactose.
The term **galacto-pyranosyl uronic acid** is the more formal chemical name for a galacturonic acid unit when it is in its six-membered (pyranose) ring form within a polymer chain.
The other options are incorrect:
- (A) Galactose and glucose are simple sugars (monosaccharides).
- (B) Fructose is a simple sugar.
- (D) Amylose is a polysaccharide, but it is a component of starch and is made up of glucose units.

Step 3: Final Answer:
The primary building block of the pectin polymer is galacturonic acid, correctly named as

galacto-pyranosyl uronic acid in its ring form. Thus, option (C) is the correct answer.

Quick Tip

For exams, connect "Pectin" directly with "Galacturonic Acid". This is the fundamental structural unit responsible for its gelling properties.

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5. Candling of egg reveals the presence of _____

(A) blood spot
(B) hazards
(C) vitelline membrane
(D) microorganisms

Correct Answer: (A) blood spot

Solution:

Step 1: Understanding the Concept:
Candling is a non-destructive method used in the egg industry to assess the internal quality of an egg. It involves shining a bright light through the egg to illuminate its contents.

Step 2: Detailed Explanation:
During candling, several quality factors can be observed:
- **Air cell size:** A smaller air cell indicates a fresher egg.
- **Yolk condition:** The yolk should be centered and its outline indistinct.
- **Albumen (white) condition:** The white should be clear and firm.
- **Defects:** The light reveals abnormalities such as cracks in the shell, and internal defects like **blood spots** (from a ruptured blood vessel during ovulation) or meat spots (tissue from the oviduct).
The other options are less accurate:
- (B) "Hazards" is too general. A blood spot could be considered a quality hazard, but it's not a safety hazard.
- (C) The vitelline membrane (which encloses the yolk) is a normal part of every egg; candling assesses its integrity, not its mere presence.
- (D) Microorganisms are too small to be seen by candling, although spoilage caused by them (e.g., a "black rot") might be visible.

Step 3: Final Answer:
Candling is an effective method for detecting internal defects, the most common of which is a blood spot. Therefore, option (A) is the correct answer.

Quick Tip

Think of candling as an "X-ray" for eggs. It's used to find internal flaws. Blood spots are a key defect that graders look for during this process.

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6. The standard weight of extra large size grade hen eggs, ranges _____ g

(A) 38 - 44
(B) More than 60
(C) 53 - 59
(D) 45 - 52

Correct Answer: (B) More than 60

Solution:

Step 1: Understanding the Concept:
Eggs are sorted and graded by size, which is determined by weight. These standards can vary slightly by country, but they follow a general pattern of increasing weight for each size grade.

Step 2: Detailed Explanation:
A common weight classification system for hen eggs (such as AGMARK in India or similar international standards) is as follows:
- **Peewee/Pullet:** Below 45 g
- **Small:** 45 - 52 g
- **Medium:** 53 - 59 g
- **Large:** 60 g and above (often starts around 58-60g)
- **Extra Large:** This category usually encompasses the heaviest eggs, typically starting above 60g and often specified as 65g or more in some systems.

Let's analyze the given options based on this general classification:
- (A) 38 - 44 g: This corresponds to Peewee or Small eggs.
- (C) 53 - 59 g: This typically corresponds to Medium or Large eggs.
- (D) 45 - 52 g: This corresponds to Small eggs.
- (B) More than 60 g: This range aligns with the definition of Large and Extra Large eggs. Given the options, it is the only one that correctly places Extra Large eggs.

Step 3: Final Answer:
The weight range for extra large eggs is generally considered to be above 60 grams. Therefore, option (B) is the most appropriate answer.

Quick Tip

For exam purposes, remember a "standard large" egg is about 55-60 grams. Anything above that falls into the "extra large" or "jumbo" category. This is a useful benchmark to have.

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7. The major microorganism responsible for food infection transmitted through eggs is _____

(A) E. coli
(B) Salmonella
(C) Pseudomonas
(D) Clostridium botulinum

Correct Answer: (B) Salmonella

Solution:

Step 1: Understanding the Concept:
A food infection is a type of foodborne illness caused by ingesting food contaminated with living pathogenic microorganisms, which then multiply in the human gastrointestinal tract and cause illness.

Step 2: Detailed Explanation:
Salmonella, particularly the serotype *Salmonella Enteritidis*, is the bacterium most commonly associated with eggs and egg products.
Contamination can occur in two ways:
1. **Vertical Transmission:** An infected hen can pass the bacteria to the inside of the egg before the shell is formed.
2. **Horizontal Transmission:** The bacteria can penetrate the eggshell from contaminated feces or environment.
Consuming raw or undercooked eggs contaminated with *Salmonella* can lead to salmonellosis, an infection characterized by diarrhea, fever, and abdominal cramps.
The other microorganisms are less likely:
- **E. coli** is typically associated with undercooked ground beef, contaminated water, or produce.
- **Pseudomonas** is a common spoilage bacterium but not a primary cause of infection from eggs.
- **Clostridium botulinum** is an anaerobic bacterium associated with improperly canned or preserved foods.

Step 3: Final Answer:
The major and most well-known microorganism causing food infection transmitted through eggs is Salmonella. Therefore, option (B) is correct.

Quick Tip

In any food safety question involving eggs and bacterial infection, *Salmonella* is almost always the correct answer. Associate "raw eggs" with the risk of "Salmonella".

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8. Match List-I with List-II

List-I **Cake defects**	**List-II** **Causes**
(A) Too light crust	(I) Too high baking temperature
(B) Dense texture	(II) Too much shortening
(C) Too dark crust	(III) Too little sugar
(D) Crumbly texture	(IV) Too much liquid

Choose the most appropriate answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Solution:

Step 1: Understanding the Concept:
Cake quality depends on a precise balance of ingredients and correct baking conditions. An imbalance leads to specific defects. We need to match each defect with its most likely cause.

Step 2: Detailed Explanation:
Let's analyze each defect:
- **(A) Too light crust:** Crust color develops from the Maillard reaction and caramelization of sugars. Insufficient sugar or too low a baking temperature will result in poor browning and a pale crust. Thus, **(A) matches with (III) Too little sugar**.
- **(B) Dense texture:** A dense, heavy texture can be caused by several factors, including improper leavening or a weak structure that collapses. Too much liquid can dilute the structural components (flour, eggs) and gluten, leading to a weak batter that does not rise properly. Thus, **(B) matches with (IV) Too much liquid**.
- **(C) Too dark crust:** This is the opposite of a light crust. Excessive browning is caused by too much sugar or, more commonly, a baking temperature that is too high, causing the exterior to brown too quickly before the interior is cooked. Thus, **(C) matches with (I) Too high baking temperature**.
- **(D) Crumbly texture:** Shortening (fat) tenderizes the cake by coating flour particles and shortening gluten strands. An excessive amount of shortening over-tenderizes the cake, resulting in a weak structure that is dry and falls apart easily. Thus, **(D) matches with (II) Too**

much shortening.

Step 3: Final Answer:
The correct pairings are: (A) - (III), (B) - (IV), (C) - (I), and (D) - (II). This corresponds to option (D).

Quick Tip

To solve baking problems, understand the function of each ingredient:

- **Sugar:** Browning, moisture, tenderness.
- **Fat/Shortening:** Tenderness. (Too much = crumbly)
- **Liquid:** Hydration, structure. (Too much = dense)
- **Temperature:** Sets structure, causes browning. (Too high = dark crust)

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9. Match List-I with List-II

List-I **Ingredients for bread manufacture**	**List-II** **Role of ingredients**
(A) Shortening	(I) Texture
(B) Yeast	(II) Flavour
(C) Sugar	(III) Loaf volume
(D) Flour	(IV) Fermentation substrate

Choose the most appropriate answer from the options given below:

(A) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:
Each ingredient in bread making plays a specific and crucial role in the final product's characteristics. This question requires matching the ingredient to its primary function from the given list.

Step 2: Detailed Explanation:
Let's analyze the role of each ingredient:
- **(A) Shortening:** Fat is added to bread dough to tenderize the crumb, lubricate the gluten network, and improve the slicing quality and shelf life. Its primary role is related to the final

(I) Texture.
- **(B) Yeast:** Yeast performs fermentation, which produces carbon dioxide for leavening. It also produces ethanol and various esters and other volatile compounds that contribute significantly to the characteristic aroma and **(II) Flavour** of bread.
- **(C) Sugar:** The primary role of sugar in a yeast-leavened dough is to act as food for the yeast. It is the **(IV) Fermentation substrate** that the yeast metabolizes to produce CO_2 and alcohol. It also contributes to crust browning and flavour.
- **(D) Flour:** Flour, specifically the gluten proteins within it, forms a viscoelastic network that traps the gas produced by the yeast. The quality and quantity of this gluten are the primary determinants of the final **(III) Loaf volume** and structure.

Step 3: Final Answer:
Based on the analysis, the correct matches are: (A) with (I), (B) with (II), (C) with (IV), and (D) with (III). This combination is given in option (C).

Quick Tip

To solve matching questions about ingredients, focus on the most unique and primary role of each component. For example, while yeast affects volume and sugar affects flavour, sugar's most critical role is being the yeast's food (substrate), and flour's primary role is providing the structure for volume.

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10. Match List-I with List-II

List-I **Product**	**List-II** **Related temperature (°C)**
(A) Syrup	(I) 112-115
(B) Fondant	(II) 110-112
(C) Caramel	(III) 118-120
(D) Toffee	(IV) 132-143

Choose the most appropriate answer from the options given below:

(A) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:
The manufacturing of sugar confectionery depends on boiling a sugar solution to specific temperatures. Each temperature corresponds to a particular sugar concentration and results in a

different texture in the final cooled product. This progression is known as the stages of sugar cookery.

Step 2: Detailed Explanation:
Let's match the products to their typical cooking temperatures based on the stages of sugar cookery:
- **(B) Fondant:** The base for fondant requires a sugar syrup boiled to the soft-ball stage, which allows for the formation of fine sugar crystals upon cooling and agitation. The thread stage is slightly below this. Let's match Fondant with the Thread Stage temperature: **(II) 110-112 °C**.
- **(A) Syrup:** A simple syrup used for desserts or as a base for other candies is often cooked to the soft-ball stage to give it more body than a simple solution. This corresponds to **(I) 112-115 °C**.
- **(D) Toffee:** Toffee has a firm, chewy texture and is cooked to the firm-ball stage, which is hotter than the soft-ball stage. This corresponds to **(III) 118-120 °C**.
- **(C) Caramel:** Caramel requires a higher temperature to achieve its characteristic brown color (from caramelization) and harder texture. The soft-crack stage is appropriate for making hard caramels. This corresponds to **(IV) 132-143 °C**.

So, the logical matching is A→I, B→II, C→IV, D→III.

Step 3: Final Answer:
The correct matching sequence is (A) - (I), (B) - (II), (C) - (IV), (D) - (III). This corresponds to option (C).

Quick Tip

Remember the general order of sugar cooking stages by increasing temperature: Thread → Soft Ball → Firm Ball → Hard Ball → Soft Crack → Hard Crack → Caramel. Match the products based on their hardness: Fondant (softest) → Toffee → Caramel (hardest/highest temp).

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11. The term "GRAS" stands for:

(A) Generally Recognized As Stable
(B) Generally Recommended As Safe
(C) Generally Regarded As Stable
(D) Generally Recognized As Safe

Correct Answer: (D) Generally Recognized As Safe

Solution:

Step 1: Understanding the Concept:
GRAS is a regulatory designation by the United States Food and Drug Administration (FDA). It pertains to food additives, such as flavorings, spices, and preservatives.

Step 2: Detailed Explanation:
The acronym GRAS stands for **Generally Recognized As Safe**. This designation means that a chemical or substance added to food is considered safe by experts under the conditions of its intended use, and is exempt from the usual federal Food, Drug, and Cosmetic Act (FFDCA) food additive tolerance requirements. Common examples include salt, sugar, and vinegar.
The other options are incorrect variations of this official term.

Step 3: Final Answer:
The correct expansion of the acronym GRAS is "Generally Recognized As Safe". Therefore, option (D) is correct.

Quick Tip

In food science and regulation, GRAS is a fundamental concept. Memorize the exact wording: "Generally Recognized As Safe." Pay attention to each word, as incorrect options often use similar words like "Regarded," "Recommended," or "Stable."

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12. Match List-I with List-II

List-I **Product**	**List-II** **Property**
(A) Biscuit	(I) Low sugar and fat
(B) Cracker	(II) Flat crisp
(C) Hard dough biscuit	(III) Partially developed gluten
(D) Soft dough biscuit	(IV) Flowy dough

Choose the most appropriate answer from the options given below:

(A) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)

Solution:

Step 1: Understanding the Concept:
Different types of biscuits and crackers are distinguished by their ingredients, dough properties, and final product characteristics. This question asks to match specific biscuit types with their defining properties.

Step 2: Detailed Explanation:
- **(D) Soft dough biscuit:** These are typically high in fat and sugar, which inhibits gluten development. This results in a short, tender texture and a dough that is soft and often **(IV) Flowy**, suitable for depositing. Cookies are a prime example.
- **(C) Hard dough biscuit:** These have lower fat and sugar content. The dough is developed to be tough and extensible, though the gluten is only **(III) Partially developed** compared to bread dough. These doughs are sheeted and cut. Examples include Marie biscuits.
- **(B) Cracker:** Crackers are characterized by their savory taste, laminated structure, and crisp texture. They are typically made from lean doughs with **(I) Low sugar and fat**.
- **(A) Biscuit:** This is a general term. Given the other specific matches, "biscuit" likely refers to the general characteristic shared by many types, which is being a **(II) Flat crisp** baked product.

Step 3: Final Answer:
The most logical matching is (A)-(II), (B)-(I), (C)-(III), and (D)-(IV). This corresponds to option (A).

Quick Tip

Remember the key distinction between biscuit doughs: Soft dough has high fat/sugar and is flowy (like cookie dough). Hard dough has low fat/sugar and is tough/elastic (like for Marie biscuits). Crackers are an extreme case of hard dough, very low in fat/sugar.

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13. The sequence of biscuit manufacturing process generally involves:
(A). Cooling and packing
(B). Forming
(C). Baking
(D). Mixing
Choose the most appropriate answer from the options given below:

(A) (D), (B), (C), (A).
(B) (A), (B), (C), (D).
(C) (B), (A), (D), (C).
(D) (C), (B), (D), (A).

Correct Answer: (A) (D), (B), (C), (A).

Solution:

Step 1: Understanding the Concept:
The manufacturing of biscuits, like most baked goods, follows a logical sequence of operations from raw materials to the finished product. The task is to arrange the given steps in the correct chronological order.

Step 2: Detailed Explanation:
Let's trace the process flow:
1. The first step is to combine all the raw ingredients (flour, sugar, fat, water, etc.) to create a homogenous dough. This is **(D) Mixing**.
2. Once the dough is ready, it must be shaped into individual biscuit pieces. This can be done by sheeting and cutting, rotary moulding, or depositing. This is **(B) Forming**.
3. The formed dough pieces are then passed through an oven to remove moisture and develop the characteristic texture, color, and flavor. This is **(C) Baking**.
4. After baking, the biscuits are hot and fragile. They must be cooled down to ambient temperature to become firm and crisp before they can be packaged. This is **(A) Cooling and packing**.

Step 3: Final Answer:
The correct sequence of operations is Mixing → Forming → Baking → Cooling and packing. This corresponds to the order (D), (B), (C), (A), which is option (A).

Quick Tip

For any process sequencing question, think logically from start to finish. You always start by combining ingredients (Mixing) and end with the finished product ready for sale (Packing). The processing steps (Forming, Baking) must happen in between.

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14. The process for the development of cocoa mass follows a sequence of
(A). Milling
(B). Cleaning and roasting
(C). Breaking and winnowing
(D). Fermentation of dried beans
Choose the most appropriate answer from the options given below:

(A) (A), (B), (C), (D).
(B) (D), (B), (C), (A).
(C) (B), (A), (D), (C).
(D) (C), (B), (D), (A).

Correct Answer: (B) (D), (B), (C), (A).

Solution:

Step 1: Understanding the Concept:
The conversion of raw cocoa beans into cocoa mass (also known as cocoa liquor), the primary ingredient for chocolate, involves several key processing steps. This question asks for the correct order of these steps.

Step 2: Detailed Explanation:
The journey from bean to mass is as follows:

1. The process begins at the farm level after harvesting. The cocoa beans and pulp are subjected to **(D) Fermentation**, followed by drying. This step is crucial for developing the precursor compounds for chocolate flavor.
2. The dried beans are then transported to the processing plant, where they are first cleaned to remove foreign matter and then roasted. **(B) Cleaning and roasting** develops the characteristic chocolate aroma and flavor and loosens the outer shell.
3. The roasted beans are then passed through a machine that breaks them into smaller pieces and uses air currents to separate the light outer shells from the heavier inner part, known as the cocoa nib. This is **(C) Breaking and winnowing**.
4. The final step to produce cocoa mass is to grind the cocoa nibs into a fine paste. The heat generated during this process melts the cocoa butter in the nibs, resulting in a thick liquid. This is **(A) Milling**.

Step 3: Final Answer:
The correct sequence is Fermentation → Cleaning and roasting → Breaking and winnowing → Milling. This corresponds to the order (D), (B), (C), (A), which is option (B).

Quick Tip

Remember the cocoa process flow: It starts with raw beans (Fermentation), then they are prepared (Roasting), then the shell is removed (Winnowing), and finally, the core (nib) is ground (Milling) to get the mass.

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15. Syneresis or weeping is a defect in_____

(A) Jelly
(B) Pickles
(C) Juices
(D) Jam

Correct Answer: (A) Jelly

Solution:

Step 1: Understanding the Concept:
Syneresis, also known as weeping, is the contraction of a gel, which results in the separation or "weeping" of liquid from the gel structure. This phenomenon occurs in food systems that are based on a gel network, such as those formed by proteins (e.g., yogurt) or polysaccharides (e.g., pectin in jellies).

Step 2: Detailed Explanation:
- **(A) Jelly:** A jelly is a clear or translucent fruit spread made from fruit juice, sugar, and pectin. It is a classic example of a pectin gel. If the gel network is unstable (due to improper pH, sugar concentration, or pectin quality), it can shrink over time and squeeze out the liquid

it holds, which is a common defect known as syneresis.
- **(B) Pickles:** Pickles are vegetables preserved in brine or vinegar; they are not a gel system.
- **(C) Juices:** Juices are liquids and do not have a gel structure.
- **(D) Jam:** Jam is also a pectin gel, similar to jelly, but it contains fruit pulp or pieces. Syneresis can also occur in jam, but it is a quintessential and highly visible defect in a clear jelly. Given the options, jelly is the most precise answer representing a pure gel system where this defect is prominent.

Step 3: Final Answer:
Syneresis is a characteristic defect of gel-based foods. Among the options provided, jelly is the best example of a food product defined by its gel structure where weeping is a well-known quality issue. Therefore, option (A) is the correct answer.

Quick Tip

Associate the term "syneresis" or "weeping" with any food that is a gel. Common examples in exams include jelly, jam, yogurt, and custards. The key is the presence of a 3D network that traps liquid.

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16. Arrange the processing steps of Jelly marmalade in a proper sequence:
(A). Selection and preparation of fruit
(B). Preparation of sherds & peels
(C). Boiling and cleaning of pectin
(D). Canning and sterilization
Choose the most appropriate answer from the options given below:

(A) (A), (B), (D), (C).
(B) (A), (B), (C), (D).
(C) (A), (C), (B), (D).
(D) (C), (B), (D), (A).

Correct Answer: (B) (A), (B), (C), (D).

Solution:

Step 1: Understanding the Concept:
Jelly marmalade is a fruit preserve made from the juice and peel of citrus fruits boiled with sugar and water. The process involves several distinct steps that must be performed in a logical order to achieve the desired product.

Step 2: Detailed Explanation:
Let's establish the chronological order of the steps:
1. The process begins with sourcing the raw material. This involves choosing suitable fruit and then washing and cutting it. This is **(A) Selection and preparation of fruit**.

2. A defining feature of marmalade is the presence of citrus peel shreds. After the initial preparation, the peels must be specifically cut into thin strips or "sherds". This is **(B) Preparation of sherds & peels**. This step must follow the general preparation of the fruit.
3. The next major stage is the cooking process. The prepared fruit, juice, peels, and sugar are boiled together. This step extracts pectin from the fruit, dissolves the sugar, and concentrates the mixture to the point where it will set into a gel upon cooling. The phrase **(C) Boiling and cleaning of pectin** refers to this cooking and gel formation stage.
4. Once the marmalade is cooked, it must be preserved for shelf stability. This involves filling it into jars or cans while hot, sealing them, and then processing them to ensure they are commercially sterile. This is **(D) Canning and sterilization**, the final step.

Step 3: Final Answer:
The logical sequence is: Selection and preparation of fruit → Preparation of sherds & peels → Boiling → Canning and sterilization. This corresponds to the order (A), (B), (C), (D), which is option (B).

Quick Tip

For process sequencing, always identify the absolute first step (raw material preparation) and the absolute last step (packaging/preservation). Then, arrange the intermediate steps logically. For marmalade, remember you must prepare the peels before you can cook them in the mixture.

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17. Natural carotenes can be extracted from_____

(A) saffron
(B) soyabean
(C) beans
(D) pear

Correct Answer: (A) saffron

Solution:

Step 1: Understanding the Concept:
Carotenes are a class of natural pigments belonging to the carotenoid family. They are responsible for many of the yellow, orange, and red colors found in plants. The question asks to identify a source of carotenes from the given options.

Step 2: Detailed Explanation:
- **Saffron:** The vibrant color of saffron comes from carotenoid compounds, primarily crocin and crocetin, along with other carotenes like alpha- and beta-carotene. Saffron is one of the most potent natural sources of these color compounds.
- **Soyabean:** Soybeans are not known as a rich source of carotenes. Their primary components

are protein and oil.
- **Beans:** While some beans contain carotenoids (e.g., green beans have lutein and beta-carotene, often masked by chlorophyll), they are generally not considered a primary source for extraction compared to other vegetables or spices.
- **Pear:** Pears have very low levels of carotenes, which is evident from their pale flesh color.
Comparing the options, saffron is the most significant source of carotenoid pigments.

Step 3: Final Answer:
Among the given options, saffron is the most notable source for the extraction of natural carotenoid pigments. Therefore, option (A) is correct.

Quick Tip

Associate vibrant natural colors (deep reds, yellows, oranges) with carotenoids. Foods like carrots, sweet potatoes, tomatoes, and intensely colored spices like paprika and saffron are rich sources.

---

18. The process of yoghurt manufacture involves the following sequence
(A). Homogenization of milk
(B). Standardization of milk
(C). Pasteurization, cooling followed by addition of starter culture
(D). Fermentation, packaging and storage
Choose the most appropriate answer from the options given below:

(A) (C), (A), (B), (D)
(B) (B), (C), (A), (D)
(C) (B), (A), (C), (D)
(D) (A), (B), (C), (D)

Correct Answer: (C) (B), (A), (C), (D)

Solution:

Step 1: Understanding the Concept:
Yoghurt production is a controlled process that transforms milk into a fermented dairy product. Each step is performed in a specific order to ensure the final product has the desired safety, texture, and flavor.

Step 2: Detailed Explanation:
The standard sequence for yoghurt manufacturing is as follows:
1. **(B) Standardization of milk:** The process starts with adjusting the milk's composition. This primarily involves modifying the fat and milk solids-not-fat (MSNF) content to meet legal standards and achieve the desired final texture.
2. **(A) Homogenization of milk:** The standardized milk is then homogenized by forcing

it through small orifices under high pressure. This breaks down the fat globules, preventing cream separation and resulting in a smoother, more viscous yoghurt.
3. **(C) Pasteurization, cooling followed by addition of starter culture:** The milk is pasteurized at a high temperature (e.g., 85-95°C) to kill spoilage and pathogenic bacteria and to denature whey proteins, which helps create a more stable gel. The milk is then cooled to the optimal fermentation temperature (40-45°C) before the starter culture (*Lactobacillus bulgaricus* and *Streptococcus thermophilus*) is added.
4. **(D) Fermentation, packaging and storage:** The inoculated milk is incubated at the set temperature. During this time, the starter bacteria ferment lactose into lactic acid, causing the milk pH to drop and the casein proteins to coagulate, forming the characteristic yoghurt gel. After the desired acidity is reached, the yoghurt is cooled, packaged, and stored under refrigeration.

Step 3: Final Answer:
The correct chronological sequence of the steps is (B) → (A) → (C) → (D). This matches option (C).

Quick Tip

For dairy processing sequences, always start with adjusting the raw material (Standardization). Heat treatment (Pasteurization) comes before adding live cultures, and the biological process (Fermentation) is the core manufacturing step before final packaging.

---

19. Toxic constituent in *Vicia faba* may cause _____ pathological disorder.

(A) Favism
(B) Lathyrism
(C) Rickets
(D) Blindness

Correct Answer: (A) Favism

Solution:

Step 1: Understanding the Concept:
Vicia faba, commonly known as the fava bean or broad bean, contains certain natural compounds that can be toxic to susceptible individuals, leading to a specific medical condition.

Step 2: Detailed Explanation:
- **Favism:** This is a condition where individuals with a hereditary deficiency of the enzyme glucose-6-phosphate dehydrogenase (G6PD) experience acute hemolytic anemia after consuming fava beans. The causative agents in the beans are the pyrimidine glycosides vicine and convicine.
- **Lathyrism:** This is a neurological disorder caused by eating certain legumes of the genus

Lathyrus (grass pea), not *Vicia faba*. The toxin responsible is oxalyldiaminopropionic acid (ODAP).
- **Rickets:** This is a bone disorder caused by a deficiency of vitamin D, calcium, or phosphate. It is unrelated to fava bean consumption.
- **Blindness:** While nutritional deficiencies (like Vitamin A deficiency) can cause blindness, it is not associated with toxins in fava beans.

Step 3: Final Answer:
The pathological disorder specifically associated with the toxic constituents in *Vicia faba* is Favism. Therefore, option (A) is correct.

Quick Tip

Memorize the specific pairings of food toxins and the diseases they cause: *Vicia faba* (Fava beans) → Favism; *Lathyrus sativus* (Grass pea) → Lathyrism; Improperly processed cassava → Konzo.

---

20. Which of the following legume is considered as the poor man's pulse?

(A) Field bean
(B) Horse gram
(C) Green gram
(D) Lentil

Correct Answer: (B) Horse gram

Solution:

Step 1: Understanding the Concept:
Certain crops are given colloquial names like "poor man's pulse" or "poor man's crop" based on their affordability, nutritional value, and ability to grow in harsh conditions where other crops might fail, making them vital for subsistence farmers.

Step 2: Detailed Explanation:
Horse gram (*Macrotyloma uniflorum*) is widely known as the "poor man's pulse" or "poor man's superfood". This is because it is a highly drought-resistant crop that can be cultivated in poor soils and low rainfall areas. It is rich in protein, iron, and calcium, providing essential nutrition at a low cost, particularly in rural and arid regions of India.
While other legumes like field bean, green gram, and lentil are also important sources of protein, horse gram's exceptional hardiness and importance in marginal agriculture have specifically earned it this title.

Step 3: Final Answer:
Horse gram is widely recognized as the "poor man's pulse" due to its resilience, nutritional

value, and low cost of cultivation. Therefore, option (B) is the correct answer.

Quick Tip

For questions about colloquial crop names, think about the crop's economic and agricultural role. "Poor man's crop" usually refers to something very hardy and inexpensive. For example, potato is the "poor man's friend," and pearl millet is the "poor man's food."

---

21. Which of the following are polyunsaturated fatty acids (n-6)?
(A). Linoleic
(B). γ- Linolenic
(C). Arachidonic
(D). Oleic
Choose the most appropriate answer from the options given below:

(A) (A), (B) and (D) only.
(B) (A), (B) and (C) only.
(C) (A), (B), (C) and (D).
(D) (B), (C) and (D) only.

Correct Answer: (B) (A), (B) and (C) only.

Solution:

Step 1: Understanding the Concept:
Fatty acids are classified based on the number of double bonds (saturation) and the position of the first double bond from the methyl end (omega or n- position). A polyunsaturated fatty acid (PUFA) has two or more double bonds. An n-6 (or omega-6) fatty acid has its first double bond at the sixth carbon atom from the methyl end.

Step 2: Detailed Explanation:
Let's analyze each fatty acid:
- **(A) Linoleic acid (LA):** Its notation is 18:2(n-6). It has 18 carbons and 2 double bonds, with the first at the 6th carbon. It is an n-6 PUFA.
- **(B) γ-Linolenic acid (GLA):** Its notation is 18:3(n-6). It has 18 carbons and 3 double bonds, with the first at the 6th carbon. It is an n-6 PUFA. (This is different from α-linolenic acid (ALA), which is an n-3 PUFA).
- **(C) Arachidonic acid (AA):** Its notation is 20:4(n-6). It has 20 carbons and 4 double bonds, with the first at the 6th carbon. It is an n-6 PUFA.
- **(D) Oleic acid (OA):** Its notation is 18:1(n-9). It has only one double bond, so it is a monounsaturated fatty acid (MUFA), not a PUFA. Also, its double bond is at the n-9 position.
Therefore, Linoleic, γ-Linolenic, and Arachidonic acids are all n-6 PUFAs.

Step 3: Final Answer:
The fatty acids that fit the description of n-6 polyunsaturated are (A), (B), and (C). This corresponds to option (B).

Quick Tip

Remember the three key fatty acid families:

- **n-6 Family Head:** Linoleic Acid (LA)
- **n-3 Family Head:** α-Linolenic Acid (ALA)
- **n-9 Family Head:** Oleic Acid (OA)

Arachidonic acid and γ-linolenic acid are derived from linoleic acid, so they are also in the n-6 family.

---

22. Durum wheat is used for the making of _____

(A) Pasta
(B) Cake
(C) Pastry
(D) Cookies

Correct Answer: (A) Pasta

Solution:

Step 1: Understanding the Concept:
Different varieties of wheat have distinct characteristics, particularly in terms of their protein (gluten) content and hardness. These properties determine their suitability for various food products.

Step 2: Detailed Explanation:
- **Durum wheat** (*Triticum durum*) is a very hard type of wheat with a high protein content and strong gluten quality. The coarse flour ground from durum wheat is called semolina. These properties are ideal for making products that need to hold their shape and have a firm texture after cooking, such as **Pasta** and couscous.
- **Cake, Pastry, and Cookies** require a soft, tender texture. They are made from soft wheat varieties, which have a lower protein content and weaker gluten. Using durum wheat would result in tough, dense, and undesirable products.

Step 3: Final Answer:
Durum wheat's unique hard and high-protein characteristics make it the primary choice for manufacturing high-quality pasta. Therefore, option (A) is correct.

Quick Tip

A simple rule for wheat types: **Hard/Strong Wheat** (like Durum) is for bread and pasta. **Soft/Weak Wheat** is for cakes, cookies, and pastries.

---

23. Freshly milled wheat flour used for bread making is matured for _____ months during storage.

(A) 3 to 4
(B) 2 to 3
(C) 1 to 2
(D) 5 to 6

Correct Answer: (C) 1 to 2

Solution:

Step 1: Understanding the Concept:
Freshly milled wheat flour has what is known as "green" properties, meaning its gluten is not yet ideal for bread making. It requires a period of aging or maturation to improve its baking qualities. During this time, natural oxidation occurs, which strengthens the gluten-forming proteins (gliadin and glutenin) and bleaches the natural yellowish pigments.

Step 2: Detailed Explanation:
The process of natural aging allows for atmospheric oxygen to interact with the flour components. This oxidation strengthens the disulfide bonds within the gluten network, leading to better dough elasticity, gas retention, and ultimately, greater loaf volume.
This process typically takes several weeks to a few months. A period of **1 to 2 months** is generally considered sufficient for this natural maturation to significantly improve the flour's performance in bread making. Storing for too long (e.g., 5-6 months) can increase the risk of rancidity of the lipids in the flour.

Step 3: Final Answer:
The standard duration for naturally maturing freshly milled wheat flour for bread making is 1 to 2 months. Therefore, option (C) is the correct answer.

Quick Tip

Remember that flour maturation is an oxidative process. While modern mills often use chemical agents (like ascorbic acid) to speed this up, natural aging is still a key concept. For exams, associate "freshly milled flour" with the need for a short aging period to improve gluten strength.

---

24. The yellow colour of the cow milk is due to the presence of_____

(A) sterols
(B) albumin
(C) phospholipids
(D) carotenoids

Correct Answer: (D) carotenoids

Solution:

Step 1: Understanding the Concept:
The color of milk and milk fat is influenced by the diet of the cow. Certain pigments from the cow's feed are fat-soluble and can be transferred into the milk.

Step 2: Detailed Explanation:
- **Carotenoids**, particularly **beta-carotene**, are yellow-orange pigments found abundantly in green forage like grass, which is a major part of a cow's diet.
- Beta-carotene is a fat-soluble pigment. When consumed by the cow, it is absorbed and gets dissolved in the milk fat globules.
- This gives the milk fat a yellowish hue. The intensity of the color depends on the breed of the cow and the amount of green feed in its diet. This color is especially concentrated in products with high fat content, like cream and butter.
- Sterols, albumin (a protein), and phospholipids are other components of milk, but they are colorless and do not contribute to the yellow color.

Step 3: Final Answer:
The yellow color in cow's milk is caused by the presence of carotenoid pigments, primarily beta-carotene, dissolved in the milk fat. Therefore, option (D) is correct.

Quick Tip

Associate carotenoids with yellow/orange colors in nature (e.g., carrots). Remember that since beta-carotene is fat-soluble, the yellow color in milk is more prominent in the cream or butter. This is why butter from grass-fed cows is more yellow.

---

25. Sequentially arrange the processing steps involved in the manufacturing of cheddar cheese
(A). Standardization
(B). Pre-heating
(C). Addition of starter culture
(D). Pasteurization
Choose the most appropriate answer from the options given below:

(A) (A), (B), (D), (C).
(B) (A), (B), (C), (D).
(C) (B), (A), (D), (C).
(D) (C), (B), (D), (A).

Correct Answer: (A) (A), (B), (D), (C).

Solution:

Step 1: Understanding the Concept:
Cheesemaking is a precise process that involves a series of steps performed in a specific order to convert milk into a stable, flavorful product. The initial steps focus on preparing the milk for coagulation.

Step 2: Detailed Explanation:
1. **(A) Standardization:** The process begins with raw milk. Its composition, particularly the fat-to-protein ratio, is adjusted to ensure consistent cheese quality.
2. **(B) Pre-heating and (D) Pasteurization:** After standardization, the milk is heat-treated. This involves pre-heating the milk to the required temperature and then holding it for a specific time (**Pasteurization**) to kill any harmful microorganisms and spoilage enzymes. This is a critical food safety step.
3. After pasteurization, the milk is cooled to the optimal temperature for the starter bacteria to thrive (around 30-32°C for cheddar).
4. **(C) Addition of starter culture:** Once the milk is at the correct temperature, the starter culture (lactic acid bacteria) is added. These bacteria will ferment lactose into lactic acid, which is essential for the subsequent steps of coagulation and cheese development.
The sequence (A) → (B) → (D) → (C) is the only logical flow, as pasteurization must occur before the addition of live cultures, otherwise the heat would kill them.

Step 3: Final Answer:
The correct sequence for the initial steps of cheddar cheese manufacturing is Standardization → Pre-heating → Pasteurization → Addition of starter culture. This corresponds to the order (A), (B), (D), (C), which is option (A).

Quick Tip

In any dairy fermentation process, remember the rule: "Prepare, Kill, Inoculate". First, prepare the milk (standardize). Then, kill unwanted microbes (pasteurize). Finally, inoculate with the desired microbes (add starter culture).

---

26. Foods which are specially processed or formulated to satisfy a particular dietary requirement which exists due to a disease or disorder are known as _____

(A) Healthy foods
(B) Nutraceuticals
(C) Balanced foods
(D) Special foods

Correct Answer: (D) Special foods

Solution:

Step 1: Understanding the Concept:
This question asks for the correct term for foods designed to manage specific health conditions or diseases. This falls under a specific category in food regulation and science.

Step 2: Detailed Explanation:
- The definition provided in the question—"specially processed or formulated to satisfy a particular dietary requirement which exists due to a disease or disorder"—directly corresponds to the regulatory category known as **Foods for Special Dietary Use (FSDU)** or Medical Foods.
- Examples include gluten-free products for celiac disease, lactose-free milk for lactose intolerance, or formulations for individuals with phenylketonuria (PKU).
- Let's analyze the options: - **Healthy foods** and **Balanced foods** are general, non-specific terms. - **Nutraceuticals** are typically products derived from food sources with extra health benefits, often sold in medicinal forms (e.g., capsules of fish oil). While related, the term FSDU is more specific to whole food formulations for disease management. - **Special foods** is the best available option, serving as a simplified term for the official category of "Foods for Special Dietary Use".

Step 3: Final Answer:
The most appropriate term among the choices for foods formulated to manage a disease or disorder is "Special foods," as a proxy for Foods for Special Dietary Use. Therefore, option (D) is correct.

Quick Tip

In food regulation, specific definitions are key. Foods for a general healthy population are different from those designed to manage a medical condition. The latter are "special" because they cater to non-standard dietary needs.

---

27. The colour permitted in cheddar cheese as per FSS Act, 2006 is _____

(A) Annatto
(B) Anthocyanin
(C) Riboflavin

(D) Chlorophyll

Correct Answer: (A) Annatto

Solution:

Step 1: Understanding the Concept:
Cheddar cheese is naturally an off-white or pale yellow color. The distinct orange color found in many varieties of cheddar is achieved by adding a permitted food colorant during its production. Food safety regulations, like the FSS Act in India, specify which additives are allowed.

Step 2: Detailed Explanation:
- **Annatto** is a natural food coloring derived from the seeds of the achiote tree (*Bixa orellana*). Its main pigments are bixin (oil-soluble) and norbixin (water-soluble).
- It has been used for centuries to impart a yellow-orange color to dairy products like cheese (especially Cheddar, Colby, and Leicester), butter, and margarine.
- The Food Safety and Standards (FSS) Act, 2006, and its subsequent regulations permit the use of annatto in cheese up to a specified maximum level.
- The other options are incorrect: Anthocyanins (red/purple), Riboflavin (Vitamin B2, yellow), and Chlorophyll (green) are not the permitted or traditional colorants for cheddar cheese.

Step 3: Final Answer:
The permitted color used to give cheddar cheese its characteristic orange hue is Annatto. Therefore, option (A) is correct.

Quick Tip

For questions about food colors, remember the classic associations: Annatto → Orange Cheese/Butter; Turmeric → Yellow Curries; Caramel → Brown Colas/Sauces; Saffron → Yellow Rice.

---

28. The rate of food spoilage is not dependent on _____

(A) Water activity
(B) Package size
(C) OR potential
(D) Temperature

Correct Answer: (B) Package size

Solution:

Step 1: Understanding the Concept:
The rate of food spoilage is determined by a set of intrinsic (inherent to the food) and extrinsic

(environmental) factors that affect microbial growth and chemical reactions. The question asks which of the given options is not a direct controlling factor.

Step 2: Detailed Explanation:
Let's analyze the factors:
- **(A) Water activity (a_w)**: This is a critical intrinsic factor. It measures the amount of free water available for microbial growth. Below a certain a_w, most spoilage microorganisms cannot grow. Thus, the rate of spoilage is highly dependent on it.
- **(C) OR potential (Oxidation-Reduction potential)**: This intrinsic factor determines the type of microorganisms that can grow. A high OR potential favors aerobes, while a low potential favors anaerobes. It directly influences the spoilage pathway.
- **(D) Temperature**: This is a key extrinsic factor. The rate of microbial growth and enzymatic/chemical reactions are highly dependent on temperature. This is the principle behind refrigeration and cooking.
- **(B) Package size**: This is not a direct scientific parameter that governs the rate of spoilage. While the packaging material, the atmosphere within the package, and the surface-area-to-volume ratio can influence spoilage, the absolute size of the package itself is not a primary controlling factor like temperature, a_w, or OR potential. The spoilage rate of the food inside would be the same regardless of whether it's in a 100g pack or a 1kg pack, assuming all other conditions are identical.

Step 3: Final Answer:
Water activity, OR potential, and temperature are all direct factors that control the rate of food spoilage. Package size is not. Therefore, option (B) is the correct answer.

Quick Tip

Remember the FATTOM acronym for factors affecting microbial growth: Food, Acidity (pH), Time, Temperature, Oxygen (OR potential), Moisture (Water Activity). Any factor not on this fundamental list, like "package size," is likely to be the incorrect option in a question like this.

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29. Match List-I with List-II

List-I **Raw foods**	**List-II** **Storage temperature range (°C)**
(A) Banana	(I) 13 - 15.6
(B) Lemon	(II) 0 - 2.2
(C) Nuts	(III) 12.8 - 14.4
(D) Tomato	(IV) 4.4 - 10

Choose the most appropriate answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)

(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)

Solution:

Step 1: Understanding the Concept:
Different foods have optimal storage temperatures to maximize shelf life and maintain quality. Storing foods outside their optimal range can lead to spoilage, degradation, or physiological disorders like chilling injury.

Step 2: Detailed Explanation:
Let's match each food with its appropriate storage temperature range:
- **(A) Banana:** A tropical fruit that is highly susceptible to chilling injury (skin blackening, failure to ripen) if stored below about 12°C. The ideal storage temperature is around 13-15°C. This matches perfectly with **(I) 13 - 15.6**.
- **(C) Nuts:** Shelled nuts are low in moisture but high in oil, making them prone to oxidative rancidity. Storing them at low, near-freezing temperatures drastically slows down this chemical reaction, preserving their quality for a long time. This matches perfectly with **(II) 0 - 2.2**.
- **(B) Lemon:** Citrus fruits are best stored at cool, but not cold, temperatures. An ideal range is often cited as 10-14°C to prevent chilling injury while extending shelf life. This matches well with **(III) 12.8 - 14.4**.
- **(D) Tomato:** Ripe tomatoes are best stored at cool room temperatures to preserve their flavor. Refrigeration (below 12°C) can cause flavor loss. However, for short-term holding to slow down over-ripening, a temperature range of 4-10°C is sometimes used, although it is sub-optimal. Among the given choices, **(IV) 4.4 - 10** is the most plausible, albeit imperfect, match for short-term storage.

Step 3: Final Answer:
Based on the analysis, the best pairings are A-I, B-III, C-II, and D-IV. This corresponds to option (B).

Quick Tip

Remember the general rule for produce storage: Tropical/subtropical fruits (like bananas, tomatoes, mangoes) are prone to chilling injury and should be stored cool, not cold. Low-moisture, high-fat foods (like nuts) benefit from cold storage to prevent rancidity.

---

30. What does the term "JECFA" stands for:

(A) Joint Expert Committee on Food Additives
(B) Joint Excellence Committee on Food Allergens
(C) Joint Expert Committee on Food Analysis

(D) Joint Export Committee on Food Additives

Correct Answer: (A) Joint Expert Committee on Food Additives

Solution:

Step 1: Understanding the Concept:
JECFA is an international scientific body that plays a crucial role in global food safety standards. It is administered jointly by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO).

Step 2: Detailed Explanation:
The full and correct name for the acronym JECFA is the **Joint FAO/WHO Expert Committee on Food Additives**.
Its primary mandate is to conduct risk assessments and provide scientific advice on:

- Food additives
- Contaminants and toxins in food
- Residues of veterinary drugs in food

The other options are incorrect because they use terms like "Excellence," "Analysis," or "Export," which are not part of the official name. The committee's focus is on expert scientific evaluation of food additives and related substances.

Step 3: Final Answer:
The correct expansion of the acronym JECFA is Joint Expert Committee on Food Additives. Therefore, option (A) is the correct answer.

Quick Tip

For exams, it is crucial to memorize the full names of key international food safety organizations. Remember that JECFA provides the scientific advice, and the Codex Alimentarius Commission (CAC) uses this advice to set international food standards.

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31. Which of the following criteria that are used for screening of the New Food Product ideas?
(A). Marketability
(B). Technical feasibility
(C). Manufacturing capability
(D). Financial capability
Choose the most appropriate answer from the options given below:

(A) (A), (B) and (D) only.
(B) (A), (B) and (C) only.

(C) (A), (B), (C) and (D).
(D) (B), (C) and (D) only.

Correct Answer: (C) (A), (B), (C) and (D).

Solution:

Step 1: Understanding the Concept:
New Product Development (NPD) is a multi-stage process. After generating ideas, the "idea screening" phase is crucial for eliminating unviable concepts before investing significant resources. This screening is based on a comprehensive set of business and technical criteria.

Step 2: Detailed Explanation:
All the listed criteria are essential for a thorough screening of new food product ideas:
- **(A) Marketability:** This assesses the business potential. Questions include: Is there a consumer need? Who are the target customers? What is the market size? Who are the competitors? A product that won't sell is not a viable idea.
- **(B) Technical feasibility:** This assesses the scientific and technological aspects. Can we actually create this product with the desired taste, texture, and shelf life? Does the technology exist?
- **(C) Manufacturing capability:** This assesses the operational aspect. Do we have the right equipment, facilities, and expertise to produce the product consistently and at scale? Can our existing production lines handle it?
- **(D) Financial capability:** This assesses the economic viability. Is the product profitable? What are the estimated costs for development, production, and marketing? Do we have the financial resources to fund the project?
Since all four are critical hurdles a new product idea must clear, they are all used in the screening process.

Step 3: Final Answer:
Marketability, technical feasibility, manufacturing capability, and financial capability are all fundamental criteria for screening new food product ideas. Therefore, option (C), which includes all four, is the correct answer.

Quick Tip

Think of the NPD screening process as a checklist for success. A good idea must be **desirable** (marketable), **feasible** (technically possible), **viable** (financially sound), and **producible** (manufacturing capability). All aspects must be considered.

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32. In chiffon cakes, leavening occurs mainly by whipping of the _____

(A) egg yolk
(B) citric acid

(C) egg white
(D) ascorbic acid

Correct Answer: (C) egg white

Solution:

Step 1: Understanding the Concept:
Leavening is the process of incorporating gas into a dough or batter to make it rise and create a light, porous structure. In baking, this can be achieved chemically (baking soda/powder), biologically (yeast), or mechanically. Chiffon cakes are a type of foam cake that relies primarily on mechanical leavening.

Step 2: Detailed Explanation:
- Chiffon cakes get their characteristic light and airy texture from the incorporation of air into a stable foam.
- This foam is created by **whipping egg whites**. The proteins in the egg whites (like ovalbumin) denature and form a network that traps air bubbles. When heated during baking, the trapped air expands, causing the cake to rise.
- **Egg yolk** is used in chiffon cakes for richness, color, and emulsification, but it cannot create the large, stable foam needed for leavening.
- **Citric acid** (or more commonly, cream of tartar) is an acidifier often added to egg whites before whipping. It helps to stabilize the protein network, allowing for a stronger and more voluminous foam, but it is not the source of the leavening itself.
- **Ascorbic acid** (Vitamin C) is not typically used for this purpose in cakes.

Step 3: Final Answer:
The primary leavening agent in chiffon cakes is the air trapped in the foam created by whipping egg whites. Therefore, option (C) is the correct answer.

Quick Tip

Remember the three main types of foam cakes and their leavening:

- **Angel food cake:** Uses only whipped egg whites.
- **Sponge cake:** Uses both whipped egg whites and whipped egg yolks.
- **Chiffon cake:** Uses whipped egg whites and contains oil/fat for moistness.

In all three, whipped egg whites are a key leavening component.

---

33. Hypobaric storage represents storage at _____
(A). Low pressure
(B). High pressure
(C). Low pressure and high humidity

(D). Low pressure and low humidity
Choose the most appropriate answer from the options given below:

(A) (A) and (B) only.
(B) (C) only.
(C) (A), (B), (C) and (D).
(D) (B), (C) and (D) only.

Correct Answer: (B) (C) only.

Solution:

Step 1: Understanding the Concept:
Hypobaric storage is a form of modified atmosphere storage used to extend the shelf life of perishable products, especially fresh fruits and vegetables. The term itself provides a clue to its meaning: 'hypo-' means low, and '-baric' refers to pressure.

Step 2: Detailed Explanation:
- **(A) Low pressure:** The core principle of hypobaric storage is maintaining a sub-atmospheric (low) pressure inside the storage chamber. This reduces the partial pressure of oxygen, which slows down respiration rates and the growth of aerobic spoilage organisms. It also helps to remove ethylene, a ripening hormone produced by the produce.
- However, storing produce at low pressure creates a high water vapor pressure deficit between the product and its environment, which would cause rapid dehydration and shriveling.
- To counteract this, the atmosphere inside the chamber must be kept at a very high relative humidity (typically ¿90%).
- Therefore, a complete and accurate description of hypobaric storage is **(C) Low pressure and high humidity**. This combination slows down ripening and decay while preventing moisture loss.
- High pressure (B) is used in other food processing methods (like HPP), but not for hypobaric storage. Low pressure with low humidity (D) would be a dehydration process, not a preservation method for fresh produce.

Step 3: Final Answer:
Hypobaric storage is a specific technology that combines storage at low pressure with high humidity. Therefore, option (C) is the most complete and correct description, making option (B) from the final choices the correct answer.

Quick Tip

Break down the word: **Hypo** = Low, **Baric** = Pressure. So, it's low-pressure storage. Then, ask yourself: what would happen to a fruit at low pressure? It would dry out. So, you must add humidity to prevent that. This logic leads you to "Low pressure and high humidity."

34. Which of the following is commonly used as oxygen scavenger in food packaging?

(A) Powdered iron
(B) Calcium
(C) Potassium permanganate
(D) Chlorine

Correct Answer: (A) Powdered iron

Solution:

Step 1: Understanding the Concept:
An oxygen scavenger is a substance used in active packaging systems. It is placed inside a sealed package to remove or "scavenge" residual oxygen from the headspace, thereby protecting the food product from oxygen-related deterioration like microbial growth and oxidative rancidity.

Step 2: Detailed Explanation:
- **Powdered iron** is the most common chemical used in commercial oxygen scavengers. It works through a simple oxidation process (rusting): iron reacts with oxygen in the presence of water to form iron oxide. This reaction effectively consumes the oxygen inside the package, reducing the level to below 0.01%.
- **Calcium** is primarily used as a desiccant (to absorb moisture), not an oxygen scavenger.
- **Potassium permanganate** is an ethylene scavenger, used to slow the ripening of fruits and vegetables by oxidizing the ethylene gas they produce.
- **Chlorine** is a strong oxidizing agent used for sanitation and disinfection, not for scavenging oxygen within a food package.

Step 3: Final Answer:
Powdered iron is the standard material used in oxygen scavenging sachets for food packaging. Therefore, option (A) is the correct answer.

Quick Tip

Think of the small "Do Not Eat" packets found in jerky, nuts, or cured meats. These are oxygen scavengers, and they almost always contain iron powder that "rusts" to remove oxygen and extend shelf life.

35. Match List-I with List-II

List-I Method	List-II Process
(A) Rigor mortis	(I) Papain
(B) Tenderization of meat	(II) Muscle stiffness
(C) Evisceration	(III) Removal of feathers
(D) Scalding	(IV) Inspection of viscera

Choose the most appropriate answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
(C) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (C) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:
This question requires matching terms and processes related to meat and poultry processing, from post-mortem changes to specific slaughterhouse operations.

Step 2: Detailed Explanation:
- **(A) Rigor mortis** is a Latin term meaning "stiffness of death." It is the physiological process where muscles become stiff and inextensible several hours after an animal's death. Therefore, (A) matches with **(II) Muscle stiffness**.
- **(B) Tenderization of meat** is the process of breaking down connective tissue and muscle fibers to make meat more tender. This can be done using proteolytic enzymes. **(I) Papain**, an enzyme extracted from papaya, is a common commercial meat tenderizer. Therefore, (B) matches with (I).
- **(C) Evisceration** is the step in animal slaughter where the internal organs (viscera) are removed from the carcass. This process is immediately followed by **(IV) Inspection of viscera** by a qualified inspector to check for signs of disease. Therefore, (C) matches with (IV).
- **(D) Scalding** is a poultry processing step where the bird carcass is immersed in hot water. This loosens the feathers in their follicles, making their subsequent removal much easier. Therefore, (D) matches with **(III) Removal of feathers**.

Step 3: Final Answer:
The correct pairings are: (A)-(II), (B)-(I), (C)-(IV), and (D)-(III). This corresponds to option (C).

Quick Tip

Visualize the poultry processing line: Scalding (hot water) happens before feather removal. Evisceration (organ removal) is done before inspection. For meat science, remember Rigor Mortis is the stiffening, and enzymes like Papain are used for tenderizing.

36. The penetration of fat within the muscle fibre when an animal is well fed, is called as _____

(A) stabilization
(B) marbling
(C) ageing
(D) rigor mortis

Correct Answer: (B) marbling

Solution:

Step 1: Understanding the Concept:
This question asks for the specific term used to describe the fat that is deposited within the lean tissue of meat, which is a key factor in determining its quality.

Step 2: Detailed Explanation:
- **Marbling** is the common term for intramuscular fat, which appears as small flecks or streaks of fat within the muscle. It is a desirable trait in meat, as it contributes significantly to juiciness, flavor, and tenderness during cooking. The amount of marbling is influenced by the animal's breed, diet, and age.
- **Stabilization** is a general term for making a system stable and is not specific to meat science.
- **Ageing** (or aging) is the process of holding meat at controlled temperatures for a period to allow natural enzymes to break down muscle fibers, thereby increasing tenderness.
- **Rigor mortis** is the post-mortem stiffening of muscles.

Step 3: Final Answer:
The deposition of fat within the muscle is called marbling. Therefore, option (B) is correct.

Quick Tip

When you see a high-quality cut of steak with fine white lines of fat running through the red meat, you are looking at marbling. It's a visual indicator of a tender and flavorful piece of meat.

---

37. The molten mixture of sand, soda, limestone for the development of glass is called as _____

(A) mold
(B) gob
(C) curing

(D) annealing

Correct Answer: (B) gob

Solution:

Step 1: Understanding the Concept:
This question relates to the terminology used in the manufacturing process of glass containers. After the raw materials (sand, soda ash, limestone) are melted in a furnace, the molten glass is formed into individual containers.

Step 2: Detailed Explanation:
- The molten mixture of raw materials is simply called molten glass or glass melt. However, in the forming process, a specific, measured amount of this molten glass is sheared off to form a single container. This portion of molten glass is called a **gob**.
- **Mold** is the hollow form into which the gob is placed to be shaped (by blowing or pressing) into a bottle or jar.
- **Curing** is a term typically associated with polymers and concrete, not glass manufacturing.
- **Annealing** is a crucial step that happens after the glass is formed. It involves slowly cooling the container in a special oven (a lehr) to relieve internal stresses and prevent it from shattering easily.
Among the given options, "gob" is the term for a portion of the molten mixture used in the development process.

Step 3: Final Answer:
A measured portion of the molten glass mixture used to form a single glass item is known as a gob. Therefore, option (B) is the correct answer.

Quick Tip

Visualize a glass bottle factory. A stream of glowing, molten glass comes out of the furnace. Shears cut off a precise "gob" of this glass, which then drops into a mold to be shaped. The gob is the raw material unit for one bottle.

---

38. Application of silicone on the glass bottle surface during their manufacturing helps in
(A). Maintaining glossy appearance
(B). Prevents breakage
(C). Decreases the noise on contact
(D). Prevents spoilage
Choose the most appropriate answer from the options given below:

(A) (A), (B) and (D) only.
(B) (A), (B) and (C) only.

(C) (A), (B), (C) and (D).
(D) (B), (C) and (D) only.

Correct Answer: (B) (A), (B) and (C) only.

Solution:

Step 1: Understanding the Concept:
During glass bottle manufacturing, surface coatings are applied to protect the glass and facilitate handling on high-speed filling lines. A cold-end coating, often silicone-based, is applied after the annealing process.

Step 2: Detailed Explanation:
The silicone coating provides lubricity to the bottle surface. This has several benefits:
- **(A) Maintaining glossy appearance:** The coating protects the glass from abrasion and scuffing as bottles come into contact with each other and with machinery. This prevents scratches that would dull the surface, thus maintaining its gloss.
- **(B) Prevents breakage:** Scratches and abrasions on the glass surface create microscopic flaws that act as stress concentration points, significantly weakening the bottle and making it more susceptible to breakage under pressure or impact. The protective coating reduces scratching and thus helps prevent breakage.
- **(C) Decreases the noise on contact:** The lubricity provided by the coating allows bottles to slide smoothly against each other on conveyor belts, reducing friction and the associated clatter and noise.
- **(D) Prevents spoilage:** The surface coating has no antimicrobial or barrier properties. Preventing spoilage is the role of the food preservation process (e.g., pasteurization) and the integrity of the bottle's seal or closure. This statement is incorrect.

Step 3: Final Answer:
The application of silicone helps in maintaining a glossy appearance, preventing breakage, and decreasing noise. Therefore, option (B), which includes (A), (B), and (C), is the correct answer.

Quick Tip

The primary function of a silicone coating on glass is to make it slippery. This slipperiness prevents scratches (which maintains gloss and strength) and reduces noise on the production line. It's a physical protection, not a chemical or microbial one.

---

39. Sugarcane gur (jaggery) contains _____ % sucrose.

(A) 65 to 85
(B) 20 to 30
(C) 35 to 40

(D) 50 to 60

Correct Answer: (A) 65 to 85

Solution:

Step 1: Understanding the Concept:
Gur, or jaggery, is a traditional non-centrifugal cane sugar, meaning it is a concentrated product of sugarcane juice without the separation of molasses. Its composition includes sucrose, invert sugars (glucose and fructose), moisture, and minerals.

Step 2: Detailed Explanation:
Jaggery is a less-refined form of sugar, so its sucrose content is lower than that of white, refined sugar (which is ¿99% sucrose). However, sucrose is still the main component. The composition can vary based on the sugarcane variety and processing methods, but a typical range for good quality jaggery is:

- **Sucrose:** 65-85%
- **Invert sugars:** 10-15%
- **Moisture:** 5-10%
- **Ash (minerals):** 2-5%

The range of **65 to 85 %** accurately reflects the sucrose content of sugarcane gur. The other options are too low.

Step 3: Final Answer:
Sugarcane jaggery typically contains 65 to 85 percent sucrose. Therefore, option (A) is correct.

Quick Tip

Remember that jaggery is basically solidified, concentrated sugarcane juice. It's mostly sugar, so the percentage of sucrose must be high. However, it's not pure sugar, so it won't be close to 100%. The 65-85% range is the most logical choice.

---

40. During processing, the characteristic flavor is developed in cocoa:

(A) Cooking
(B) Roasting
(C) Boiling
(D) Frying

Correct Answer: (B) Roasting

Solution:

Step 1: Understanding the Concept:
The development of the characteristic flavor and aroma of chocolate is a complex process that occurs in several stages. The question asks to identify the key processing step where these flavors are primarily developed.

Step 2: Detailed Explanation:
While flavor development begins during the fermentation of raw cocoa beans (where flavor precursors like amino acids and reducing sugars are formed), the main flavor profile is created during the **roasting** step.
During roasting, the cocoa nibs are heated to high temperatures (typically 120-160°C). This triggers a series of chemical reactions:

- **Maillard Reaction:** A reaction between amino acids and reducing sugars that produces a vast array of compounds responsible for the brown color and complex, roasted, nutty, and caramel-like flavors.
- **Strecker Degradation:** A related reaction that produces aldehydes, which contribute to the chocolatey aroma.

Cooking, boiling, and frying are not the specific terms or processes used for this critical flavor development stage in cocoa processing.

Step 3: Final Answer:
The characteristic flavor of cocoa is primarily developed during the roasting process. Therefore, option (B) is the correct answer.

Quick Tip

Just like coffee beans, cocoa beans must be roasted to unlock their flavor. Associate the process of "roasting" with the development of the rich, complex flavors in both coffee and chocolate.

---

41. Increase in volume of bread during baking is known as _____

(A) sheen
(B) oven spring
(C) bloom
(D) rising

Correct Answer: (B) oven spring

Solution:

Step 1: Understanding the Concept:
When bread dough is placed in a hot oven, it undergoes a final, rapid increase in volume before the crust sets. This phenomenon is a critical part of the baking process and has a specific technical name.

Step 2: Detailed Explanation:
Let's analyze the terms:
- **Oven spring:** This is the correct term for the final burst of leavening that occurs in the dough during the first 10-12 minutes of baking. It is caused by two main factors: 1. The heat of the oven accelerates the activity of the yeast, causing it to produce a large amount of carbon dioxide gas rapidly. 2. The existing gas bubbles trapped in the dough expand significantly as they heat up, and the water in the dough turns to steam, which also expands and contributes to leavening.
- **Sheen:** This refers to the glossy or shiny appearance of the bread's crust, often enhanced by an egg wash or steam during baking. It is a visual characteristic, not a volume increase.
- **Bloom:** This term describes the attractive appearance of the finished loaf, particularly how the crust has opened up or "bloomed" at the score marks. While related to a good oven spring, it is not the name for the volume increase itself.
- **Rising:** This is a general term for the leavening of dough that occurs during fermentation and proofing, before it enters the oven. "Oven spring" is the specific term for the rising that happens *inside* the oven.

Step 3: Final Answer:
The rapid increase in the volume of bread during the initial stage of baking is known as oven spring. Therefore, option (B) is the correct answer.

Quick Tip

Think of the dough "springing" into action one last time when it feels the intense heat of the oven. This final expansion before the crust sets is the "oven spring."

---

42. _____ are responsible for the flavor and aroma of bread.

(A) Propanol and maltol
(B) Flavanol and isomaltol
(C) Maltol and Isomaltol
(D) Maltose and galactose

Correct Answer: (C) Maltol and Isomaltol

Solution:

Step 1: Understanding the Concept:
The characteristic flavor and aroma of bread are not from the raw ingredients alone but are

developed during fermentation and, most importantly, during baking. The high heat of the oven causes chemical reactions like the Maillard reaction and caramelization, which produce a wide range of volatile and non-volatile flavor compounds.

Step 2: Detailed Explanation:
- **Maltol** and **Isomaltol** are two important flavor compounds formed during the thermal processing of carbohydrate-rich foods.
- They are produced via the caramelization of sugars and the Maillard reaction (reaction between amino acids and reducing sugars).
- Maltol has a characteristic caramel-like or cotton candy-like aroma and contributes to the perception of sweetness. Isomaltol also contributes to the caramel and roasted notes of the bread crust.
- **Propanol** is an alcohol that can be produced during fermentation, but it is not a primary character-defining flavor compound of bread.
- **Flavanol** is a type of flavonoid (polyphenol) and is not associated with bread aroma.
- **Maltose** and **galactose** are sugars; they act as precursors in the flavor-forming reactions but are not the final aroma compounds themselves.

Step 3: Final Answer:
Maltol and Isomaltol are key compounds formed during baking that are responsible for the desirable flavor and aroma of bread. Therefore, option (C) is the correct answer.

Quick Tip

For questions about the flavor of baked goods (bread, cookies) or roasted products (coffee, cocoa), the answer often involves compounds formed by the Maillard reaction and caramelization. Maltol is a classic example of such a compound.

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43. Match List-I with List-II

List-I **Food**	**List-II** **Toxicant**
(A) Peas	(I) Hemagglutinins
(B) Soyabean	(II) Saponins
(C) Spinach	(III) Prussic acid
(D) Almond	(IV) Oxalic acid

Choose the most appropriate answer from the options given below:

(A) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:
Many raw plant-based foods contain natural compounds known as anti-nutritional factors or toxicants. These can interfere with nutrient absorption or be toxic if consumed in large quantities without proper processing (like cooking). This question requires matching specific foods to their well-known toxicants.

Step 2: Detailed Explanation:
- **(A) Peas:** Like many other legumes, peas contain **(I) Hemagglutinins** (also known as lectins). These proteins can cause red blood cells to clump together and can interfere with nutrient absorption. They are destroyed by cooking.
- **(B) Soyabean:** Soybeans contain several anti-nutritional factors, including trypsin inhibitors, hemagglutinins, and **(II) Saponins**. Saponins have a bitter taste and foaming properties.
- **(C) Spinach:** Spinach is well-known for being high in **(IV) Oxalic acid**. Oxalic acid can bind with minerals like calcium and iron, making them unavailable for absorption by the body.
- **(D) Almond:** Bitter almonds, in particular, contain amygdalin, a cyanogenic glycoside. When the almond is crushed or chewed, an enzyme acts on amygdalin to release hydrogen cyanide, also known as **(III) Prussic acid**, which is highly toxic.

Step 3: Final Answer:
The correct pairings are: (A)-(I), (B)-(II), (C)-(IV), and (D)-(III). This combination corresponds to option (C).

Quick Tip

Memorize these common food-toxicant pairs for exams: Legumes (beans, peas) → Lectins/Hemagglutinins; Spinach/Rhubarb → Oxalic Acid; Bitter Almonds/Cassava → Cyanide/Prussic Acid; Soybeans → Trypsin inhibitors/Saponins.

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44. A flexible pouch capable of withstanding temperatures of about 120 °C is known as _____

(A) High barrier plastic
(B) Microwave-ovenable package
(C) Retortable pouch
(D) Aseptic pouch

Correct Answer: (C) Retortable pouch

Solution:

Step 1: Understanding the Concept:
The question describes a type of packaging used for in-package thermal sterilization. The temperature mentioned (120 °C, more precisely 121 °C or 250 °F) is the standard temperature used in a retort or autoclave for commercial sterilization of low-acid foods.

Step 2: Detailed Explanation:
- **Retortable pouch:** This is a flexible, laminated pouch designed specifically to withstand the high temperatures and pressures of the retorting (autoclaving) process. It serves as an alternative to traditional metal cans for thermally processed, shelf-stable foods.
- **High barrier plastic** is a property of a material (e.g., providing a barrier to oxygen or moisture), not a type of finished package. Retort pouches are made from high-barrier plastics, but this is not the name of the package itself.
- **Microwave-ovenable package** is designed for reheating food in a microwave and does not necessarily have the strength to withstand retort temperatures.
- **Aseptic pouch** is a package that is filled with a pre-sterilized product in a sterile environment. The package itself is not subjected to high heat after filling.

Step 3: Final Answer:
A flexible pouch designed to withstand sterilization temperatures of around 120 °C in a retort is called a retortable pouch. Therefore, option (C) is the correct answer.

Quick Tip

Associate the word "retort" with high-temperature sterilization (like a pressure cooker). A "retortable pouch" is essentially a flexible can, designed to go through this process.

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45. Match List-I with List-II

List-I (Can Name)	**List-II (Dimension)**
(A) 62	(I) 307 x 409
(B) No.2	(II) 203 x 308
(C) No.10	(III) 303 x 406
(D) 303	(IV) 603 x 700

Choose the most appropriate answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(B) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Correct Answer: (B) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:
Metal cans used in the food industry are standardized by name and dimensions. The dimensions are given as a three-digit number for the diameter followed by a three-digit number for the height. The first digit represents inches, and the next two digits represent sixteenths of an inch. For example, 307 is 3 and 7/16 inches.

Step 2: Detailed Explanation:
Let's match the common can names to their dimensions:
- **(C) No.10 Can:** This is a large, institutional-size can. Its standard dimension is **(IV) 603 x 700**, which means 6 and 3/16 inches in diameter by 7 inches in height.
- **(B) No.2 Can:** This is a common retail can size. Its dimension is **(I) 307 x 409**, which is 3 and 7/16 inches in diameter by 4 and 9/16 inches in height.
- **(D) 303 Can:** This is another very common can size, slightly smaller than the No.2 can. Its dimension is **(III) 303 x 406**, which is 3 and 3/16 inches in diameter by 4 and 6/16 inches in height.
- **(A) 62:** By process of elimination, this can name must match the remaining dimension, which is **(II) 203 x 308**.

Step 3: Final Answer:
The correct pairings are: (A)-(II), (B)-(I), (C)-(IV), and (D)-(III). This corresponds to option (B).

Quick Tip

For can sizes, remember the largest and most common: the No. 10 can is the huge one used in restaurants (603 x 700). The 303 can is a very standard supermarket size. Knowing these two can often help you solve the matching question by elimination.

---

46. Which of the following is NOT a type of "Difference test"?

(A) Duo-trio test
(B) Triangle test
(C) Paired-comparison test
(D) Hedonic test

Correct Answer: (D) Hedonic test

Solution:

Step 1: Understanding the Concept:
Sensory evaluation tests are broadly categorized into two types: analytical tests and affective tests. Analytical tests use trained panelists to determine differences or describe characteristics,

while affective tests use consumers to determine preference or acceptance. Difference tests are a sub-category of analytical tests.

Step 2: Detailed Explanation:
- **Difference tests** are designed to answer the simple question: "Are these products different?" They do not ask which is better. - **Triangle test:** Panelists are given three samples (two are the same, one is different) and asked to identify the odd one out. - **Duo-trio test:** Panelists are given a reference sample, then two other samples, and asked to identify which of the two matches the reference. - **Paired-comparison test:** Panelists are given two samples and asked to identify which one has more of a specific attribute (e.g., "Which is sweeter?"). This is a directional difference test.
- **Affective tests** are designed to measure subjective responses like liking or preference. - **Hedonic test:** This is the most common affective test. Panelists are asked to rate their liking for a product on a scale, typically the 9-point hedonic scale ranging from "Dislike extremely" to "Like extremely."
Since the Hedonic test measures liking, not just difference, it is an affective test, not a difference test.

Step 3: Final Answer:
The Duo-trio, Triangle, and Paired-comparison tests are all types of difference tests. The Hedonic test is an affective test that measures liking. Therefore, the Hedonic test is not a difference test. Option (D) is correct.

Quick Tip

Remember the core question each sensory test answers:

- Difference Tests (Triangle, Duo-Trio): "Are they different?"
- Affective/Hedonic Tests: "How much do you like it?"

This distinction is key to classifying them correctly.

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47. QRAC stands for:

(A) Qualitative Risk Analyzing Committee
(B) Qualitative Risk Assessment Committee
(C) Quantitative Risk Assessment Committee
(D) Quantitative Risk Analysing Committee

Correct Answer: (C) Quantitative Risk Assessment Committee

Solution:

Step 1: Understanding the Concept:
This question asks for the expansion of the acronym QRAC, which relates to the field of risk assessment in food safety or a related discipline. The terminology is specific.

Step 2: Detailed Explanation:
- **Risk Assessment** is the scientifically based process consisting of four steps: hazard identification, hazard characterization, exposure assessment, and risk characterization. It is the formal term used by international bodies like Codex Alimentarius. "Risk Analyzing" is a less formal, though related, term. This makes options (B) and (C) more likely than (A) and (D).
- Risk assessment can be either **Qualitative** (describing risk in terms like high, medium, low) or **Quantitative** (assigning numerical probabilities to the risk).
- A **Quantitative Risk Assessment Committee (QRAC)** would be a body specifically tasked with performing or overseeing quantitative risk assessments, which involve complex modeling and data analysis to estimate risk numerically. This is a highly specialized and plausible name for an expert committee.
- While a "Qualitative Risk Assessment Committee" could also exist, the acronym QRAC most directly expands to Quantitative Risk Assessment Committee, which is a recognized concept in the field.

Step 3: Final Answer:
The most accurate and standard expansion of the acronym QRAC in the context of scientific risk evaluation is Quantitative Risk Assessment Committee. Therefore, option (C) is the correct answer.

Quick Tip

In technical acronyms, always choose the most formal and precise terminology. "Assessment" is the standard term for the formal process, more so than "Analyzing". Both "Qualitative" and "Quantitative" are valid types, but "Quantitative" fits the "Q" in the acronym.

---

48. The instrument used to measure plasticity of bread dough is known as

(A) Penetrometer
(B) Fibrograph meter
(C) Tenderometer
(D) Brabender Farinograph

Correct Answer: (D) Brabender Farinograph

Solution:

Step 1: Understanding the Concept:
The physical properties of bread dough, such as plasticity, elasticity, and resistance to exten-

sion, are collectively known as dough rheology. Specific instruments are designed to measure these properties to predict the dough's behavior during processing and the quality of the final bread.

Step 2: Detailed Explanation:
- **Brabender Farinograph:** This is a standard instrument in the baking industry used to measure the physical properties of dough. It records the resistance of a dough against the mixing action of two blades. The resulting chart, called a Farinogram, provides information about the flour's water absorption, dough development time, stability, and its mixing tolerance, which are related to the dough's plasticity and elasticity.
- **Penetrometer:** This instrument measures the hardness or consistency of materials like fats, gels, and fruits by measuring the depth a cone or needle penetrates the sample under a known weight.
- **Fibrograph meter:** This is used in the textile industry to measure the length and uniformity of cotton fibers.
- **Tenderometer:** This instrument measures the tenderness of foods, particularly peas, by measuring the force required to crush a sample.

Step 3: Final Answer:
The Brabender Farinograph is the instrument specifically designed to measure the rheological properties, including plasticity, of bread dough during mixing. Therefore, option (D) is correct.

Quick Tip

Associate key instruments with their function in cereal science:

- **Farinograph:** Dough behavior during mixing.
- **Extensograph:** Dough resistance to stretching and elasticity.
- **Alveograph:** Dough tenacity, extensibility, and baking strength by inflating a dough bubble.

---

49. The 'AGMARK' standard was set up by

(A) Ministry of Health and Family Welfare
(B) Ministry of Agriculture
(C) Directorate of Marketing and Inspection
(D) Directorate of Quality and Inspection

Correct Answer: (C) Directorate of Marketing and Inspection

Solution:

Step 1: Understanding the Concept:
AGMARK is a certification mark for agricultural products in India, assuring that they conform to a grade standard notified by the Government of India. The question asks for the specific body responsible for setting up and administering this standard.

Step 2: Detailed Explanation:
- The acronym AGMARK stands for **AG**ricultural **MARK**.
- This certification scheme was introduced through the Agricultural Produce (Grading and Marking) Act of 1937.
- The legally constituted body responsible for the implementation of AGMARK standards is the **Directorate of Marketing and Inspection (DMI)**, which is an attached office of the Department of Agriculture and Farmers Welfare under the **Ministry of Agriculture Farmers Welfare**.
- While the Ministry of Agriculture is the parent ministry, the Directorate of Marketing and Inspection is the specific agency that sets up and enforces the standard, making it the most precise answer. The Ministry of Health and Family Welfare oversees the FSSAI.

Step 3: Final Answer:
The AGMARK standard is set up and implemented by the Directorate of Marketing and Inspection (DMI). Therefore, option (C) is the correct answer.

Quick Tip

The name itself is a clue: **AGMARK** = **AG**ricultural **MARK**eting. This directly links the standard to the Directorate of **Marketing** and Inspection.

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50. The Codex Alimentarius Commission was established under the authority of
(A). World Health Organization
(B). World Trade Organization
(C). Food and Agriculture Organization
(D). International Organization for Standardization
Choose the most appropriate answer from the options given below:

(A) (A), (B) and (C) only
(B) (A) and (D) only
(C) (A) and (C) only
(D) (B), (C) and (D) only

Correct Answer: (C) (A) and (C) only

Solution:

Step 1: Understanding the Concept:
The Codex Alimentarius Commission (CAC) is the central part of the Joint FAO/WHO Food

Standards Programme and is responsible for developing international food standards, guidelines, and codes of practice to protect the health of consumers and ensure fair practices in the food trade.

Step 2: Detailed Explanation:
- The Codex Alimentarius Commission was established in 1963 as a joint intergovernmental body.
- It was created by two United Nations organizations: - **(A) World Health Organization (WHO)**, which is concerned with protecting public health. - **(C) Food and Agriculture Organization (FAO)**, which is concerned with ensuring food quality and supply.
- The World Trade Organization (WTO) uses Codex standards as a benchmark in international trade disputes but did not establish the CAC.
- The International Organization for Standardization (ISO) is a separate, non-governmental body that develops a wide range of standards, including those for food safety management systems (e.g., ISO 22000).

Step 3: Final Answer:
The Codex Alimentarius Commission was jointly established by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO). Therefore, the correct combination is (A) and (C), which is option (C).

Quick Tip

Remember the partnership that created Codex: The FAO brings expertise in **food and agriculture**, while the WHO brings expertise in public **health**. Together, they create standards for safe food.

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51. Bananas usually get spoiled due to chilling injury when stored at temperature

(A) <12 °C
(B) <18 °C
(C) <15 °C
(D) <21 °C

Correct Answer: (A) <12 °C

Solution:

Step 1: Understanding the Concept:
Chilling injury is a physiological disorder that occurs in many tropical and subtropical plants and fruits when they are exposed to low, but non-freezing, temperatures. It manifests as various symptoms of spoilage. Bananas are a classic example of a chill-sensitive commodity.

Step 2: Detailed Explanation:
- The optimal storage temperature for bananas depends on their stage of ripeness, but it is crucial to keep them above the threshold for chilling injury.
- The critical temperature below which chilling injury occurs in bananas is generally considered to be around 12-13 °C.
- Storing bananas below this temperature range leads to symptoms like a dull, smoky, or black peel color, failure of the pulp to ripen and soften, and the development of off-flavors.
- Therefore, storing bananas at temperatures **less than 12 °C** will cause spoilage due to chilling injury. The other temperature thresholds are too high.

Step 3: Final Answer:
The critical temperature threshold for chilling injury in bananas is approximately 12 °C. Therefore, option (A) is the correct answer.

Quick Tip

A simple practical tip is "Never put unripe bananas in the refrigerator." A typical refrigerator is set at around 4 °C, which is well below the 12 °C threshold and will cause the peel to turn black while the fruit inside fails to ripen properly.

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52. The chemical agents most suitable for deflocculation process are
(A). Sodium metasilicate
(B). Sodium tripolyphosphate
(C). Sodium decaphosphate
(D). Sodium sesquisilicate
Choose the most appropriate answer from the options given below:

(A) (A) and (D) only
(B) (A), (B) and (D) only
(C) (A), (C) and (D) only
(D) (C) and (D) only

Correct Answer: (B) (A), (B) and (D) only

Solution:

Step 1: Understanding the Concept:
Deflocculation is the process of preventing colloidal particles from coming together to form aggregates (flocs) or breaking up existing flocs. Chemical agents that promote this are called deflocculants or dispersing agents. They are widely used in detergents, ceramics, and water treatment. The main classes of inorganic deflocculants are condensed phosphates and silicates.

Step 2: Detailed Explanation:
Let's analyze the listed chemical agents:

- **(A) Sodium metasilicate** and **(D) Sodium sesquisilicate** are alkali metal silicates, which are well-known and effective deflocculants, particularly in cleaning and detergent formulations.
- **(B) Sodium tripolyphosphate (STPP)** and **(C) Sodium decaphosphate** are polyphosphates. Polyphosphates are extremely effective deflocculants and sequestrants, widely used in various industrial applications, including food processing and detergents.
- All four compounds listed are indeed suitable for the deflocculation process. However, the question asks to choose the most appropriate answer from the given combinations. This suggests that some may be more common or effective than others. Sodium tripolyphosphate (STPP) is one of the most widely used and powerful deflocculants. Sodium decaphosphate is a less common term for polyphosphates. Given the options, the combination that includes the most representative and commonly used agents from both the silicate and phosphate classes is the most likely correct answer. Option (B) includes the common silicates and the very common STPP.

Step 3: Final Answer:
Sodium metasilicate, sodium tripolyphosphate, and sodium sesquisilicate are all highly suitable and commonly used deflocculating agents. Therefore, the combination in option (B) is a strong choice.

Quick Tip

Remember that two major classes of inorganic chemicals used as deflocculants (dispersing agents) are polyphosphates (like STPP) and silicates (like sodium metasilicate). They are key ingredients in many detergent and cleaning formulations.

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53. NOEL stands for

(A) Non-Observable Effluent Limit
(B) No Observable Effluent Limit
(C) Non-Observable Effect Level
(D) No Observable Effect Level

Correct Answer: (D) No Observable Effect Level

Solution:

Step 1: Understanding the Concept:
NOEL is a fundamental acronym in toxicology and risk assessment. It represents a key data point derived from animal studies, which is used to establish safe intake levels of substances like food additives or pesticides for humans.

Step 2: Detailed Explanation:
- The acronym NOEL stands for **No Observable Effect Level**.
- It is defined as the highest dose or concentration of a substance at which no detectable effects

(either adverse or non-adverse) are observed in the exposed test animals, compared to a control group.
- It is a critical value used to calculate the Acceptable Daily Intake (ADI) for humans, typically by dividing the NOEL by a safety factor (often 100).
- The terms "Non-Observable" and "Effluent Limit" are incorrect. "Effluent" relates to wastewater discharge, not toxicology.

Step 3: Final Answer:
The correct expansion of the acronym NOEL is No Observable Effect Level. Therefore, option (D) is correct.

Quick Tip

Distinguish between NOEL and its close relative, NOAEL (**No Observable Adverse Effect Level**). NOAEL is the highest dose with no *adverse* effects, and is more commonly used today. However, NOEL is still a key term to know. Focus on the "No" and "Effect Level" parts.

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54. The instrument used to measure the salt percentage of pickles is_____

(A) Polarimeter
(B) Brinograph
(C) Saltmeter
(D) Ionograph

Correct Answer: (C) Saltmeter

Solution:

Step 1: Understanding the Concept:
Pickling is a preservation method that relies on high concentrations of salt or acid. Measuring the salt percentage in the brine is crucial for ensuring product safety, quality, and consistency. The question asks for the specific instrument used for this purpose.

Step 2: Detailed Explanation:
- A **Saltmeter**, also known as a salinometer or salometer, is an instrument designed to measure the salinity or salt content of a solution. These devices often work by measuring the electrical conductivity of the brine, which increases with salt concentration, or by measuring its specific gravity (using a hydrometer specifically calibrated for salt).
- **Polarimeter:** Measures the rotation of polarized light, used for determining the concentration of optically active substances like sugar.
- **Brinograph:** This is not a standard term. A Brinell hardness tester is used in metallurgy.
- **Ionograph:** A more general instrument used to measure the concentration of ionic contaminants, often on electronic circuit boards. While salt is ionic, "Saltmeter" is the specific and

correct term for this food application.

Step 3: Final Answer:
The instrument specifically used to measure the salt percentage in pickles or brine is a Saltmeter. Therefore, option (C) is the correct answer.

Quick Tip

For instrumentation questions, the most direct and specific name is usually the correct answer. To measure salt, you use a saltmeter. To measure pH, you use a pH meter.

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55. A type of freezing where resistance to heat transfer is minimized due to intimate contact between food or package and refrigerant

(A) Indirect contact freezing
(B) Air freezing
(C) Immersion freezing
(D) Fluidized-bed freezing

Correct Answer: (C) Immersion freezing

Solution:

Step 1: Understanding the Concept:
The efficiency of a freezing process depends on how quickly heat can be removed from the food. The rate of heat transfer is maximized when there is direct, intimate contact between the food and the cooling medium (refrigerant), which minimizes the resistance to heat flow.

Step 2: Detailed Explanation:
- **Immersion freezing** involves directly immersing the food product (either packaged or unpackaged) into a liquid refrigerant, such as chilled brine, glycerol, or liquid nitrogen. This direct immersion ensures complete, intimate contact over the entire surface of the food, leading to a very high rate of heat transfer and rapid freezing.
- **Indirect contact freezing** (e.g., plate freezing) places food on metal plates cooled by a refrigerant. While contact is good, it's indirect and may not be perfect over the entire surface.
- **Air freezing** (e.g., blast freezing) uses cold air as the refrigerant. Air is a poor conductor of heat compared to liquids, so the heat transfer rate is lower.
- **Fluidized-bed freezing** is a type of air freezing where small particles are suspended in air. While it improves upon standard air freezing, the contact is still with air, not a liquid.

Step 3: Final Answer:
Immersion freezing provides the most intimate contact between the food and the refrigerant, minimizing heat transfer resistance. Therefore, option (C) is the correct answer.

Quick Tip

Think about cooling a hot object. Plunging it into cold water (immersion) cools it much faster than leaving it in a cold room (air) or placing it on a cold block (indirect contact). The same principle applies to freezing.

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56. The process of 'Hot-break' is commonly used in the manufacturing of products like
(A). Orange squash
(B). Tomato paste
(C). Orange juice
(D). Tomato juice
Choose the most appropriate answer from the options given below:

(A) (B) and (D) only
(B) (A), (B) and (C) only
(C) (A), (B), (C) and (D)
(D) (C) and (D) only

Correct Answer: (A) (B) and (D) only

Solution:

Step 1: Understanding the Concept:
'Hot-break' is a specific thermal processing step used primarily in the manufacturing of tomato products. It involves rapidly heating freshly crushed tomatoes to a high temperature (around 90-95°C). The purpose is to immediately and completely inactivate the natural pectic enzymes (e.g., pectin methylesterase).

Step 2: Detailed Explanation:
- By inactivating these enzymes, the 'hot-break' process preserves the natural pectin in the tomatoes. Pectin is responsible for viscosity (thickness).
- This results in a final product with a very high and stable viscosity. Such high viscosity is highly desirable in products like **(B) Tomato paste**, ketchup, and certain types of thick **(D) Tomato juice**.
- An alternative method, 'cold-break' (heating to a lower temperature, 65°C), allows some enzyme activity, resulting in a less viscous product, which is suitable for other types of tomato juice.
- The 'hot-break' process is specific to tomato processing to control pectin and viscosity and is not used for **(A) Orange squash** or **(C) Orange juice**.

Step 3: Final Answer:
The 'hot-break' process is used in the manufacturing of both tomato paste and tomato juice to achieve high viscosity. Therefore, option (A), which includes (B) and (D), is the correct answer.

Quick Tip

Associate 'Hot-break' and 'Cold-break' exclusively with tomato products. Remember: **Hot-break = High Heat = No Enzymes = High Viscosity** (for paste/ketchup).

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57. During the process of ripening of fruits, the transition of pectic substance occurs in the following order:
(A). Protopectin
(B). Pectin
(C). Pectinic acid
(D). Pectic acid
Choose the most appropriate answer from the options given below:

(A) (A), (C), (B), (D)
(B) (B), (A), (C), (D)
(C) (B), (C), (D), (A)
(D) (C), (B), (D), (A)

Correct Answer: (No correct option provided, the actual sequence is (A)→(B)→(C)→(D))

Solution:

Step 1: Understanding the Concept:
Pectic substances are complex carbohydrates that act as a cementing agent in the cell walls of plants, contributing to the firmness of fruits. As a fruit ripens, enzymes progressively break down these substances, leading to softening. This transition follows a specific biochemical pathway.

Step 2: Detailed Explanation:
The correct order of transformation of pectic substances during ripening is as follows:
1. **(A) Protopectin:** This is the water-insoluble form of pectin found in unripe, hard fruits. It is a large polymer bound to the cellulose in the cell wall.
2. **(B) Pectin:** As the fruit begins to ripen, the enzyme protopectinase starts to break down protopectin into smaller, soluble pectin molecules. This is what causes the fruit to begin to soften.
3. **(C) Pectinic acid:** With further ripening, the enzyme pectin methylesterase (PME) removes some of the methyl groups from the pectin molecules. This results in the formation of pectinic acids.
4. **(D) Pectic acid:** In the final stages of ripening and over-ripening, the enzyme polygalacturonase (PG) breaks down the polymer chains, and any remaining methyl groups are removed. This results in the formation of pectic acid (polygalacturonic acid), leading to a very soft or mushy texture.
The correct sequence is therefore (A) → (B) → (C) → (D).

Step 3: Final Answer:
The correct sequential order for the transition of pectic substances during fruit ripening is Protopectin → Pectin → Pectinic acid → Pectic acid. As none of the provided options reflect this, the question is flawed.

Quick Tip

Remember the progression from hard to mushy: Starts with the large, insoluble **Protopectin** (unripe). This breaks down into soluble **Pectin** (ripe), which is then further degraded into **Pectinic acid** and finally **Pectic acid** (overripe/mushy).

---

58. The soft and fragile food products, having delicate flavors and colors, are best dried by which of the following method:

(A) Drum drying
(B) Vacuum drying
(C) Tray drying
(D) Freeze drying

Correct Answer: (D) Freeze drying

Solution:

Step 1: Understanding the Concept:
The goal of drying is to remove water, but different methods use varying levels of heat and pressure, which can impact the quality of the final product. For delicate products, the gentlest method is required to preserve structure, flavor, and color.

Step 2: Detailed Explanation:
- **Freeze drying (Lyophilization):** This is the gentlest drying method. The product is first frozen, and then the water is removed by sublimation (turning directly from solid ice to vapor) under a high vacuum. Because the water is not in a liquid state and the process occurs at low temperatures, the food's structure is maintained, shrinkage is minimal, and heat-sensitive flavors and colors are exceptionally well-preserved. This is ideal for soft, fragile products like berries, coffee, and herbs.
- **Drum drying** and **Tray drying** use high heat, which can destroy delicate flavors, cause browning, and damage the structure of fragile foods.
- **Vacuum drying** is gentler than atmospheric drying because the vacuum lowers the boiling point of water, but it is not as gentle as freeze drying and can still lead to some structural collapse.

Step 3: Final Answer:
Freeze drying is the superior method for drying soft, fragile food products with delicate flavors and colors because it best preserves the original quality attributes. Therefore, option (D) is

correct.

Quick Tip

For questions about preserving the highest quality in a dried product (especially structure, flavor, color), the answer is almost always **Freeze Drying**. It is the premium, albeit most expensive, drying method.

---

59. Which of the following is used as an antioxidant in fats and oils?

(A) BHA
(B) BHF
(C) HBT
(D) HBA

Correct Answer: (A) BHA

Solution:

Step 1: Understanding the Concept:
Antioxidants are food additives used to prevent or delay oxidative rancidity in foods that contain fats and oils. This is achieved by donating a hydrogen atom to free radicals, thus terminating the chain reaction of oxidation. Several synthetic phenolic compounds are commonly used for this purpose.

Step 2: Detailed Explanation:
- **BHA** stands for **Butylated Hydroxyanisole**. It is a widely used, effective, and approved synthetic antioxidant for preserving fats, oils, and fat-containing products like cereals, chewing gum, and potato chips.
- Other common synthetic antioxidants include BHT (Butylated Hydroxytoluene), PG (Propyl Gallate), and TBHQ (Tertiary Butylhydroquinone).
- The other acronyms listed (BHF, HBT, HBA) are not standard names for approved food antioxidants.

Step 3: Final Answer:
BHA (Butylated Hydroxyanisole) is a common antioxidant used in fats and oils. Therefore, option (A) is the correct answer.

Quick Tip

Memorize the "big four" synthetic antioxidants used in food: BHA, BHT, PG, and TBHQ. If you see one of these in an exam question about antioxidants, it is very likely the correct answer.

60. The correct order of unit operations carried out in the Canning of vegetables is:

(A) Sorting—-Retorting—-Exhausting—-Filling—-Sealing
(B) Retorting—Filling—-Exhausting—-Processing—-Sealing
(C) Retorting—-Filling—-Processing—-Exhausting—-Sealing
(D) Sorting—-Filling—-Exhausting—-Sealing——Retorting

Correct Answer: (D) Sorting—-Filling—-Exhausting—-Sealing——Retorting

Solution:

Step 1: Understanding the Concept:
Canning is a method of food preservation in which food is processed and sealed in an airtight container. The process involves a series of sequential steps designed to prepare the food, package it, and then render it commercially sterile.

Step 2: Detailed Explanation:
The logical sequence of operations in vegetable canning is as follows:
1. **Sorting:** The process begins with the raw material. Vegetables are sorted and graded for quality, size, and maturity. (This is often preceded by washing).
2. **Filling:** The prepared vegetables (which may have been peeled, cut, or blanched) are filled into cans. Brine or sauce is also added.
3. **Exhausting:** Before sealing, air is removed from the headspace of the can. This is done to create a vacuum after cooling, which prevents internal can corrosion and minimizes oxidative spoilage.
4. **Sealing:** The can is immediately hermetically (airtightly) sealed.
5. **Retorting:** This is the final and critical step. The sealed cans are subjected to high-pressure steam (typically at 121°C) in a retort to destroy spoilage microorganisms and their spores, achieving commercial sterility.
The order in option (D) correctly follows this sequence. The other options place the final sterilization step (Retorting) at or near the beginning, which is incorrect.

Step 3: Final Answer:
The correct sequence of unit operations is Sorting → Filling → Exhausting → Sealing → Retorting. Therefore, option (D) is correct.

Quick Tip

For any preservation process, always think logically. Raw material preparation (Sorting) comes first. The final "kill step" or sterilization (Retorting) must happen after the container is sealed to prevent recontamination.

61. An example of hard and ripened cheese is:

(A) Roquefort cheese
(B) Cottage cheese
(C) Cheddar cheese
(D) Camembert cheese

Correct Answer: (C) Cheddar cheese

Solution:

Step 1: Understanding the Concept:
Cheese is classified based on several factors, including moisture content (soft, semi-hard, hard) and whether it undergoes a ripening (aging) process. A hard, ripened cheese is one with low moisture content that has been aged for a period, allowing enzymes and microbes to develop its characteristic flavor and texture.

Step 2: Detailed Explanation:
- **Cheddar cheese:** This is the quintessential example of a hard, ripened cheese. It has a low moisture content (typically $< 39\%$) and is aged for several months to over a year, developing a sharp flavor and a firm, dense texture.
- **Roquefort cheese:** This is a semi-soft, blue-veined cheese. It is ripened, but it is not considered a hard cheese due to its higher moisture content.
- **Cottage cheese:** This is an unripened, fresh cheese. It has a very high moisture content and a soft, curdy texture. It is consumed fresh and is not aged.
- **Camembert cheese:** This is a soft-ripened cheese. It has a high moisture content and a soft, creamy interior that ripens from the outside in.

Step 3: Final Answer:
Among the given options, Cheddar cheese is the best example of a hard and ripened cheese. Therefore, option (C) is correct.

Quick Tip

To classify cheese, ask two questions: 1. Is it soft or hard? (Think about how easily it slices or crumbles). 2. Is it eaten fresh or aged? (Fresh cheeses like cottage cheese and mozzarella are mild; aged cheeses like Cheddar and Parmesan are sharp). A hard, ripened cheese will be firm and flavorful.

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62. The alkali treatment of cocoa to enhance its color and flavor is known as

(A) French process
(B) Dutch process
(C) Enrobing

(D) Tempering

Correct Answer: (B) Dutch process

Solution:

Step 1: Understanding the Concept:
Natural cocoa powder is acidic (pH 5.5) and has a reddish-brown color and a sharp, fruity flavor. A specific process was developed to modify these properties to make cocoa more soluble and give it a different sensory profile.

Step 2: Detailed Explanation:
- The **Dutch process**, or "Dutching," was invented by Coenraad Johannes van Houten in the Netherlands. It involves treating cocoa nibs or cocoa liquor with an alkaline solution, such as potassium carbonate or sodium carbonate.
- This treatment neutralizes the natural acidity of the cocoa, raising its pH to 7 or above.
- The results of this process are: - **Color Enhancement:** The cocoa becomes darker, often a deep reddish-brown or nearly black. - **Flavor Modification:** The flavor becomes milder, less acidic, and smoother. - **Increased Solubility:** The treated cocoa powder disperses more easily in liquids.
- **Enrobing** is the process of coating a center (like a candy or biscuit) with a layer of chocolate.
- **Tempering** is the controlled process of heating and cooling chocolate to ensure the cocoa butter crystallizes in a stable form, giving the final product a glossy finish and a crisp snap.

Step 3: Final Answer:
The alkali treatment of cocoa is known as the Dutch process. Therefore, option (B) is the correct answer.

Quick Tip

Remember the association: **Dutch** process = **D**ark cocoa. This alkali treatment is what gives Oreo cookies their characteristic dark color and smooth flavor.

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63. The enzyme used in isomerization of corn starch during the making of High Fructose Corn Syrup is/are:
(A). Alpha-amylase
(B). Glucoamylase
(C). Glucose isomerase
Choose the most appropriate answer from the options given below:

(A) (A) and (B) only
(B) (B) and (C) only
(C) (B) only

(D) (A), (B) and (C)

Correct Answer: (D) (A), (B) and (C)

Solution:

Step 1: Understanding the Concept:
The production of High Fructose Corn Syrup (HFCS) from corn starch is a multi-step enzymatic process. It involves breaking down the large starch polymer into glucose and then converting a portion of that glucose into fructose.

Step 2: Detailed Explanation:
The process uses a sequence of three key enzymes:
1. **(A) Alpha-amylase:** This enzyme is used in the first step, liquefaction. It breaks down the long-chain starch molecules into smaller polysaccharide chains called dextrins.
2. **(B) Glucoamylase:** This enzyme is used in the second step, saccharification. It breaks down the dextrins into individual glucose molecules, resulting in a glucose syrup.
3. **(C) Glucose isomerase:** This is the crucial third enzyme. It is used in the isomerization step, where it converts a portion of the glucose molecules into fructose molecules. Since fructose is much sweeter than glucose, this step creates the "high fructose" syrup.
The question asks which enzymes are used "during the making" of HFCS, which implies the entire process from starch. Therefore, all three enzymes are involved.
Correction Note: The original question text is slightly ambiguous. It asks about "isomerization of corn starch". Isomerization is only one step, performed by glucose isomerase (C). However, it also says "during the making of High Fructose Corn Syrup", which covers the whole process. Given the options, the question is interpreted to mean the entire manufacturing process. If the question meant ONLY the isomerization step, the answer would be (C) only. But since (A), (B), and (C) is an option, it is intended to cover the entire process.

Step 3: Final Answer:
The entire process of making HFCS from corn starch involves alpha-amylase, glucoamylase, and glucose isomerase. Therefore, option (D) is the most comprehensive answer.

Quick Tip

Remember the HFCS enzyme chain: 1. **Alpha-amylase** cuts the big starch chains (liquefaction). 2. **Glucoamylase** cuts the small chains into glucose (saccharification). 3. **Glucose Isomerase** converts glucose to fructose (isomerization).

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64. Match List-I with List-II

List-I Type of sugar	List-II Application
(A) Icing	(I) Common sweetening ingredient
(B) HFCS	(II) Cake preparation
(C) Sugar cubes	(III) Candies
(D) Granulated	(IV) Tea service

Choose the most appropriate answer from the options given below:

(A) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
(B) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(C) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Solution:

Step 1: Understanding the Concept:
Different forms of sugar are produced for specific functional and practical applications in food products and services. This question requires matching the type of sugar with its most common use.

Step 2: Detailed Explanation:
- **(A) Icing sugar:** Also known as powdered or confectioner's sugar, this is finely ground granulated sugar. Its fine texture allows it to dissolve easily and create smooth textures, making it ideal for making icings, frostings, and for general **(II) Cake preparation** (e.g., in frostings and fillings).
- **(B) HFCS (High Fructose Corn Syrup):** This is a liquid sweetener. Its properties, such as high sweetness, moisture retention, and resistance to crystallization, make it a very common ingredient in processed foods, especially beverages and **(III) Candies**.
- **(C) Sugar cubes:** These are simply granulated sugar pressed into blocks. They are designed for portion control and convenience, primarily for sweetening hot beverages like tea or coffee. Thus, they are associated with **(IV) Tea service**.
- **(D) Granulated sugar:** This is the standard, all-purpose "table sugar." It is the most widely used form of sugar in both households and industry, making it the **(I) Common sweetening ingredient** for a vast range of applications.

Step 3: Final Answer:
The correct pairings are: (A)-(II), (B)-(III), (C)-(IV), and (D)-(I). This corresponds to option (A).

Quick Tip

Associate the form of the sugar with its function: Powdered (Icing) for smooth things like frosting. Liquid (HFCS) for processed foods/candies. Blocks (Cubes) for drinks. Standard crystals (Granulated) for everything else.

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65. Match List-I with List-II

List-I **Fat type**	**List-II** **Manufacturing**
(A) Lard	(I) Ripening
(B) Butter	(II) Rendering
(C) Margarine	(III) Emulsion
(D) Mayonnaise	(IV) Partial hydrogenation

Choose the most appropriate answer from the options given below:

(A) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
(B) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(C) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:
This question requires matching different types of fat-based food products with the key process involved in their manufacturing.

Step 2: Detailed Explanation:
- **(A) Lard:** This is fat derived from pigs. The process of obtaining lard involves heating the fatty tissues of the pig to melt the fat and separate it from the connective tissue. This process of melting and clarifying fat is called **(II) Rendering**.
- **(B) Butter:** This is a dairy product made by churning cream. After churning, the butter granules are worked to remove buttermilk. Often, the cream is soured or cultured with bacteria before churning, and the butter itself may be aged slightly to develop flavor. This flavor development stage is a form of **(I) Ripening**.
- **(C) Margarine:** This is a butter substitute made primarily from vegetable oils. To convert liquid vegetable oils into a solid, spreadable fat, they are often subjected to **(IV) Partial hydrogenation**. This process adds hydrogen atoms to the unsaturated fatty acids, making them more saturated and solid at room temperature.
- **(D) Mayonnaise:** This is a stable mixture of oil, egg yolk, and an acid (like vinegar or lemon juice). A mixture of two immiscible liquids like oil and water (from the vinegar/juice) is called an **(III) Emulsion**. The lecithin in the egg yolk acts as the emulsifier.

Step 3: Final Answer:
The correct pairings are: (A)-(II), (B)-(I), (C)-(IV), and (D)-(III). This corresponds to option (A).

Quick Tip

Remember the core process for each fat product: **Lard** = Rendering animal fat. **Margarine** = Hydrogenating vegetable oil. **Mayonnaise** = Emulsifying oil and vinegar. **Butter** = Churning cream (which can be ripened).

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66. Identify the correct sequence of product/by-product formation during cocoa and chocolate processing/manufacturing:
(A). Cocoa powder
(B). Chocolate liquor
(C). Cocoa butter
(D). Nibs
Choose the most appropriate answer from the options given below:

(A) (A), (B), (C), (D)
(B) (A), (B), (D), (C)
(C) (D), (B), (C), (A)
(D) (C), (B), (D), (A)

Correct Answer: (C) (D), (B), (C), (A)

Solution:

Step 1: Understanding the Concept:
The manufacturing of chocolate and cocoa powder from raw cocoa beans is a sequential process where each step yields a specific intermediate product. The question asks for the correct order in which these products are formed.

Step 2: Detailed Explanation:
The process flow is as follows:
1. Raw cocoa beans are fermented, dried, and roasted. The roasted beans are then broken, and the shells are separated from the inner part of the bean. This inner part is called the **(D) Nibs**.
2. The cocoa nibs are then ground into a fine paste. The heat from grinding melts the fat (cocoa butter) within the nibs, resulting in a thick, dark, liquid paste known as **(B) Chocolate liquor** or cocoa mass. This is the base for all chocolate products.
3. To make cocoa powder, the chocolate liquor is put into a hydraulic press, which squeezes out a large portion of the fat. This fat is **(C) Cocoa butter**.
4. The solid block that remains after the cocoa butter has been pressed out is called press cake.

This press cake is then pulverized to create **(A) Cocoa powder**.

Step 3: Final Answer:
The correct sequence of formation is Nibs → Chocolate liquor → Cocoa butter → Cocoa powder. This corresponds to the order (D), (B), (C), (A), which is option (C).

Quick Tip

Think of the process as starting with the solid bean piece (**Nibs**), grinding it to a liquid (**Chocolate Liquor**), and then separating that liquid into its fat part (**Cocoa Butter**) and its solid part (**Cocoa Powder**).

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67. The drier that can be used for carrying out the instantizing or agglomeration process is:

(A) Drum drier
(B) Spray drier
(C) Tunnel drier
(D) Kiln drier

Correct Answer: (B) Spray drier

Solution:

Step 1: Understanding the Concept:
Instantizing is a process that improves the dispersibility and solubility of a dried powder in a liquid (e.g., instant coffee, instant milk powder). This is achieved through agglomeration, where fine powder particles are clustered together to form larger, porous granules. These granules sink into the liquid and wet more easily than fine powders.

Step 2: Detailed Explanation:
- A **Spray drier** is uniquely suited for this process. In modern multi-stage spray driers, the initial drying creates fine particles. These fine particles are then passed through a zone of high humidity (often by reintroducing steam or fine water mist) near the bottom of the drier. This makes their surfaces sticky.
- They then enter a secondary drying stage, typically an integrated fluid-bed drier, where the sticky particles collide and bind together, forming larger agglomerates. This two-step process within a single system is the standard method for instantizing.
- **Drum driers**, **Tunnel driers**, and **Kiln driers** are not designed for this process. They produce flakes, large dried pieces, or bulk dried materials, and they lack the mechanism for controlled re-wetting and agglomeration of fine particles.

Step 3: Final Answer:
The spray drier, particularly a multi-stage system with a fluid bed, is the equipment used for

the agglomeration and instantizing process. Therefore, option (B) is correct.

Quick Tip

Associate "instant" powders with agglomeration. The best way to create these porous, easy-to-dissolve granules from a liquid feed is by using a sophisticated spray drying process.

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68. The major microorganism that the food handler's may harbour as part of the body's flora is:

(A) Staphylococcus aureus
(B) Bacillus thermophilus
(C) Clostridium botulinum
(D) Bacillus cereus

Correct Answer: (A) Staphylococcus aureus

Solution:

Step 1: Understanding the Concept:
Food handlers can be a significant source of microbial contamination. Some microorganisms are part of the normal flora of the human body, meaning they live on or in a person without causing illness to them, but can cause foodborne illness if transferred to food.

Step 2: Detailed Explanation:
- **Staphylococcus aureus** is a common bacterium that is a major part of the normal flora of the human body. It is frequently found in the nasal passages and on the skin of healthy individuals. If food handlers with poor hygiene practices (e.g., not washing hands, coughing or sneezing near food) handle cooked foods, they can transfer *S. aureus*. If the food is then stored at improper temperatures, the bacteria can multiply and produce a heat-stable toxin that causes staphylococcal food poisoning.
- **Bacillus thermophilus** is a thermophilic (heat-loving) bacterium, not typically part of human flora.
- **Clostridium botulinum** and **Bacillus cereus** are spore-forming bacteria typically found in soil and the environment, not as a primary part of the normal human body flora.

Step 3: Final Answer:
Staphylococcus aureus is the major microorganism associated with the normal flora of a food handler that is of concern in food safety. Therefore, option (A) is correct.

Quick Tip

In food safety questions, when you see "food handler," immediately think of *Staphylococcus aureus*. It's the classic example of a bacterium transferred from a person's skin or nose to food.

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69. The basic functions of a food package are:
(A). Containment
(B). Fortification
(C). Adulteration
(D). Communication
Choose the most appropriate answer from the options given below:

(A) (A) and (D) only
(B) (A), (B) and (D) only
(C) (A), (B), (C) and (D)
(D) (B), (C) and (D) only

Correct Answer: (A) (A) and (D) only

Solution:

Step 1: Understanding the Concept:
Food packaging serves several fundamental purposes. The primary functions are to physically hold the product, protect it from the environment, provide convenience, and convey information to the consumer.

Step 2: Detailed Explanation:
- **(A) Containment:** This is the most basic function of a package. It must hold the food, preventing it from leaking or spilling.
- **(D) Communication:** The package provides a surface for printing essential information. This includes the product name, brand, ingredients, nutritional facts, instructions for use, and legally required information. This is a crucial function.
- **(B) Fortification:** This is the process of adding micronutrients to a food product itself to improve its nutritional value. It is a function of food formulation, not packaging.
- **(C) Adulteration:** This is the act of adding inferior substances to a food product or debasing its quality. A key role of packaging is to *prevent* adulteration and tampering, not to cause it.
Therefore, the only correct basic functions listed are Containment and Communication.

Step 3: Final Answer:
The basic functions of a food package from the given list are containment and communication. Therefore, option (A) is the correct answer.

Quick Tip

Remember the four primary functions of packaging: Protection, Containment, Communication, and Convenience. Any option that falls outside these categories is likely incorrect.

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70. Examples of active packaging includes;
(A). MAP
(B). Ethylene scavenger
(C). Antioxidant release film
(D). Moisture absorbents
Choose the most appropriate answer from the options given below:

(A) (A), (B) and (D) only
(B) (A), (B) and (C) only
(C) (A), (B), (C) and (D)
(D) (B), (C) and (D) only

Correct Answer: (D) (B), (C) and (D) only

Solution:

Step 1: Understanding the Concept:
Active packaging refers to systems where the package, the food, and the environment interact in a way that extends shelf life or improves product quality. This goes beyond the passive barrier function of traditional packaging. It involves components that actively scavenge, absorb, or release substances within the package.

Step 2: Detailed Explanation:
- **(B) Ethylene scavenger:** This is a classic example of active packaging. A sachet or film actively absorbs ethylene gas produced by fruits and vegetables, thereby slowing down the ripening and senescence processes.
- **(C) Antioxidant release film:** This is an active system where the packaging material is impregnated with an antioxidant (like BHT or vitamin E) that actively migrates into the food to prevent oxidative rancidity.
- **(D) Moisture absorbents:** Also known as desiccants, these are sachets or pads that actively absorb excess moisture from the headspace or from the food product (e.g., in a package of fresh meat), inhibiting microbial growth.
- **(A) MAP (Modified Atmosphere Packaging):** This is a closely related but distinct technology. In MAP, the air in the package is replaced with a specific gas mixture at the moment of packaging. The package then provides a passive barrier to maintain this atmosphere. It does not involve a component that is continuously and actively changing the atmosphere over time. Therefore, it is generally classified separately from active packaging.

Step 3: Final Answer:
Ethylene scavengers, antioxidant release films, and moisture absorbents are all clear examples

of active packaging. Therefore, option (D) is the most appropriate answer.

Quick Tip

The key to identifying active packaging is to look for an ongoing "action" word: scavenging, absorbing, releasing, or emitting. MAP is a one-time "modification" of the atmosphere, making it distinct.

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71. Match List-I with List-II

List-I **Irradiation dose range, kGy**	**List-II** **Objectives**
(A) 0.05-0.15	(I) Elimination of specific pathogens
(B) 35-60	(II) Insect disinfestation
(C) 3.0-13	(III) Inhibition of sprouting
(D) 0.1-0.5	(IV) Sterilization of foods

Choose the most appropriate answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(B) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (I), (B) - (IV), (C) - (III), (D) - (II)

Correct Answer: (B) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Solution:

Step 1: Understanding the Concept:
Food irradiation is a process of exposing food to ionizing radiation. The applied dose, measured in kiloGrays (kGy), determines the effect. Different dose levels are used to achieve specific objectives, from inhibiting physiological processes to complete sterilization.

Step 2: Detailed Explanation:
The effects of different irradiation doses are generally categorized as follows:
- **Low Dose (¡ 1 kGy):** Used for purposes like sprout inhibition and killing insects. - **(A) 0.05-0.15 kGy** is a very low dose specifically used for **(III) Inhibition of sprouting** in tubers and bulbs like potatoes and onions. - **(D) 0.1-0.5 kGy** is the dose range used for **(II) Insect disinfestation** in cereals, pulses, and fresh and dried fruits. - **Medium Dose (1-10 kGy):** Used to reduce spoilage microbes and eliminate non-spore-forming pathogens. - **(C) 3.0-13 kGy** falls in this range. A dose of 3-10 kGy is used for **(I) Elimination of specific pathogens** like *Salmonella* and *E. coli* in meat, poultry, and seafood (Radicidation). - **High Dose (¿ 10 kGy):** Used for commercial sterilization. - **(B) 35-60 kGy** is a high dose required for **(IV) Sterilization of foods** (Radappertization), making them shelf-stable

without refrigeration, often for military or hospital use.

Step 3: Final Answer:
The correct pairings are: (A)-(III), (B)-(IV), (C)-(I), and (D)-(II). This corresponds to option (B).

Quick Tip

Remember the general rule for irradiation dosage: The smaller the target, the lower the dose needed. It takes a very low dose to stop a plant from sprouting. It takes a bit more to kill an insect. It takes a medium dose to kill bacteria. It takes a very high dose to kill the most resistant bacterial spores for complete sterilization.

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72. The industrial High Pressure Processing setup consists of the following components;
(A). Pressure pump
(B). Pressure agitator
(C). Pressure chamber
(D). Pulse chamber
Choose the most appropriate answer from the options given below:

(A) (A), (B) and (D) only
(B) (A) and (D) only
(C) (A) and (C) only
(D) (B), (C) and (D) only

Correct Answer: (C) (A) and (C) only

Solution:

Step 1: Understanding the Concept:
High Pressure Processing (HPP) is a non-thermal food preservation technology that uses extremely high hydrostatic pressure to inactivate microorganisms and enzymes. An industrial HPP setup has a few core essential components to generate and contain this pressure.

Step 2: Detailed Explanation:
The fundamental components of an HPP system are:
- **(A) Pressure pump:** A high-pressure intensifier pump is required to generate the massive pressures needed for the process (typically 400-600 MPa). This is the "engine" of the system.
- **(C) Pressure chamber (or vessel):** This is a thick-walled, high-strength steel cylinder where the packaged food, submerged in a pressure-transmitting fluid (usually water), is placed. It is designed to safely contain the immense pressure.
- **(B) Pressure agitator:** This is an incorrect term. According to Pascal's Principle, pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and the

walls of the containing vessel. Therefore, pressure is instantaneous and uniform, and no agitation is necessary.
- **(D) Pulse chamber:** This component is associated with Pulsed Electric Field (PEF) processing, a different non-thermal technology where food is passed through a chamber and subjected to short, high-voltage electrical pulses. It is not part of an HPP system.

Step 3: Final Answer:
The essential components of an HPP setup from the list are the pressure pump and the pressure chamber. Therefore, option (C) is the correct answer.

Quick Tip

Think of an HPP machine as a very simple but powerful system: you need something to make the pressure (**pump**) and something to hold the pressure (**chamber**). Other terms like "agitator" or "pulse chamber" are likely distractors from other technologies.

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73. Match List-I with List-II

List-I Foods	**List-II a_w values**
(A) Flour	(I) 0.96
(B) Dry Fruits	(II) 0.75-0.80
(C) Jam	(III) 0.55-0.80
(D) Bread	(IV) 0.67-0.87

Choose the most appropriate answer from the options given below:

(A) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
(B) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Solution:

Step 1: Understanding the Concept:
Water activity (a_w) is a measure of the free water available in a food for microbial growth and chemical reactions. It ranges from 0 (completely dry) to 1.0 (pure water). Different food types have characteristic a_w ranges.

Step 2: Detailed Explanation:
Let's match the foods with their typical a_w values:
- **(D) Bread:** This is a high-moisture baked good. Its a_w is quite high, typically around 0.94-0.98. Out of the given options, the range is not perfect. However, bread is the wettest product

on this list aside from jam. Let's re-evaluate.
- **(C) Jam:** Jams have a very high sugar content. Sugar binds water, significantly lowering the water activity to prevent microbial spoilage, despite their high moisture content. A typical a_w for jam is 0.75-0.80. Let's match (C) to (II).
- **(B) Dry Fruits:** These are intermediate moisture foods. Their a_w is lower than bread but higher than flour. A range of 0.60-0.65 is common, but the provided options are higher. Let's examine the ranges again.
- **(A) Flour:** This is a low-moisture food, stable against most microbial growth. Its a_w is typically between 0.67-0.87. Let's match (A) to (IV).

Let's re-examine based on the provided options which seem unusual. Let's work backwards from the given answer key's logic: (A) - (III), (B) - (IV), (C) - (I), (D) - (II). - (C) Jam is matched with (I) 0.96. This is incorrect. Jam's a_w is low due to sugar. - (D) Bread is matched with (II) 0.75-0.80. This is also incorrect. Bread's a_w is very high. - (A) Flour is matched with (III) 0.55-0.80. This range is plausible for flour. - (B) Dry Fruits is matched with (IV) 0.67-0.87. This range is also plausible for some dried fruits.
There appears to be a significant error in the question's provided ranges or the options. Let's attempt a logical matching based on relative water activity. - Highest a_w: Bread (˜0.96) - High a_w but lowered by solutes: Jam (˜0.80) - Intermediate a_w: Dry Fruits (˜0.65) - Low a_w: Flour (˜0.60)
Matching to the closest given values: - (D) Bread → (I) 0.96 - (C) Jam → (II) 0.75-0.80 - (B) Dry Fruits → (IV) 0.67-0.87 (plausible range) - (A) Flour → (III) 0.55-0.80 (plausible range)
This logical matching (D-I, C-II, B-IV, A-III) does not correspond to any of the answer choices. The question or options are flawed. However, if forced to choose the "best fit" from the flawed options, it requires accepting some incorrect pairings. Let's analyze option (D) again: (A)-(III), (B)-(IV), (C)-(I), (D)-(II). This option incorrectly matches Jam to 0.96 and Bread to 0.75-0.80. Due to these fundamental errors, a correct solution cannot be derived.

Step 3: Final Answer:
The question contains incorrect data in the options, making a correct match impossible based on standard food science values. Both the water activity values for bread and jam are mismatched in all options. The question is fundamentally flawed.

Quick Tip

When faced with a flawed matching question, try to find the "best" or most logical pairings first. High-moisture products like fresh bread have a very high a_w (close to 1.0). High-sugar products like jam have a much lower a_w than their moisture content suggests. Dry products like flour have the lowest a_w. If no option fits this logic, recognize the question may be faulty.

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74. Which of the following statements is/are correct with reference to composition of fats and oils;
(A). The chain length and degree of saturation control the properties that are

found within the fatty acids and lipids
(B). Fatty acids typically contain an even number of carbon atoms.
(C). The saturated acids have higher melting points than unsaturated acids of corresponding size.
Choose the most appropriate answer from the options given below:

(A) (A) and (C) only
(B) (B) and (C) only
(C) (A) only (B) only
(D) (A), (B) and (C)

Correct Answer: (D) (A), (B) and (C)

Solution:

Step 1: Understanding the Concept:
This question asks to evaluate three fundamental statements about the chemistry of fatty acids, the building blocks of fats and oils.

Step 2: Detailed Explanation:
Let's analyze each statement:
- **(A) The chain length and degree of saturation control the properties that are found within the fatty acids and lipids:** This is a correct and fundamental principle. **Chain length** (the number of carbon atoms) and **degree of saturation** (the number of double bonds) are the two primary structural features that determine the physical and chemical properties of a fatty acid, such as its melting point, solubility, and susceptibility to oxidation.
- **(B) Fatty acids typically contain an even number of carbon atoms:** This is correct. In biological systems, fatty acids are synthesized by the sequential addition of two-carbon units (from acetyl-CoA). As a result, the vast majority of naturally occurring fatty acids have an even number of carbon atoms (e.g., palmitic acid C16, stearic acid C18, oleic acid C18). Odd-chain fatty acids exist but are much less common.
- **(C) The saturated acids have higher melting points than unsaturated acids of corresponding size:** This is correct. Saturated fatty acids have straight, linear chains that can pack together closely via van der Waals forces. This tight packing requires more energy (a higher temperature) to break apart, resulting in a higher melting point. Unsaturated fatty acids have "kinks" in their chains due to the double bonds, which prevent them from packing closely. This results in weaker intermolecular forces and a lower melting point.
Since all three statements are correct, the correct option must include (A), (B), and (C).

Step 3: Final Answer:
All three statements regarding the composition and properties of fats and oils are correct. Therefore, option (D) is the correct answer.

Quick Tip

Remember these key fatty acid rules: 1. **Saturation affects shape and state**: Saturated = Straight = Solid fat. Unsaturated = Kinked = Liquid oil. 2. **Melting Point**: Longer chain = Higher MP. More saturation = Higher MP. 3. **Natural structure**: Most are even-numbered chains.

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75. Identify the factors that decrease the stability of egg foams;
(A). Acidity
(B). Fat content
(C). Salt content
(D). Sugar
Choose the most appropriate answer from the options given below:

(A) (B) and (C) only
(B) (A), (B) and (D) only
(C) (A), (B), (C) and (D)
(D) (B), (C) and (D) only

Correct Answer: (A) (B) and (C) only

Solution:

Step 1: Understanding the Concept:
Egg foam stability refers to the ability of the whipped foam (meringue) to hold its structure and not collapse or leak liquid (weep) over time. Various ingredients can either help or hinder this stability. The question asks which factors decrease stability.

Step 2: Detailed Explanation:
Let's analyze the effect of each factor:
- **(A) Acidity:** The addition of an acid (like cream of tartar or lemon juice) **increases** foam stability. The acid helps to denature the egg white proteins and allows them to form a stronger, more stable network around the air bubbles.
- **(B) Fat content:** Fat is highly detrimental to both the formation and stability of egg foams. Even a tiny trace of fat (e.g., from a speck of egg yolk) will interfere with the ability of the proteins to form a cohesive film around the air bubbles, causing the foam to be weak and collapse easily. Therefore, fat **decreases** stability.
- **(C) Salt content:** Adding salt to egg whites **decreases** foam stability. Although salt can decrease the time it takes to form a foam, it weakens the protein structure, making the foam less stable and more likely to weep over time.
- **(D) Sugar:** Sugar has a major stabilizing effect on egg foams. It should be added after the foam has reached a soft peak stage. The sugar dissolves in the liquid phase of the foam, increasing its viscosity and protecting the protein structure from over-coagulation. This results in a very strong, stable, and glossy meringue. Therefore, sugar **increases** stability.
The factors that decrease stability are fat and salt.

Step 3: Final Answer:
Fat content and salt content both decrease the stability of egg foams. Therefore, option (A) which includes (B) and (C) only, is the correct answer.

Quick Tip

To remember egg foam chemistry:

- **Stabilizers (Friends):** Acid (cream of tartar), Sugar. They make the foam stronger.
- **Destabilizers (Foes):** Fat (yolk), Salt. They make the foam weaker.
