CUET PG 2025 Dairy 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 Atmospheric Science 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. NDDB at Anand (Gujarat) was set up in _____

(A) 1987
(B) 1990
(C) 1980
(D) 1982
(E) None of the above (Correct answer not in options)

Correct Answer: (E) None of the above (Correct answer not in options)

Solution:
Step 1: Understanding the Concept:
The question asks for the year of establishment for the National Dairy Development Board (NDDB), which has its headquarters in Anand, Gujarat. This requires knowledge of key events in the history of India's dairy sector.

Step 2: Detailed Explanation:
The foundation of the National Dairy Development Board (NDDB) is a landmark event in the

history of Indian agriculture, directly linked to the White Revolution.
The NDDB was founded in the year **1965**.
The impetus for its creation came from the then Prime Minister of India, Lal Bahadur Shastri. During a visit to Anand, he was deeply impressed by the success of the Kaira District Co-operative Milk Producers' Union Limited, popularly known as Amul. He wished to replicate this cooperative model across the nation to empower farmers and boost milk production.
Dr. Verghese Kurien, the architect of Amul's success, was requested to head the newly formed organization, and he served as its founder-chairman.
Let's analyze the given options:

- **1987:** This year is significant but not for the establishment. In 1987, the Parliament of India passed the NDDB Act, which declared it an 'Institution of National Importance'. This act also merged the erstwhile Indian Dairy Corporation with the NDDB. So, while 1987 is an important year in NDDB's legislative history, it is not its founding year.
- **1990, 1980, 1982:** These years do not correspond to any major founding or legislative milestones for the NDDB.

Since the correct establishment year, 1965, is not provided in options 1 through 4, the appropriate answer is that the correct option is not listed.

Step 3: Final Answer:
The National Dairy Development Board (NDDB) was set up in 1965. As this option is not available, the correct choice is "None of the above".

Quick Tip

For questions about the establishment of major institutions, remember the founding year as well as any key legislative years. The NDDB was founded in 1965, a key date associated with India's White Revolution, while the NDDB Act was passed in 1987.

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2. Jamunapari breed is a breed of-

(A) Buffalo
(B) Sheep
(C) Cow
(D) Goat

Correct Answer: (D) Goat

Solution:
Step 1: Understanding the Concept:
This question tests the ability to correctly classify a specific animal breed, Jamunapari, into its

corresponding species. This is fundamental knowledge in animal husbandry.

Step 2: Detailed Explanation:
The Jamunapari is a renowned breed of **goat**.

- **Origin:** It originates from the Etawah district of Uttar Pradesh, India, particularly in the area along the banks of the Yamuna River, from which it derives its name.
- **Characteristics:** It is one of the largest goat breeds. It is easily identifiable by its distinct features: a large, convex face with a prominent Roman nose; very long, flat, and pendulous ears; and long legs. They typically have a white coat with tan or black markings on the head and neck.
- **Utility:** It is considered a dual-purpose breed, meaning it is raised for both milk and meat. Jamunapari does are good milkers, and the breed is often used for upgrading and improving other goat breeds.

Let's look at the other options to confirm:

- **Buffalo:** Famous Indian buffalo breeds include Murrah, Surti, Jaffarbadi, and Nili-Ravi.
- **Sheep:** Famous Indian sheep breeds include Marwari, Deccani, Nellore, and Mandya.
- **Cow:** Famous Indian cow breeds include Gir, Sahiwal, Red Sindhi, and Ongole.

Clearly, Jamunapari does not fall into any of these categories and is exclusively a goat breed.

Step 3: Final Answer:
The Jamunapari breed is a breed of Goat. Therefore, option (D) is the correct answer.

Quick Tip

Familiarize yourself with the names of common Indian livestock breeds. Associating breeds like Jamunapari (Goat), Murrah (Buffalo), and Gir (Cow) with their respective species is crucial for animal husbandry questions.

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3. The approximate yield of ghee in kg from 100 kg buffalo milk is

(A) 9.0
(B) 4.0
(C) 6.5
(D) 5.0

Correct Answer: (C) 6.5

Solution:

Step 1: Understanding the Concept:

The question asks for the approximate yield of ghee from a given quantity of buffalo milk. The yield of ghee, which is almost pure milk fat, is primarily dependent on two factors: the fat percentage of the milk and the efficiency of the fat recovery process.

Step 2: Detailed Explanation:

- **Fat Content of Buffalo Milk:** Buffalo milk is significantly richer in fat than cow milk. The average fat content in buffalo milk ranges from 6% to 8%, although it can be higher. For this calculation, let's use a conservative average of 7.5%.
- **Ghee Composition:** Ghee contains over 99.5% milk fat. The rest is a very small amount of moisture.
- **Processing and Recovery:** When ghee is made, not all the fat from the milk is recovered. Some fat is lost in the buttermilk (if the cream separation method is used) and in the ghee residue (the solids that settle at the bottom during clarification). The efficiency of fat recovery is typically around 90% to 93%.

Calculation:

1. **Calculate the total amount of fat** in 100 kg of buffalo milk.
   Assuming a fat percentage of 7.5%:

$$\text{Total Fat} = 100\,\text{kg milk} \times \frac{7.5}{100} = 7.5\,\text{kg fat}$$

2. **Calculate the yield of ghee** based on a recovery efficiency of, say, 92%.

$$\text{Ghee Yield} = \text{Total Fat} \times \text{Recovery Efficiency}$$

$$\text{Ghee Yield} = 7.5\,\text{kg} \times 0.92 = 6.9\,\text{kg}$$

If we consider a slightly lower fat percentage, for instance, 7.0%:

$$\text{Total Fat} = 100\,\text{kg milk} \times \frac{7.0}{100} = 7.0\,\text{kg fat}$$

$$\text{Ghee Yield} = 7.0\,\text{kg} \times 0.92 = 6.44\,\text{kg}$$

The calculated values (6.44 kg and 6.9 kg) are very close to the option 6.5 kg. Given the natural variations in milk composition and processing, an approximate yield of 6.5 kg is a very standard and accepted figure in the dairy industry. The other options are less likely: 9.0 kg would require an exceptionally high fat content and almost perfect recovery, while 4.0 kg and 5.0 kg would be too low for average buffalo milk.

Step 3: Final Answer:

The approximate yield of ghee from 100 kg of buffalo milk is around 6.5 kg. Therefore, option (C) is the correct answer.

Quick Tip

Remember the key difference in composition: Buffalo milk is richer in fat and total solids than cow milk. This leads to a higher yield of fat-based products like ghee and solids-based products like khoa. For quick estimation, remember buffalo milk gives about 6-7% ghee yield.

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4. Match the LIST-I with LIST-II

LIST-I (Breeds of Buffalo)		**LIST-II** (Origion of breed)	
A.	Murrah	I.	South - western part of Gujarat
B.	Jaffarbadi	II.	Mehsana in Gujarat
C.	Mehsana	III.	Gir forest of Kathiawar area
D.	Surti	IV.	Rohtak in Haryana

Choose the correct 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-IV, B-III, C-II, D-I

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

Solution:
Step 1: Understanding the Concept:
This question requires matching prominent Indian buffalo breeds with their respective native tracts or geographical regions of origin. This is a common type of question in exams related to agriculture and animal science.

Step 2: Detailed Explanation:
Let's analyze and match each breed from LIST-I with its origin from LIST-II.

- **A. Murrah:** The Murrah is arguably the most important dairy buffalo breed in India and is often called the "black gold". It is native to the state of Haryana and parts of Punjab. Its core breeding tract includes the districts of Rohtak, Hisar, and Jind in Haryana. Therefore, **Murrah (A) matches with Rohtak in Haryana (IV)**.
- **B. Jaffarbadi:** This is the heaviest buffalo breed in India. It is native to the Saurashtra region of Gujarat, specifically found in and around the Gir forest. The name itself comes from the town of Jaffarabad in Amreli district. Thus, **Jaffarbadi (B) matches with Gir forest of Kathiawar area (III)**.
- **C. Mehsana:** This breed originated in the Mehsana district of Gujarat and surrounding areas. It is believed to have been developed from a cross between the Murrah and Surti

breeds, exhibiting characteristics intermediate to both. So, **Mehsana (C) correctly matches with Mehsana in Gujarat (II)**.

- **D. Surti:** The home tract of the Surti breed is the 'Charotar' region of Gujarat, which includes the Kaira and Vadodara (Baroda) districts. This region is in the south-western part of Gujarat. The breed is known for its relatively smaller body and high-fat milk. Hence, **Surti (D) matches with South-western part of Gujarat (I)**.

Step 3: Final Answer:
Compiling the correct pairs, we get: A matches with IV, B matches with III, C matches with II, and D matches with I. The correct sequence is **A-IV, B-III, C-II, D-I**, which corresponds to option (D).

Quick Tip

Creating a simple table or flashcards for major livestock breeds and their native states/regions is an effective way to memorize this information. Often, the name of the breed itself (like Mehsana or Jaffarbadi) gives a clue to its origin.

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5. Caring of new born calf includes -
A. Immediately after the calf is born, make sure that all mucous is removed from the nose and mouth.
B. Apply tincture of iodine to the navel at birth, and dust with boric acid powder.
C. Under most conditions, the calf will be on its feet and ready for suckling within an hour.
D. Be sure the calf gets first milk (colostrum) at least for 48 hours.
Choose the correct 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:
The question evaluates knowledge of the essential and immediate care practices required for a newborn calf. Proper neonatal care is critical to minimize calf mortality and ensure a healthy start in life.

Step 2: Detailed Explanation:
Let's examine the validity and importance of each statement:

- **Statement A:** This is the very first and most critical step. Immediately after birth, the calf's airways (nose and mouth) may be blocked by mucous and fetal membranes. Clearing these obstructions is essential to allow the calf to take its first breath and prevent suffocation. This is a correct and vital practice.
- **Statement B:** The navel cord stump is a moist, open tissue that provides a direct entry point for bacteria from the environment into the calf's bloodstream. This can lead to serious infections like navel ill, joint ill, or systemic septicemia. Applying a strong disinfectant like tincture of iodine (typically 7% solution) seals the navel, disinfects it, and helps it dry faster. This is a standard and indispensable procedure in calf management.
- **Statement C:** This statement describes the behavior of a normal, healthy calf. A healthy calf shows a strong instinct to stand and seek the udder for milk. The ability to stand within 30-60 minutes after birth is a key indicator of the calf's vigor and health. While this is an observation rather than a direct action, understanding this normal behavior is part of calf care, as failure to do so indicates a problem.
- **Statement D:** This is arguably the single most important aspect of calf nutrition and health. Colostrum, the first milk produced after birth, is rich in maternal antibodies (immunoglobulins). Calves are born with almost no immunity, and they acquire passive immunity by absorbing these antibodies from colostrum. This absorption is most efficient in the first 6-12 hours of life. Feeding colostrum for the first 2-3 days (48-72 hours) ensures the calf gets this crucial protection and a rich source of nutrients.

All four statements represent correct, essential, and standard aspects of newborn calf care and management.

Step 3: Final Answer:
All the statements A, B, C, and D are correct aspects of caring for a newborn calf. Therefore, option (C) is the correct answer.

Quick Tip

Remember the three 'C's of calf care: Colostrum, Cleanliness, and Comfort. This question covers aspects of all three. Ensuring prompt feeding of colostrum is the single most important factor for calf survival and health.

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6. Butyro Refracto meter is used to measure
A. Purity of ghee
B. B R reading of ghee
C. Fat content in milk
D. Vitamin content in milk
Choose the correct answer from the options given below:

(A) A and C are correct
(B) A, B, C, D are wrong

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

Correct Answer: (D) A and B are correct

Solution:
Step 1: Understanding the Concept:
The question asks about the specific applications of a Butyro Refractometer, an instrument used in dairy and food analysis. It tests the understanding of different quality control instruments and their functions.

Step 2: Detailed Explanation:
A Butyro Refractometer is an optical instrument that measures the refractive index of a substance, specifically fats and oils. The refractive index is a measure of how much a ray of light bends when it passes through the substance.
Let's analyze each statement:

- **A. Purity of ghee:** This is the primary use of the instrument. Pure ghee (clarified butterfat) has a very specific and narrow range of refractive index. If ghee is adulterated with cheaper vegetable oils or animal body fats, the refractive index of the mixture will change. By measuring this property, one can detect potential adulteration and thus assess the **purity of ghee**. This statement is correct.
- **B. B R reading of ghee:** This statement is correct by definition. The instrument is calibrated to display the refractive index on a special scale known as the "Butyro-refractometer (BR) scale". The measurement taken from this instrument is called the **BR reading**. So, the instrument is used to measure the BR reading.
- **C. Fat content in milk:** This is incorrect. A Butyro Refractometer requires a clear liquid (like melted fat) for light to pass through. Milk is an opaque emulsion of fat globules in a watery serum. The fat content in milk is determined by other methods, most commonly the Gerber method, which uses a centrifuge to separate the fat.
- **D. Vitamin content in milk:** This is incorrect. Vitamins are micronutrients present in very small quantities. Their analysis requires highly specific and sensitive chemical or chromatographic methods, such as High-Performance Liquid Chromatography (HPLC). A refractometer measures a bulk physical property and cannot identify or quantify individual vitamins.

Therefore, the Butyro Refractometer is used to take a BR reading of ghee, which in turn is used to check its purity. Statements A and B are both correct.

Step 3: Final Answer:
Statements A and B are correct applications of a Butyro Refractometer. Therefore, option (D) is the correct answer.

Quick Tip

Associate specific dairy testing instruments with their primary purpose. For example:

- **Lactometer:** Specific gravity (to check for water adulteration).
- **Gerber Centrifuge:** Fat percentage in milk.
- **Butyro Refractometer:** Refractive index (for ghee purity).

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7. _____ is secreted from the posterior pituitary gland and is must for the ejection (milk let-down) of milk.

(A) Somatotropin
(B) Parathyroid
(C) Adrenals
(D) Oxytocin

Correct Answer: (D) Oxytocin

Solution:
Step 1: Understanding the Concept:
The question asks to identify the specific hormone responsible for the physiological process of milk ejection, also known as the "milk let-down reflex," and to identify the gland from which it is secreted.

Step 2: Detailed Explanation:
The process of lactation is controlled by several hormones. The key hormone for milk ejection is **Oxytocin**.

- **The Milk Let-down Reflex:** This is a neuro-hormonal reflex. When a calf suckles or the udder is stimulated before milking, nerve impulses travel from the teat to the brain. The brain's hypothalamus is stimulated, which in turn signals the **posterior pituitary gland** to release oxytocin into the bloodstream.
- **Action of Oxytocin:** Oxytocin travels through the blood to the mammary gland. Here, it acts on specific muscle-like cells called myoepithelial cells, which surround the milk-producing alveoli. The oxytocin causes these cells to contract, squeezing the alveoli and forcing the milk out into the milk ducts and gland cistern, making it available for the calf to drink or for the milker to extract.

Let's analyze the other options:

- **(A) Somatotropin:** Also known as Growth Hormone (GH), it is secreted by the *anterior* pituitary. It is galactopoietic, meaning it helps maintain and enhance milk *production* over the long term, but it does not cause milk *ejection*.

- **(B) Parathyroid:** The parathyroid gland secretes Parathyroid Hormone (PTH), which regulates calcium and phosphorus levels in the blood. It is crucial for milk synthesis (as milk is rich in calcium) but not for let-down.
- **(C) Adrenals:** The adrenal glands secrete hormones like adrenaline and cortisol, especially during stress or fear. Adrenaline actually *inhibits* the milk let-down reflex by constricting blood vessels in the udder, which prevents oxytocin from reaching its target cells.

Step 3: Final Answer:
Oxytocin is the hormone secreted from the posterior pituitary gland that is essential for the milk let-down reflex. Therefore, option (D) is the correct answer.

Quick Tip

Differentiate between the two key lactation hormones:

- **Prolactin** (from Anterior Pituitary): For milk **P**roduction (synthesis).
- **Oxytocin** (from Posterior Pituitary): For milk **O**utflow (ejection/let-down).

This simple mnemonic can help you remember their distinct roles.

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8. 100 kg of buffalo milk will yield _____ kg of Khoa

(A) 16
(B) 22
(C) 10
(D) 30

Correct Answer: (B) 22

Solution:
Step 1: Understanding the Concept:
The question asks for the approximate yield of Khoa from 100 kg of buffalo milk. Khoa (also known as khoya or mawa) is a concentrated dairy product made by heating and evaporating the water from milk until it reaches a solid consistency. The yield is directly dependent on the Total Solids (TS) content of the milk used.

Step 2: Detailed Explanation:

- **Composition of Milk:** Buffalo milk is preferred for Khoa making because of its high Total Solids (TS) content, which is typically around 16-18%. This is significantly higher than cow milk's TS content of 12-13%.
- **Composition of Khoa:** The final Khoa product itself has about 60-70% total solids and 30-40% moisture.

- **Yield Calculation:** The yield can be estimated by considering the concentration of solids. All the solids from the milk are concentrated into the final product.

Calculation:

1. **Calculate the amount of Total Solids** in 100 kg of buffalo milk.
   Assuming an average TS content of 17.5%:

$$\text{Total Solids in Milk} = 100\,\text{kg} \times \frac{17.5}{100} = 17.5\,\text{kg}$$

2. **Calculate the theoretical weight of Khoa**.
   This 17.5 kg of solids will make up about 70% of the final Khoa's weight (assuming 30% moisture in Khoa).

$$\text{Weight of Khoa} \times 70\% = 17.5\,\text{kg}$$
$$\text{Weight of Khoa} = \frac{17.5}{0.70} = 25\,\text{kg}$$

This 25 kg is a theoretical maximum. In practice, due to handling losses (e.g., sticking to the pan, spillage), the actual yield is slightly lower. A practical yield of 21-23 kg per 100 kg of buffalo milk is the industry standard. This corresponds to a conversion ratio of roughly 4.5:1 to 5:1 (kg of milk to kg of Khoa).
Let's check the options:

- (A) 16 kg: This is too low for buffalo milk, and more typical for good quality cow milk.
- (B) 22 kg: This falls perfectly within the expected practical range of 21-23 kg.
- (C) 10 kg: This is extremely low and incorrect.
- (D) 30 kg: This is unrealistically high and exceeds the theoretical maximum.

Step 3: Final Answer:
Based on the high total solids content of buffalo milk, the typical yield of Khoa is around 22 kg per 100 kg of milk. Therefore, option (B) is the correct answer.

Quick Tip

For dairy technology questions, it's helpful to remember the approximate yields of major products. The yield of Khoa from buffalo milk (around 21-23%) is significantly higher than from cow milk (around 16-18%) due to the higher total solids content.

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9. The over run in butter generally ranges between

(A) 16-18%
(B) 10-12%
(C) 21-23%

(D) 13-15%

Correct Answer: (C) 21-23%

Solution:
Step 1: Understanding the Concept:
The term "overrun" in butter making refers to the percentage increase in the final weight of butter produced from a given amount of milk fat. This increase is due to the controlled incorporation of non-fat components, primarily water, but also salt and a small amount of curd, which are legally permitted within specified limits.

Step 2: Key Formula or Approach:
The formula to calculate overrun is:

$$\text{Overrun (\%)} = \frac{(\text{Weight of Butter Produced} - \text{Weight of Fat Used})}{\text{Weight of Fat Used}} \times 100$$

Step 3: Detailed Explanation:
To understand the typical range, we need to consider the legal composition of butter. According to FSSAI (Food Safety and Standards Authority of India) regulations, table butter must contain:

- **Milk Fat:** Not less than 80.0% by weight.
- **Moisture:** Not more than 16.0% by weight.
- **Common Salt:** Not more than 3.0% by weight.
- **Curd (Milk solids other than fat):** About 1.0 - 1.5%.

Let's calculate the theoretical maximum overrun. If we make 100 kg of butter that perfectly meets the minimum fat standard, it will contain exactly 80 kg of fat and 20 kg of non-fat components (16 kg water + salt + curd).
Using the formula with these values:

$$\text{Overrun (\%)} = \frac{(100\,\text{kg Butter} - 80\,\text{kg Fat})}{80\,\text{kg Fat}} \times 100$$

$$\text{Overrun (\%)} = \frac{20}{80} \times 100 = 25\%$$

This 25% represents the maximum possible legal overrun. In commercial practice, manufacturers aim to get as close to this as possible for economic reasons, but they must also maintain a safety margin to ensure their product never falls below the 80% fat limit. Therefore, the actual industrial target for overrun is slightly below the maximum, typically in the range of 21% to 24%.
The option **21-23%** accurately reflects this practical, commercial range for butter production.

Step 4: Final Answer:
The general range for overrun in butter is between 20% and 25%. The closest and most appropriate option is 21-23%. Therefore, option (C) is the correct answer.

Quick Tip

Overrun is a key concept in butter and ice cream making. For butter, remember it's about adding water, salt, and curd to fat. A quick way to estimate is that for every 4 parts of fat, you get about 5 parts of butter, leading to a theoretical overrun of (5-4)/4 = 25%.

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10. The major challenges of Indian dairy and livestock farming are -
A. Deficient animal health care service
B. Insufficient trained manpower
C. Government policies and lack of resources
D. Increased adoption level and more skilled persons are available
Choose the correct 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:
The question asks to identify the primary constraints or challenges that impede the progress of the dairy and livestock sector in India. This requires an understanding of the ground realities and systemic issues in Indian agriculture.

Step 2: Detailed Explanation:
Let's analyze each statement to determine if it represents a challenge:

- **A. Deficient animal health care service:** This is a major challenge. India has a poor veterinarian-to-livestock ratio. Access to quality and affordable veterinary services, diagnostics, and preventive measures like vaccination programs is limited, particularly in rural and remote areas. This leads to high animal morbidity and mortality from preventable diseases, causing huge economic losses.
- **B. Insufficient trained manpower:** This is another significant bottleneck. There is a shortage of skilled professionals at all levels, including veterinarians, para-veterinary staff, artificial insemination technicians, and extension workers. This lack of skilled human resources hinders the transfer and adoption of modern scientific practices in breeding, feeding, and management.
- **C. Government policies and lack of resources:** While the government has numerous schemes, their effective implementation is often a challenge. Issues include inadequate funding, weak institutional support, lack of marketing infrastructure (like cold chains),

fluctuating prices, and limited access to credit and insurance for small-scale farmers who form the backbone of the dairy sector.

- **D. Increased adoption level and more skilled persons are available:** This statement describes a positive situation, not a challenge. It suggests that problems are being solved and the sector is improving. This is the goal of development efforts, but the reality is that low adoption levels and lack of skilled persons are the actual challenges. Therefore, this statement is the opposite of a challenge.

Step 3: Final Answer:
Statements A, B, and C accurately describe major challenges faced by the Indian dairy and livestock sector. Statement D describes a solution or a positive outcome, not a challenge. Therefore, the correct combination of challenges is A, B, and C only. This corresponds to option (B).

Quick Tip

When analyzing "challenges" or "problems" questions, look for negative statements that describe a lack or deficiency. A positive statement, like statement D, which describes an ideal or improving situation, is usually the outlier that needs to be excluded from the answer.

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11. The BR reading of ghee normally varies from _____

(A) 50-56
(B) 41-43
(C) 38-40
(D) 28-30

Correct Answer: (B) 41-43

Solution:
Step 1: Understanding the Concept:
The question asks for the standard range of the Butyro-refractometer (BR) reading for pure ghee. The BR reading is a measure of the refractive index of fat, taken at a standard temperature of 40°C. It is a critical parameter used to check the authenticity and purity of ghee.

Step 2: Detailed Explanation:
The refractive index, and thus the BR reading, of ghee is influenced by the composition of fatty acids in the milk fat, which in turn can be affected by the animal's species (cow or buffalo) and its feed.

- **Regulatory Standards:** Food safety authorities like FSSAI in India have prescribed specific ranges for the BR reading to prevent adulteration. The generally accepted range for pure ghee under FSSAI is from **40.0 to 44.0** at 40°C.

- **Species Variation:** There is a slight difference between cow and buffalo ghee.
  - Buffalo ghee tends to have a slightly lower BR reading, typically ranging from 40.0 to 42.5.
  - Cow ghee tends to have a slightly higher BR reading, typically ranging from 41.5 to 44.0.
- **Analysis of Options:**
  - (A) 50-56: This range is typical for many vegetable oils. A BR reading this high is a clear indication of adulteration.
  - (B) 41-43: This range falls squarely in the middle of the acceptable legal range (40-44) and covers the most common values found for both cow and buffalo ghee. This is the most accurate answer.
  - (C) 38-40: A reading below 40.0 is outside the prescribed standard and would raise suspicion of adulteration with certain animal body fats, which have lower refractive indices.
  - (D) 28-30: This range is extremely low and not characteristic of any edible fats or oils used for adulteration.

Step 3: Final Answer:
The normal and legally accepted BR reading for ghee lies between 40 and 44. The range 41-43 is the most representative choice among the options provided. Therefore, option (B) is the correct answer.

Quick Tip

Remember the key quality parameters for ghee. A BR reading around 40-44 at 40°C is standard. Readings significantly higher often point to vegetable oil adulteration, while lower readings can indicate adulteration with animal body fats.

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12. In buffalo milk the percentage of water is -

(A) 86.5%
(B) 84.2%
(C) 75.4%
(D) 86.6%

Correct Answer: (B) 84.2%

Solution:
Step 1: Understanding the Concept:
The question asks for the average percentage of water in buffalo milk. The composition of milk varies significantly between different species. The percentage of water is inversely related to

the percentage of total solids (fat, protein, lactose, minerals).

Step 2: Detailed Explanation:
A key characteristic of buffalo milk is its high concentration of total solids compared to cow milk. This makes it thicker and creamier.
Let's compare the average composition:

- **Buffalo Milk:**
  - Total Solids: 16-18%
  - Water: 100% - Total Solids % = 100% - (16 to 18)% = **82% to 84%**
- **Cow Milk (for comparison):**
  - Total Solids: 12-13%
  - Water: 100% - Total Solids % = 100% - (12 to 13)% = **87% to 88%**

Now, let's evaluate the given options based on the expected range for buffalo milk (82-84%):

- (A) 86.5% and (D) 86.6%: These percentages are characteristic of cow milk, which has a higher water content due to lower solids. They are incorrect for buffalo milk.
- (C) 75.4%: This water percentage is extremely low for fresh liquid milk. It would imply a total solids content of nearly 25%, which is typical for a concentrated product like condensed milk, not fresh milk.
- (B) 84.2%: This value falls comfortably within the scientifically accepted range of 82-84% water content for buffalo milk. It accurately reflects that buffalo milk is more concentrated (less watery) than cow milk.

Step 3: Final Answer:
The average percentage of water in buffalo milk is approximately 82-84%. The option 84.2% is the most accurate choice among the given options.

Quick Tip

A key point in dairy science is that buffalo milk has higher fat and total solids than cow milk, and consequently, a lower water percentage. Remembering this relative difference can help you eliminate incorrect options in questions about milk composition.

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13. The titrable acidity of cow milk varies from -

(A) 0.13 to 0.14 Percent LA
(B) 0.08 to 0.1 Percent LA
(C) 0.17 to 0.18 Percent LA
(D) 0.18 to 0.19 Percent LA

Correct Answer: (A) 0.13 to 0.14 Percent LA

Solution:
Step 1: Understanding the Concept:
The question asks for the normal range of titratable acidity in fresh cow's milk. Titratable acidity measures the total acidity of a milk sample, which includes both the natural acidity and any developed acidity. Fresh, good-quality milk has a certain level of natural acidity due to its chemical constituents.

Step 2: Detailed Explanation:

- **Natural Acidity:** Freshly drawn milk is amphoteric, meaning it can act as both a weak acid and a weak base, but it shows a net acidic reaction when titrated with an alkali like sodium hydroxide (NaOH). This inherent acidity is called natural or apparent acidity. It is not due to lactic acid, which is formed by bacterial action. The natural acidity is due to components like:
  - Caseins (the main proteins in milk)
  - Acid phosphates and citrates
  - Dissolved carbon dioxide (CO_2)
- **Titratable Acidity Measurement:** It is expressed as the percentage of lactic acid (% LA), even though fresh milk contains virtually no lactic acid. This is just a conventional way of expressing the measurement.
- **Normal Ranges:** The natural titratable acidity for fresh milk from individual healthy cows typically falls within a specific range.
  - **Cow Milk:** The normal range is generally accepted to be between 0.12% and 0.16% lactic acid. The average is often cited as 0.14%.
  - **Buffalo Milk:** Buffalo milk has higher solids (especially proteins and phosphates), so its natural acidity is slightly higher, typically ranging from 0.14% to 0.18%.
- **Evaluating the Options:**
  - (A) 0.13 to 0.14 Percent LA: This range falls perfectly within the standard accepted range for fresh cow milk.
  - (B) 0.08 to 0.1 Percent LA: This is too low and may indicate adulteration with water or milk from an animal with mastitis.
  - (C) 0.17 to 0.18 Percent LA: This range is more characteristic of fresh buffalo milk or cow milk where some bacterial souring has begun.
  - (D) 0.18 to 0.19 Percent LA: This is high and indicates significant development of lactic acid due to bacterial fermentation.

Step 3: Final Answer:
Based on the standard composition of fresh cow milk, the most accurate range for its titratable acidity is 0.13 to 0.14 Percent LA.

Quick Tip

Distinguish between natural acidity (present in fresh milk due to proteins and salts) and developed acidity (due to bacterial fermentation producing lactic acid). Acidity above 0.18% LA suggests the milk is starting to sour.

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14. The specific gravity of milk is lowered by the addition of -

(A) Skim milk
(B) Water and cream
(C) Sugar
(D) Salt

Correct Answer: (B) Water and cream

Solution:
Step 1: Understanding the Concept:
The question asks which substance(s), when added to milk, will cause its specific gravity to decrease. Specific gravity is the ratio of the density of a substance to the density of water. It is a key parameter used to check for adulteration in milk.

Step 2: Detailed Explanation:
Let's analyze the specific gravity of milk and the potential adulterants:

- **Normal Milk:** The specific gravity of normal cow milk ranges from 1.028 to 1.032. This value is a composite of its different components.
- **Milk Components and their effect on SG:**
  - **Water:** Specific gravity is 1.000.
  - **Fat:** Fat is the lightest major component of milk, with a specific gravity of about 0.93.
  - **Solids-Not-Fat (SNF):** This includes proteins, lactose, and minerals. The SNF fraction is denser than water, with an average specific gravity of about 1.6.

Now let's evaluate the effect of adding the substances listed in the options:

- **(A) Skim milk:** Skim milk is whole milk from which fat has been removed. By removing the lightest component (fat), the proportion of the heavier SNF increases. Therefore, skim milk has a *higher* specific gravity than whole milk (around 1.036). Adding skim milk would *increase* the SG of whole milk.
- **(B) Water and cream:**
  - **Water:** Adding water (SG = 1.000) will dilute the milk, bringing its specific gravity closer to 1.000, thus *lowering* it. This is the most common form of adulteration detected by specific gravity measurement.

– **Cream:** Cream is a concentration of milk fat. Since fat is very light (SG <1.0), adding cream will significantly *lower* the specific gravity of milk.

Therefore, both water and cream lower the specific gravity.

- **(C) Sugar** and **(D) Salt:** Both sugar (sucrose) and salt (sodium chloride) are soluble solids. Dissolving them in milk increases the concentration of total solids and thus *increases* the density and specific gravity of the milk.

Step 3: Final Answer:
Both water and cream, when added to milk, lower its specific gravity. Thus, the option "Water and cream" is the correct answer.

Quick Tip

Remember this simple rule for specific gravity (SG):

- Adding something lighter than milk (Water, Cream) **decreases** SG.
- Adding something heavier than milk (Skim Milk, Sugar, Salt) **increases** SG.

This helps in quickly identifying the effects of common adulterants.

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15. The process of removing 99% of the bacteria in milk by centrifugal force is known as -

(A) Standardization
(B) Regeneration
(C) Bactofugation
(D) Gravity separation

Correct Answer: (C) Bactofugation

Solution:
Step 1: Understanding the Concept:
The question asks for the specific name of a dairy process that uses centrifugal force to physically remove a very high percentage of bacteria from milk.

Step 2: Detailed Explanation:
Let's define each of the processes listed in the options:

- **(A) Standardization:** This is the process of adjusting the fat and/or solids-not-fat (SNF) content of milk to a desired, uniform level. For example, adding cream or skim milk to achieve a specific fat percentage (e.g., 3.5% for full-fat milk). It does not primarily target bacteria removal.

- **(B) Regeneration:** This is a heat exchange process used in a pasteurizer. The cold raw milk coming in is heated by the hot pasteurized milk going out. This saves energy but is not a method for removing bacteria.
- **(C) Bactofugation:** This is a specialized centrifugal process. A machine called a bactofuge spins the milk at very high speeds. Since bacteria and bacterial spores are denser than the milk serum and fat globules, they are thrown outwards and separated from the milk. This process is highly effective, capable of removing over 99% of anaerobic spores and over 95% of total bacteria. It is often used for milk intended for cheese making to prevent spoilage by gas-forming bacteria.
- **(D) Gravity separation:** This is an older, slow method of separating cream from milk. When milk is left undisturbed, the lighter fat globules rise to the top to form a cream layer. It is not efficient and does not remove bacteria.

Step 3: Final Answer:
The process specifically designed to remove bacteria from milk using a centrifuge is called Bactofugation. Therefore, option (C) is the correct answer.

Quick Tip

Break down the word: "Bacto-" refers to bacteria, and "-fugation" refers to the use of a centrifuge (centrifugal force). The term itself describes the process, making it easy to remember.

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16. High Temperature Short Time (HTST) pasteurization gives a continuous flow of milk which is heated to -

(A) 72°C for 15 seconds
(B) 63°C for 30 minutes
(C) 44°C for 44 seconds
(D) 34°C for 34 seconds

Correct Answer: (A) 72°C for 15 seconds

Solution:
Step 1: Understanding the Concept:
The question asks for the standard time and temperature combination for High Temperature Short Time (HTST) pasteurization, a common method used in the dairy industry. Pasteurization is a heat treatment process designed to kill pathogenic microorganisms and reduce spoilage organisms in milk.

Step 2: Detailed Explanation:
There are several internationally recognized standards for pasteurization. The two most common methods for milk are:

- **Low Temperature Long Time (LTLT) or Holder Method:** This is a batch process where milk is heated to a minimum of **63°C (145°F)** and held at that temperature for at least **30 minutes**. This is described in option (B).
- **High Temperature Short Time (HTST):** This is a continuous flow process, ideal for large-scale dairies. Milk is heated to a minimum of **72°C (161°F)** and held for at least **15 seconds**. This method is more energy-efficient and has less impact on the flavor and nutritional quality of milk compared to LTLT. This is described in option (A).

The other options are incorrect:

- (C) 44°C and (D) 34°C: These temperatures are in the ideal growth range for many bacteria (mesophilic range) and are not sufficient for pasteurization.

Step 3: Final Answer:
The standard time-temperature combination for HTST pasteurization is heating the milk to 72°C for a minimum of 15 seconds. Therefore, option (A) is the correct answer.

Quick Tip

Memorize the two main pasteurization standards as a pair:

- LTLT (the "slow" method): **63°C for 30 minutes**.
- HTST (the "fast" method): **72°C for 15 seconds**.

These are frequently asked in exams.

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17. Barny defect of milk is due to -

(A) Intake of bitter weeds
(B) Using late lactation milk
(C) Overheating of milk
(D) Improper ventilation of milking byre / barn

Correct Answer: (D) Improper ventilation of milking byre / barn

Solution:
Step 1: Understanding the Concept:
The question asks for the cause of a specific off-flavor in milk known as the "Barny" or "Cowy" defect. Milk is susceptible to developing various off-flavors from different sources, including the cow's health, feed, environment, and post-milking handling.

Step 2: Detailed Explanation:
The "Barny" defect is characterized by an unpleasant, animal-like odor and taste reminiscent of a poorly maintained cow barn. It is classified as an **absorbed defect**.

- **Cause:** Milk, especially when it is warm just after milking, can readily absorb volatile odors from its surroundings. If the milking is done in a poorly ventilated barn (*byre*) that has a strong smell of manure, urine, or the animal's body, these odors get absorbed into the milk fat, resulting in the barny flavor.

Let's analyze the other options:

- **(A) Intake of bitter weeds:** If a cow consumes certain weeds (like ragweed or bitterweed), the bitter compounds can pass into the milk, causing a distinct *bitter* or *weedy* flavor. This is a feed-related defect, not a barny one.
- **(B) Using late lactation milk:** Milk from a cow in late-stage lactation (stripper milk) can sometimes have a *salty* taste due to changes in mineral balance or a *rancid* taste due to higher levels of lipase enzyme.
- **(C) Overheating of milk:** Heating milk to excessively high temperatures during pasteurization or other processing causes a *cooked* or *caramelized* flavor due to chemical changes in the proteins and sugars.

Step 3: Final Answer:
The barny defect is directly caused by the milk absorbing foul odors from an unclean and poorly ventilated milking environment. Therefore, option (D) is the correct answer.

Quick Tip

Classify milk off-flavors by their source:

- **Absorbed:** Barny, feedy, weedy (from the environment or feed).
- **Bacterial:** Sour, malty (from microbial growth).
- **Chemical/Enzymatic:** Rancid (lipase action on fat), Oxidized (light/metal action on fat).

This classification helps in identifying the cause.

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18. The products that are obtained by evaporating part of water of whole milk or fully or partly skimmed milk with or without addition of sugar are -

(A) Condensed milk
(B) A value milk
(C) Z value milk
(D) F_0 value milk

Correct Answer: (A) Condensed milk

Solution:
Step 1: Understanding the Concept:

The question asks for the general category name for products made by partially concentrating milk (by removing water) and which may or may not have sugar added.

Step 2: Detailed Explanation:
Let's break down the definition given in the question:

- **Base material:** Whole milk, partly skimmed milk, or fully skimmed milk.
- **Primary process:** Evaporating part of the water, i.e., concentration.
- **Optional ingredient:** With or without the addition of sugar.

This description is the broad, overarching definition of the entire class of **condensed milks**. This category includes different specific products based on whether sugar is added or not.

- If sugar is *not* added, the product is called **Evaporated Milk**.
- If sugar *is* added, the product is called **Sweetened Condensed Milk**.

The other options are related to thermal processing calculations, not product categories:

- **A value, Z value, F_0 value:** These are parameters used in food microbiology and engineering to quantify the lethality of a heat sterilization process. The F_0 value, for instance, represents the equivalent time in minutes at 121.1°C required to achieve a certain level of microbial destruction. They are not names of milk products.

Step 3: Final Answer:
The general term for products made by evaporating water from milk, with or without adding sugar, is Condensed milk. Therefore, option (A) is the correct answer.

Quick Tip

Remember the hierarchy: "Condensed Milk" is the main category. It branches into two main types: "Evaporated Milk" (unsweetened, sterilized) and "Sweetened Condensed Milk" (sweetened, preserved by sugar).

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19. Sweetened condensed milk is the product obtained from cow or buffalo milk or combination thereof or from standardized milk by partial removal of water and .....

(A) Addition of cane sugar
(B) Addition of salt
(C) Addition of milk powder
(D) Addition of citric acid

Correct Answer: (A) Addition of cane sugar

Solution:
Step 1: Understanding the Concept:

The question asks to complete the definition of Sweetened Condensed Milk (SCM). The definition involves two primary processing steps: concentrating the milk and adding a specific ingredient that gives the product its characteristic sweetness and long shelf life.

Step 2: Detailed Explanation:
Sweetened Condensed Milk is a thick, sweet milk product. Its stability and preservation are achieved not by heat sterilization (like evaporated milk) but by high sugar concentration.

- **Process:** The manufacturing process involves standardizing milk, pre-heating it, and then evaporating a specific amount of water under vacuum. Critically, a sugar solution is added.
- **The Additive:** The defining ingredient that is added is **cane sugar (sucrose)**. The sugar is added to the milk before or during the evaporation process. The final product contains a very high concentration of sugar (typically 40-45%). This high concentration creates a high osmotic pressure, which prevents the growth of most microorganisms, thus preserving the milk without needing sterilization.

The other options are incorrect for defining SCM:

- **(B) Salt:** Salt is not a primary defining ingredient of SCM.
- **(C) Milk powder:** Milk solids are concentrated by removing water, not by adding powder.
- **(D) Citric acid:** This would be used to acidify a product, which is not the purpose of SCM.

Step 3: Final Answer:
The production of sweetened condensed milk involves the partial removal of water and the **addition of cane sugar**. Therefore, option (A) is the correct answer.

Quick Tip

The name "Sweetened Condensed Milk" tells you the two key processes: it's "sweetened" (with sugar) and "condensed" (water is removed). The sugar acts as the preservative.

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20. The product obtained from cow or buffalo milk or from standardized milk by partial removal of water is -

(A) Sweetened condensed milk
(B) Sweetened condensed skim milk
(C) Full cream Sweetened condensed skim milk
(D) Evaporated milk

Correct Answer: (D) Evaporated milk

Solution:
Step 1: Understanding the Concept:
The question describes a product made by concentrating milk. Crucially, the definition *only* mentions the removal of water and does *not* mention the addition of sugar. This omission is key to identifying the correct product from the options.

Step 2: Detailed Explanation:
Let's analyze the definition and the options:

- **Definition:** "product obtained... by partial removal of water". This describes a concentrated milk product.
- **Options Analysis:**
  - (A), (B), and (C) all contain the word **"Sweetened"**. This implies that sugar has been added as a key ingredient. Since the definition provided in the question does not mention the addition of sugar, these options are incorrect descriptions of the base product.
  - **(D) Evaporated milk:** This is the correct term for milk that has been concentrated by evaporating about 60% of its water, followed by being canned and sterilized by heat. It is an *unsweetened* condensed milk product. The definition in the question, by not mentioning sugar, perfectly describes evaporated milk.

The key distinction in the world of condensed milks is the presence or absence of sugar as a preservative.

- **No added sugar** + heat sterilized = **Evaporated Milk**
- **Added sugar** + preserved by sugar = **Sweetened Condensed Milk**

Step 3: Final Answer:
The product defined by only the partial removal of water (without added sugar) is Evaporated milk. Therefore, option (D) is the correct answer.

Quick Tip

When differentiating condensed products, always look for the keyword "sweetened". If it's absent in the definition, the product is likely evaporated milk. If it's present, it's sweetened condensed milk.

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21. Basundi is a popular product of

(A) Rajasthan and Haryana
(B) Haryana and Assam
(C) Andhra Pradesh, Gujarat, Karnataka, Kerala
(D) Bengal and Odissa

Correct Answer: (C) Andhra Pradesh, Gujarat, Karnataka, Kerala

Solution:
Step 1: Understanding the Concept:
The question asks to identify the geographical region in India where Basundi, a traditional dairy sweet, is most popular. This requires knowledge of Indian regional cuisine, specifically traditional milk-based desserts.

Step 2: Detailed Explanation:
Basundi is a rich, creamy dessert made by slowly simmering full-fat milk on low heat until it is reduced to about half its original volume. Sugar, cardamom, saffron, and nuts like pistachios and almonds are added for flavor and garnish.

- **Regional Popularity:** Basundi is predominantly popular in the western and southern states of India. It is a staple dessert in **Gujarat** and **Maharashtra**. Variants of this thickened milk sweet are also very popular in southern states like **Karnataka** and **Andhra Pradesh**.
- **Evaluating the Options:**
  - (A) Rajasthan and Haryana: This region is more famous for *Rabri*, which is similar to Basundi but often has a more layered, flaky texture (malai).
  - (B) Haryana and Assam: This is not a recognized region for Basundi's popularity.
  - (C) Andhra Pradesh, Gujarat, Karnataka, Kerala: This option correctly lists several states where Basundi or very similar preparations are extremely popular. Gujarat and Karnataka are core regions for this product.
  - (D) Bengal and Odissa: The eastern region is famous for its chhena-based sweets like Rasgulla, Sandesh, and Chhena Poda, as well as Mishti Doi (sweetened yogurt), not Basundi.

Given the choices, option (C) provides the most accurate and comprehensive list of states where Basundi is a well-known and popular product.

Step 3: Final Answer:
Basundi is a popular product in several western and southern states, including Gujarat, Karnataka, and Andhra Pradesh. Therefore, option (C) is the best fit.

Quick Tip

Associate key traditional Indian dairy products with their primary region of origin:

- **West (Gujarat/Maharashtra):** Shrikhand, Basundi
- **North (UP/Rajasthan/Haryana):** Rabri, Kulfi, Peda
- **East (Bengal/Odisha):** Mishti Doi, Sandesh, Rasgulla
- **South:** Payasam/Kheer (pan-India, but very prominent here), Mysore Pak

22. Generally _____ kg of common salt is added to 100 kg table butter during manufacturing

(A) 1.2
(B) 1.6
(C) 2.5
(D) 1.0

Correct Answer: (C) 2.5

Solution:
Step 1: Understanding the Concept:
The question asks for the typical amount of common salt (sodium chloride) added to produce 100 kg of salted table butter. Salt is a key ingredient in salted butter, contributing to flavor, preservation, and texture.

Step 2: Detailed Explanation:
In butter manufacturing, salt is added during the "working" stage after the buttermilk has been drained. The purposes of adding salt are:

- **Flavor:** To provide the characteristic taste of salted butter.
- **Preservation:** Salt acts as a preservative by inhibiting the growth of some spoilage microorganisms.
- **Moisture Control:** It helps in expelling more buttermilk, allowing for better control of the final moisture content.

Level of Salting: The amount of salt added can vary based on consumer preference and regional tastes. However, for standard commercial table butter, the salt content is typically targeted to be between **1.5% and 2.5%** of the final weight of the butter. Let's analyze the options in the context of making 100 kg of butter:

- (A) 1.2 kg: This would be 1.2% salt, which is on the lower end of the typical range.
- (B) 1.6 kg: This is 1.6% salt, which is well within the common range.
- (C) 2.5 kg: This is 2.5% salt, which represents the higher end of the standard range for salted butter. Many commercial brands target this level for a distinct salty flavor.
- (D) 1.0 kg: This is 1.0% salt, which would be considered lightly salted.

The question asks what is "generally" added. While the entire range of 1.5-2.5% is common, 2.5% is a very frequent target for commercial production and is specified as a maximum in some standards. Among the given options, it represents a common and distinct level of salting for "table butter".

Step 3: Final Answer:
A common level for salting table butter is up to 2.5%. Therefore, adding 2.5 kg of salt to 100

kg of butter is a standard practice. Option (C) is the most appropriate answer.

Quick Tip

For salted butter, remember the typical salt percentage is around 1.5% to 2.5%. This helps in quickly estimating the amount of salt needed for a given quantity of butter.

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23. According to the PFA rules, 1976, milk powder should contain not more than-

(A) 5% of moisture
(B) 10% of moisture
(C) 15% of moisture
(D) 20% of moisture

Correct Answer: (A) 5% of moisture

Solution:
Step 1: Understanding the Concept:
The question asks for the maximum permissible moisture content in milk powder according to the Prevention of Food Adulteration (PFA) Rules, 1976. These rules (now superseded and integrated into the FSSAI regulations) set the legal standards for food products in India to ensure their safety and quality.

Step 2: Detailed Explanation:
Milk powder (or dried milk) is produced by evaporating almost all the water from milk. Its low moisture content is the key to its long shelf life. High moisture content can lead to:

- Microbial spoilage (growth of bacteria, yeasts, and molds).
- Caking and lumping, which reduces its solubility.
- Chemical and enzymatic reactions (e.g., Maillard browning, fat oxidation) that degrade its quality.

Therefore, regulatory bodies set a strict maximum limit on moisture content.

- **PFA and FSSAI Standards:** The PFA Rules, 1976, and the subsequent FSSAI (Food Safety and Standards Authority of India) regulations specify the standards for milk powder. For both whole milk powder and skim milk powder, the maximum allowed moisture content is stipulated.
- **The Limit:** According to these standards, the moisture content in milk powder **shall not be more than 5.0 percent by weight**.

Let's look at the options:

- **(A) 5% of moisture:** This matches the legal standard.

- (B) 10%, (C) 15%, and (D) 20%: These levels are far too high. A product with such moisture levels would have a very short shelf life and would not be considered milk powder.

Step 3: Final Answer:
The legal limit for moisture content in milk powder as per Indian food regulations (originating from PFA rules) is 5%. Therefore, option (A) is the correct answer.

Quick Tip

For any dried food product, low moisture content is the most critical factor for shelf stability. For milk powder, remember the magic number is **5%**. Anything higher is a quality and safety concern.

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24. Rancid flavour in dried milk is due to -

(A) Low pre-heating temperature
(B) Drum surface has pits
(C) Storage at high temperature
(D) High moisture during storage

Correct Answer: (A) Low pre-heating temperature

Solution:
Step 1: Understanding the Concept:
The question asks for the cause of rancid flavor development in dried milk (milk powder). Rancidity in dairy products is primarily a chemical defect caused by the breakdown of milk fat. There are two main types: hydrolytic rancidity and oxidative rancidity. In the context of milk powder, hydrolytic rancidity is the key concern.

Step 2: Detailed Explanation:

- **Hydrolytic Rancidity:** This defect is caused by the action of an enzyme called **lipase**. Lipase breaks down triglycerides (the main form of fat) into free fatty acids. Some of these free fatty acids, particularly short-chain ones like butyric acid, have a very strong, unpleasant, and soapy or "rancid" flavor and odor.
- **Role of Pre-heating:** Lipase is naturally present in raw milk. It is a heat-labile enzyme, meaning it can be destroyed by heat treatment. During the manufacturing of milk powder, the liquid milk is "pre-heated" to a high temperature (e.g., 85-95°C) before it is concentrated and dried. The primary purpose of this high-temperature pre-heating is to inactivate enzymes, especially lipase.
- **Cause of the Defect:** If the pre-heating temperature is **too low** or the holding time is too short, the lipase enzyme will not be completely inactivated. This surviving lipase

remains active in the final milk powder. Over time during storage, it will break down the fat, leading to the development of rancid off-flavors.

- **Analysis of other options:**
  - (B) Drum surface has pits: This can lead to scorched particles and a burnt taste, but not directly to rancidity.
  - (C) Storage at high temperature: This accelerates many chemical reactions, including oxidative rancidity and Maillard browning, but the root cause of hydrolytic rancidity is the presence of active lipase.
  - (D) High moisture during storage: This promotes microbial growth and caking, and can accelerate enzymatic reactions, but the enzyme must be present in the first place for rancidity to occur.

Step 3: Final Answer:
The fundamental cause of hydrolytic rancidity in milk powder is the survival of the lipase enzyme, which occurs when the milk is subjected to an inadequate pre-heating treatment (low temperature). Therefore, option (A) is the correct answer.

Quick Tip

Associate the enzyme **lipase** with **rancid flavor** in fat-containing dairy products. The key to preventing this is adequate heat treatment (pasteurization or pre-heating) to destroy the enzyme.

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25. Given below are two statements, one is labelled as Assertion (A) and other one labelled as Reason (R).
Assertion (A): Bloats is microbial defect of condensed milk.
Reason (R): Contamination with and growth of yeast *Torula lactis condensi* at high temperature.
In light of the above statements, choose the correct answer from the options given below:

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

Correct Answer: (A) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution:
Step 1: Understanding the Concept:
This question requires evaluating two statements about a specific defect in condensed milk. We need to determine if each statement is true and if the Reason (R) correctly explains the

Assertion (A). The defect in question is "bloats" or "blowing" of cans.

Step 2: Detailed Explanation:

- **Analyze Assertion (A): "Bloats is microbial defect of condensed milk."**
  - "Bloats" refers to the swelling of the can of condensed milk due to the production of gas inside. This pressure can cause the ends of the can to bulge or even burst.
  - The production of gas (typically carbon dioxide) within a food product is a classic sign of microbial fermentation. Therefore, bloats is indeed a **microbial defect**.
  - This statement is **true**.
- **Analyze Reason (R): "Contamination with and growth of yeast *Torula lactis condensi* at high temperature."**
  - Sweetened condensed milk is preserved by a high concentration of sugar, which inhibits most bacteria. However, some specific types of microorganisms, called osmotolerant or osmophilic organisms, can survive and grow in high-sugar environments.
  - The yeast *Torula lactis condensi* (now often classified under the genus *Candida*) is a well-known osmophilic yeast. If it contaminates the product (often from the sugar or plant equipment), it can ferment the sucrose in the condensed milk.
  - This fermentation process produces carbon dioxide (CO_2) gas. The accumulation of this gas inside the sealed can leads to the "bloats". Growth is often favored by storage at higher-than-ideal temperatures.
  - This statement accurately describes the specific cause of this microbial defect. Therefore, this statement is also **true**.
- **Evaluate the relationship:** Does (R) explain (A)?
  - Yes, it does. Assertion (A) states that bloats is a microbial defect. Reason (R) provides the exact mechanism: a specific yeast ferments the sugar to produce gas, which causes the bloating. The reason perfectly explains the assertion.

Step 3: Final Answer:
Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct and specific explanation for Assertion (A). Therefore, option (A) is the correct choice.

Quick Tip

In assertion-reason questions, follow a three-step process: 1. Check if (A) is true. 2. Check if (R) is true. 3. If both are true, check if (R) is the direct cause of (A) by mentally linking them with the word "because".

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26. COB test is used for detection of

(A) Urea in milk
(B) Developed acidity of milk
(C) Sugar in Milk
(D) Bicarbonate in milk

Correct Answer: (B) Developed acidity of milk

Solution:
Step 1: Understanding the Concept:
The question asks for the purpose of the COB test in the context of milk testing. COB stands for Clot-on-Boiling. It is a simple, rapid platform test performed at milk collection centers.

Step 2: Detailed Explanation:

- **The Principle of the COB Test:** The stability of milk proteins, particularly casein, is sensitive to heat and acidity. Normal fresh milk has a certain level of natural acidity and is heat stable; it will not coagulate upon boiling.
- **Developed Acidity:** When bacteria grow in milk, they ferment lactose into lactic acid. This increases the acidity of the milk (called developed acidity). As the acidity increases, the pH of the milk decreases and approaches the isoelectric point of casein (pH 4.6), where casein is least stable.
- **The Test Procedure:** A small amount of milk is heated to boiling (e.g., in a test tube over a flame).
  - **Negative Result (COB-):** If the milk is fresh and has normal acidity, it will boil without any change in appearance.
  - **Positive Result (COB+):** If the milk has developed significant acidity, the proteins will become unstable. The heat from boiling will be sufficient to denature and coagulate the casein, causing the milk to form clots or flakes.
- **Purpose:** The COB test is used as a quick screening method to detect sour milk (milk with high developed acidity). Milk that is COB positive is considered unsuitable for heat processing (like pasteurization) because it will curdle and clog the equipment. It is therefore rejected at the collection center.

The other options are incorrect as they are detected by different tests (e.g., specific chemical tests for urea, sugar, and bicarbonates).

Step 3: Final Answer:
The Clot-on-Boiling (COB) test is used to detect heat-unstable milk, which is a direct consequence of high developed acidity. Therefore, option (B) is the correct answer.

Quick Tip

The name of the test, "Clot-on-Boiling," directly describes what it looks for. Milk clots on boiling when its acidity is high. This makes it an easy test to remember.

27. pH of normal fresh milk is between

(A) 6.1 to 6.3
(B) 7.1 to 7.3
(C) 6.0 to 6.1
(D) 6.6 to 6.8

Correct Answer: (D) 6.6 to 6.8

Solution:
Step 1: Understanding the Concept:
The question asks for the typical pH range of fresh, normal milk. pH is a measure of the hydrogen ion concentration, indicating whether a substance is acidic, neutral, or alkaline on a scale of 0 to 14.

Step 2: Detailed Explanation:

- **Acidity of Milk:** As discussed previously, fresh milk has a certain level of natural acidity due to components like caseins, phosphates, and citrates. This means its pH will be slightly below neutral.
- **The pH Scale:**
  - pH 7.0 is neutral.
  - pH <7.0 is acidic.
  - pH >7.0 is alkaline (basic).
- **Normal pH Range:** The pH of fresh, good quality milk is slightly acidic.
  - For **cow milk**, the normal pH range is typically **6.5 to 6.7**.
  - For **buffalo milk**, it is slightly lower, around **6.6 to 6.8**.
- **Variations:** The pH can be affected by factors like the stage of lactation and the health of the udder. For example, milk from a cow with mastitis is often more alkaline, with a pH closer to 7.0 or even higher.
- **Evaluating the Options:**
  - (A) 6.1 to 6.3: This is too acidic for fresh milk and would suggest significant bacterial souring has occurred.
  - (B) 7.1 to 7.3: This is alkaline and would be highly abnormal, possibly indicating severe mastitis or adulteration with neutralizers.
  - (C) 6.0 to 6.1: This is very acidic and the milk would be sour.
  - (D) 6.6 to 6.8: This range accurately encompasses the accepted normal pH values for fresh cow and buffalo milk.

Step 3: Final Answer:
The pH of normal fresh milk is slightly acidic, falling within the range of 6.6 to 6.8. Therefore, option (D) is the correct answer.

Quick Tip

Remember that fresh milk is slightly acidic, so its pH must be slightly below 7.0. This allows you to immediately eliminate any options that are neutral or alkaline. A pH of around 6.7 is a good average value to keep in mind for cow's milk.

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28. Triple effect evaporator is utilised for

(A) Separation of milk
(B) Condensing of milk
(C) Whey separation
(D) Fermentation of milk

Correct Answer: (B) Condensing of milk

Solution:
Step 1: Understanding the Concept:
The question asks for the primary application of a "triple effect evaporator" in the dairy industry. The name itself provides clues about its function.

Step 2: Detailed Explanation:

- **Evaporator Function:** An evaporator is a piece of equipment designed to remove water from a liquid product by boiling it. The primary goal is to concentrate the solids in the liquid.
- **Condensing of Milk:** In dairy processing, "condensing" is the term used for concentrating milk by removing water. This process is essential for manufacturing products like condensed milk, evaporated milk, and milk powder.
- **Multiple-Effect Evaporator:** A "triple effect" evaporator is a specific, highly energy-efficient design. It consists of three stages or "effects" linked together. The water vapor produced from boiling the milk in the first effect is used as the heating source for the second effect, and the vapor from the second is used to heat the third. This reuse of steam dramatically reduces the overall energy consumption compared to a single-effect evaporator.
- **Evaluating the Options:**
  - (A) Separation of milk: This refers to separating cream from skim milk, which is done using a centrifugal separator, not an evaporator.

- (B) Condensing of milk: This is the precise term for concentrating milk, which is the function of an evaporator.
- (C) Whey separation: This refers to separating the liquid whey from the curd during cheese making, which is done by draining or pressing.
- (D) Fermentation of milk: This is a biological process involving microorganisms to produce products like yogurt or dahi. It is done in fermentation tanks.

Step 3: Final Answer:
A triple effect evaporator is an energy-efficient system used for removing water to concentrate milk, a process known as condensing. Therefore, option (B) is the correct answer.

Quick Tip

Associate keywords: **Evaporator** = **Evaporation** of water = **Condensing** or **Concentrating** a liquid. The "triple effect" part just refers to an energy-saving design with three stages.

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29. The function of clarifiers is -

(A) Removal of dense foreign matter, dirt, cellular debris
(B) Separation of fat and skim milk
(C) Removal of fat
(D) Recovery of whey protein soilds

Correct Answer: (A) Removal of dense foreign matter, dirt, cellular debris

Solution:
Step 1: Understanding the Concept:
The question asks for the primary function of a milk clarifier. A clarifier is a piece of equipment used in the initial stages of milk processing.

Step 2: Detailed Explanation:

- **Clarifier Design and Principle:** A milk clarifier is a type of centrifuge, structurally similar to a cream separator, but designed for a different purpose. It spins milk at a high speed. Due to the centrifugal force, particles that are denser than the milk serum are thrown to the outermost edge of the centrifuge bowl.
- **Substances Removed:** These denser particles include:
  - **Foreign matter and dirt:** Any dust, soil, or sediment that may have entered the milk.
  - **Cellular debris:** Somatic cells (like leucocytes) from the cow's udder, udder tissue cells, and red blood cells.

– **Some bacteria:** Bacteria that are clumped together or are denser than milk serum.

This collected material is known as "clarifier sludge". The primary goal is to "clean" the milk by removing these undesirable solids.

- **Comparison with a Separator:**
  - A **clarifier** is designed to remove a small amount of dense solids from the milk, discharging one primary liquid stream (clarified milk).
  - A **cream separator** is designed to split the milk into two distinct liquid streams: the lighter cream (fat) and the heavier skim milk. This is the function described in option (B).
- **Other Options:** (C) Removal of fat is clarification's opposite, while (D) Recovery of whey protein solids is typically done using methods like ultrafiltration.

Step 3: Final Answer:
The main function of a clarifier is to use centrifugal force to remove solid impurities and debris that are denser than milk. Therefore, option (A) is the correct answer.

Quick Tip

Remember the difference: **Clarifier** = Cleans the milk by removing solid dirt. **Separator** = Splits the milk into cream and skim milk. Both are centrifuges but have different designs and purposes.

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30. Given below are two statements, one is labelled as Assertion (A) and other one labelled as Reason (R).
Assertion (A): Single stage homogenization increases viscosity considerably.
Reason (R): It produces clusters in which the membranes of individual fat globules join each other, although the fat itself is not in contact.
In light of the above statements, choose the most appropriate answer from the options given below.

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(B) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).
(C) (A) is correct but (R) is not correct.
(D) (A) is not correct but (R) is correct.

Correct Answer: (A) Both (A) and (R) are correct and (R) is the correct explanation of (A).

Solution:
Step 1: Understanding the Concept:
This question deals with the process of milk homogenization and its effect on milk's physical

properties. We need to evaluate the truth of an assertion about viscosity and a reason describing the behavior of fat globules.

Step 2: Detailed Explanation:

- **Analyze Assertion (A): "Single stage homogenization increases viscosity considerably."**
  - **Homogenization** is a process where milk is forced through a narrow gap at high pressure. This breaks down the large native fat globules into many smaller ones.
  - A side effect of this is that the newly formed, smaller fat globules lack a sufficient natural fat globule membrane. They become coated with casein micelles and other proteins from the milk serum.
  - These protein-coated fat globules tend to stick together, forming clumps or clusters. This network of clusters entraps the liquid phase of milk, which significantly **increases the viscosity** (thickness) of the milk.
  - So, the assertion is **true**.
- **Analyze Reason (R): "It produces clusters in which the membranes of individual fat globules join each other, although the fat itself is not in contact."**
  - This statement accurately describes the phenomenon of "fat globule clustering" that occurs after single-stage homogenization.
  - The newly formed globules, with their adsorbed casein membranes, attract each other and form grape-like clusters. The individual globules within the cluster share this new protein-based membrane, but the liquid fat inside each globule does not merge (coalesce).
  - This description of cluster formation is scientifically correct. Therefore, the reason is also **true**.
- **Evaluate the relationship:** Does (R) explain (A)?
  - Yes. The increase in viscosity mentioned in (A) is a direct result of the formation of the fat globule clusters described in (R). The network of these clusters immobilizes the serum phase, causing the milk to become thicker. Thus, the reason correctly explains the assertion.
  - To solve this clustering problem, a **two-stage homogenizer** is used, where the second, lower-pressure stage breaks up these clusters.

Step 3: Final Answer:
Both the assertion and the reason are correct statements, and the reason provides the correct scientific explanation for the assertion. Therefore, option (A) is the correct choice.

Quick Tip

Remember: **Single-stage homogenization** = fat globule clustering = increased viscosity. **Two-stage homogenization** = breaks up clusters = prevents viscosity increase and creaming.

31. In pasteurization process, if the product has been properly pasteurized, it is forwarded through unit, while that which is unpasteurized is diverted into the balance tank for reprocessing. The valve used for this purpose is -

(A) Q_{10} valve
(B) F_0 valve
(C) Flow dispersion valve
(D) Flow diversion valve

Correct Answer: (D) Flow diversion valve

Solution:
Step 1: Understanding the Concept:
The question describes a critical safety feature of a High Temperature Short Time (HTST) pasteurizer. It asks for the name of the specific valve that controls the path of the milk based on whether it has reached the correct pasteurization temperature.

Step 2: Detailed Explanation:

- **HTST Pasteurizer Safety:** An HTST system is a continuous flow system. To ensure that every particle of milk is properly pasteurized, there is an automatic safety mechanism. A temperature sensor is placed at the end of the holding tube (where the milk is held for the required time, e.g., 15 seconds).
- **The Valve's Function:** This temperature sensor is connected to a special three-way valve. This valve is called the **Flow Diversion Valve (FDV)**.
  - **Proper Temperature:** If the sensor detects that the milk is at or above the minimum legal temperature (e.g., 72°C), the FDV stays in the "forward-flow" position. It allows the properly pasteurized milk to proceed to the cooling section and then for packaging.
  - **Improper Temperature:** If, for any reason, the temperature of the milk drops below the set point, the FDV automatically and immediately switches to the "diverted-flow" position. This diverts the under-processed milk away from the pasteurized side and sends it back to the raw milk balance tank at the beginning of the system for reprocessing.
- **Purpose:** The FDV is a fail-safe device that guarantees that no unpasteurized milk can contaminate the final product.
- **Other Options:** The other terms are not names for this valve. Q_{10} and F_0 are terms related to the kinetics of thermal processing. "Flow dispersion valve" is not a standard term for this device.

Step 3: Final Answer:
The valve that diverts under-heated milk back for reprocessing in a pasteurizer is called the Flow Diversion Valve (FDV). Therefore, option (D) is the correct answer.

Quick Tip

The name "Flow Diversion Valve" perfectly describes its function: it **diverts** the **flow** of milk if it's not safe. This makes the term self-explanatory.

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32. Kalakand is a

(A) Fermented product
(B) Acid coagulated product
(C) Sweetened heat coagulated product
(D) Dried milk product

Correct Answer: (C) Sweetened heat coagulated product

Solution:
Step 1: Understanding the Concept:
The question asks to classify Kalakand, a traditional Indian dairy sweet, based on its method of preparation. This requires knowledge of the manufacturing processes of different Indian milk products.

Step 2: Detailed Explanation:

- **Kalakand Preparation:** Kalakand is made by partially coagulating milk during the process of heating and concentration. The key steps are:
  1. Milk is continuously heated and stirred in a large, open pan.
  2. A small amount of an acidulant (like citric acid or sour whey) is often added. This causes a very soft, partial coagulation of the milk proteins (casein), resulting in a characteristic granular texture.
  3. Sugar is added, and the mixture is further heated and concentrated until it reaches a thick, pasty consistency.
  4. The final product is a moist, grainy, sweetened mass.
- **Classification:** Based on this process, Kalakand belongs to the category of heat- and acid-coagulated products. However, the coagulation is primarily driven by heat in the presence of a small amount of acid, and sugar is a key ingredient. Therefore, "sweetened heat coagulated product" is a very accurate description. It is a type of *Khoa*, but with a more granular texture.
- **Evaluating the Options:**
  - (A) Fermented product: Incorrect. No microbial fermentation is involved (unlike dahi or yogurt).
  - (B) Acid coagulated product: While a small amount of acid is used, the primary process involves extensive heating and concentration. Products like paneer or chhena

are pure acid-coagulated products where the curd is separated from whey, which is not the case here.

- (C) Sweetened heat coagulated product: This is the best description. "Heat coagulation" captures the concentration and protein destabilization, and "sweetened" acknowledges the addition of sugar.
- (D) Dried milk product: Incorrect. Kalakand is a high-moisture product.

Step 3: Final Answer:
Kalakand is prepared by concentrating milk with sugar, with partial coagulation induced during heating, giving it a grainy texture. The most fitting classification is a sweetened heat coagulated product. Therefore, option (C) is correct.

Quick Tip

Differentiate Indian sweets: **Khoa**-based (heat coagulated like Burfi, Peda), **Chhena**-based (acid coagulated like Sandesh, Rasgulla), and unique ones like **Kalakand** which combines heat concentration with partial acid coagulation for a grainy texture.

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33. _____ is not a sterilizing agent used in Dairy Industry

(A) Chlorine
(B) Quaternary ammonium compounds
(C) Hydrogen peroxide
(D) Sulphuric acid

Correct Answer: (D) Sulphuric acid

Solution:
Step 1: Understanding the Concept:
The question asks to identify which of the listed chemicals is not used as a sterilizing or sanitizing agent in the dairy industry. Sterilizing agents are used to kill microorganisms on equipment surfaces to ensure product safety and quality.

Step 2: Detailed Explanation:
Let's evaluate each chemical's role in the dairy industry:

- **(A) Chlorine:** Chlorine-based compounds (like sodium hypochlorite) are widely used and effective sanitizers. They are strong oxidizing agents that kill a broad spectrum of microorganisms. They are commonly used for surface and equipment sanitation.
- **(B) Quaternary ammonium compounds (QACs or Quats):** These are cationic surfactants that are also effective sanitizers. They are less corrosive than chlorine and have some residual antimicrobial effect, making them suitable for sanitizing food contact surfaces.

- **(C) Hydrogen peroxide (H_2O_2):** This is a strong oxidizing agent used as a sterilant, particularly for aseptic packaging materials (like Tetra Pak cartons). It breaks down into water and oxygen, leaving no toxic residue.
- **(D) Sulphuric acid (H_2SO_4):** Sulphuric acid is a very strong, corrosive mineral acid. While it can kill microorganisms due to its extreme pH, it is **not used as a sterilizing agent** for equipment in the dairy industry because:
  - It is extremely corrosive to stainless steel, the primary material used for dairy equipment.
  - It is highly hazardous to handle.
  - Its primary use in a dairy lab is as a reagent in the **Gerber test for fat determination**, where it digests the milk proteins and SNF to release the fat. It is never used for cleaning or sterilizing the processing plant itself.

Step 3: Final Answer:
Chlorine, QACs, and hydrogen peroxide are all used as sanitizers or sterilants in the dairy industry. Sulphuric acid is a hazardous and corrosive chemical used for lab analysis (fat test), not for sanitation. Therefore, option (D) is the correct answer.

Quick Tip

Remember the common classes of dairy sanitizers: Halogens (chlorine, iodine), Quaternary Ammonium Compounds (QACs), Acid-Anionic sanitizers, and Peroxides (hydrogen peroxide, peracetic acid). Strong mineral acids like sulphuric or hydrochloric acid are generally not used due to their extreme corrosiveness.

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34. The process in which the sterilizer is emptied and refilled between each process cycle are-

(A) Direct sterilization
(B) Conductive heating
(C) Concentric heating
(D) Batch sterilization

Correct Answer: (D) Batch sterilization

Solution:
Step 1: Understanding the Concept:
The question describes a sterilization process characterized by distinct, separate cycles where the equipment is loaded, processed, emptied, and then reloaded for the next cycle. This is in contrast to a continuous process where the product flows through the system without interruption.

Step 2: Detailed Explanation:

- **Batch Process:** A batch process is any manufacturing process that is done in discrete quantities or "batches". The key feature is that the process starts and stops for each batch. The description "the sterilizer is emptied and refilled between each process cycle" is the very definition of a batch operation.
- **Batch Sterilization:** In the context of sterilization, this involves loading a quantity of product (e.g., cans of evaporated milk) into a sterilizer (like a retort or autoclave), running the sterilization cycle (heating, holding, cooling), and then unloading the entire batch before the next one can be loaded. This is the oldest method of sterilization.
- **Continuous Sterilization:** This is the alternative, where product flows continuously through a sterilizer, gets heated, held, and cooled without stopping. Systems like Ultra-High Temperature (UHT) processors are continuous sterilizers.
- **Evaluating the Options:**
  - (A) Direct sterilization: This refers to a method where the heating medium (steam) comes into direct contact with the product (steam injection or infusion). It can be done in batch or continuous systems, so it describes the mode of heating, not the process flow.
  - (B) Conductive heating: This refers to heat transfer through a solid barrier (like the wall of a can). It describes the mechanism of heat transfer, not the process flow.
  - (C) Concentric heating: This is not a standard term for a sterilization process.
  - (D) Batch sterilization: This term perfectly matches the description of emptying and refilling the sterilizer between cycles.

Step 3: Final Answer:
The process described, involving discrete cycles of loading and unloading the sterilizer, is known as Batch sterilization. Therefore, option (D) is the correct answer.

Quick Tip

Think of the difference between cooking rice in a pot on the stove versus using a continuous industrial rice cooker. The pot is a **batch** process (fill, cook, empty). The industrial cooker is a **continuous** process. The same logic applies to sterilization.

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35. Sandiness in milk powders is due to

(A) Proteins
(B) Fats
(C) Calcium
(D) Lactose

Correct Answer: (D) Lactose

Solution:
Step 1: Understanding the Concept:
The question asks for the cause of a specific textural defect called "sandiness" in certain dairy products, including milk powder and ice cream. This defect is characterized by a gritty, sandy mouthfeel.

Step 2: Detailed Explanation:

- **Lactose Crystallization:** The primary cause of sandiness is the crystallization of lactose, the sugar found in milk.
- **Lactose Properties:** Lactose is much less soluble in water compared to other sugars like sucrose. When milk is concentrated (as in making milk powder or ice cream mix), the concentration of lactose in the remaining water can exceed its solubility limit.
- **The Defect Mechanism:** If this supersaturated solution is cooled or dried improperly, the lactose can crystallize out of the solution into large, hard crystals. The most common form is alpha-lactose monohydrate, which forms large, sharp-edged crystals. When a person consumes the product, these hard crystals do not dissolve quickly in the mouth and are perceived by the tongue as sand-like particles, hence the term "sandiness".
- **In Milk Powders:** In milk powder manufacturing, controlling the crystallization of lactose is crucial. In spray drying, rapid drying aims to convert lactose into a non-crystalline, amorphous (glassy) state, which is very soluble. If manufacturing conditions are poor or the powder is exposed to moisture during storage, this glassy lactose can convert into large crystals, causing sandiness and caking.
- **Other Options:** While proteins, fats, and calcium are major components, they do not form large, hard crystals that cause a sandy texture. The defect is specifically linked to lactose.

Step 3: Final Answer:
The sandy or gritty texture defect in concentrated and dried dairy products is caused by the formation of large crystals of lactose. Therefore, option (D) is the correct answer.

Quick Tip

Associate the defect "sandiness" directly with **lactose crystallization**. This is a classic defect in products where the milk solids are highly concentrated, such as ice cream, sweetened condensed milk, and milk powder.

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36. _____ is the nutritious food containing fat, denatured protein, burnt lactose and minerals.

(A) Plain condensed whey
(B) Ghee-residue
(C) Sweetened condensed whey
(D) Whey paste

Correct Answer: (B) Ghee-residue

Solution:
Step 1: Understanding the Concept:
The question asks to identify a nutritious dairy by-product based on its composition: fat, denatured protein, burnt lactose, and minerals. We need to analyze the composition of the product formed during the ghee manufacturing process.

Step 2: Detailed Explanation:

- **Ghee Manufacturing:** Ghee is made by heating makkhan (butter) or cream to a high temperature (typically ¿110°C) to remove moisture and separate the milk solids from the pure fat.
- **Formation of Ghee-residue:** As the moisture evaporates, the non-fat milk solids (proteins and lactose) undergo browning reactions (Maillard reaction and caramelization) and settle at the bottom. This brownish, semi-solid material left after the clear fat (ghee) is decanted is called **Ghee-residue**.
- **Composition of Ghee-residue:** The description in the question perfectly matches the composition of ghee-residue:
  - **Fat:** It contains a significant amount of entrapped fat (ghee), which could not be fully separated.
  - **Denatured protein:** The high heat treatment denatures the milk proteins (casein and whey proteins).
  - **Burnt lactose:** The browning and characteristic flavor come from the Maillard reaction between the denatured proteins and lactose, as well as the caramelization ("burning") of lactose at high temperatures.
  - **Minerals:** It is rich in milk minerals, especially calcium and phosphorus.
- **Nutritional Value:** Due to this composition, ghee-residue is highly nutritious and is often used to prepare sweets and other food items.
- **Other Options:** The other options are whey-based products. Whey is the watery part of milk left after cheese or casein production. While nutritious, its composition and processing are different and do not typically involve the "burning" of lactose to the same extent as in ghee making.

Step 3: Final Answer:
The description of a food containing entrapped fat, denatured protein, burnt lactose, and minerals is a perfect match for Ghee-residue, the by-product of ghee manufacturing. Therefore,

option (B) is the correct answer.

Quick Tip

Remember the key by-products of major dairy processes. **Ghee-residue** is from ghee making, and **whey** is from cheese/casein making. The "burnt lactose" description is a strong clue pointing towards the high-temperature ghee process.

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37. In ultra high temperature (UHT) treatment, milk is heated at temperature of -

(A) 120°C to 125°C
(B) 145°C to 150°C
(C) 100°C to 105°C
(D) 80°C to 85°C

Correct Answer: (B) 145°C to 150°C

Solution:
Step 1: Understanding the Concept:
The question asks for the typical temperature range used in Ultra-High Temperature (UHT) processing of milk. UHT is a sterilization process designed to produce a commercially sterile product with a long shelf life at ambient temperatures.

Step 2: Detailed Explanation:

- **Goal of UHT:** UHT processing aims to kill all vegetative microorganisms and a vast majority of heat-resistant bacterial spores, making the milk commercially sterile. This allows the product to be stored for months without refrigeration, provided it is aseptically packaged.
- **The Principle:** To achieve this high level of microbial destruction with minimal chemical damage (like cooked flavor or nutrient loss), UHT processing uses a very high temperature for a very short time.
- **Time-Temperature Combination:** The standard for UHT treatment involves heating the milk to a temperature range of **135°C to 150°C**. The holding time at this temperature is very brief, typically only for a few seconds (e.g., 2 to 5 seconds).
- **Evaluating the Options:**
  - (A) 120°C to 125°C: This is the temperature range for conventional "in-container" sterilization (like for evaporated milk), which requires a much longer time (e.g., 15-20 minutes).
  - (B) 145°C to 150°C: This range falls squarely within the accepted definition of UHT processing.

– (C) 100°C to 105°C: This is boiling temperature, not sufficient for sterilization.
– (D) 80°C to 85°C: This is in the range of high-temperature pasteurization, not sterilization.

Step 3: Final Answer:
UHT treatment involves heating milk to 135-150°C for a few seconds. The option 145°C to 150°C is the most appropriate choice representing this ultra-high temperature.

Quick Tip

Distinguish between the main heat treatments:

- **Pasteurization (HTST):** ∼72°C for 15 sec (Kills pathogens).
- **Sterilization (In-can):** ∼121°C for 15 min (Kills spores, long time).
- **Sterilization (UHT):** ∼140°C for 2-5 sec (Kills spores, short time).

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38. Ice-cream may contain permitted stabilizers and emulsifiers not exceeding _____ percent by weight.

(A) 0.5
(B) 0.10
(C) 0.15
(D) 0.20

Correct Answer: (A) 0.5

Solution:
Step 1: Understanding the Concept:
The question asks for the maximum legally permitted combined percentage of stabilizers and emulsifiers in ice cream according to food regulations (like FSSAI in India). These additives are used in very small quantities to achieve desired texture and stability.

Step 2: Detailed Explanation:

- **Function of Additives in Ice Cream:**
  – **Stabilizers:** These are hydrocolloids (gums like guar gum, locust bean gum, CMC) that absorb water and form gels. Their main purpose is to improve the body and texture, increase viscosity, and most importantly, prevent the growth of large ice crystals during storage, which would cause a coarse texture.
  – **Emulsifiers:** These are surface-active agents (like mono- and di-glycerides) that help to create a finer, more stable emulsion of fat in the mix. They improve the whipping quality of the mix, resulting in a smoother texture and better meltdown properties.

- **Regulatory Limits:** Because these are food additives, their usage is strictly regulated. Food laws specify a maximum combined limit for their addition to ensure consumer safety and prevent overuse. According to Indian food laws (FSSAI, which evolved from PFA), the total amount of permitted stabilizers and emulsifiers, when used alone or in combination, **shall not exceed 0.5 percent by weight** of the final ice cream product.
- **Evaluating the Options:**
  - (A) 0.5: This matches the legal limit.
  - (B) 0.10, (C) 0.15, (D) 0.20: These values are well below the maximum permitted level. While a typical formulation might use levels in this range, the legal maximum is higher.

Step 3: Final Answer:
The maximum permitted level for the combined use of stabilizers and emulsifiers in ice cream is 0.5% by weight. Therefore, option (A) is the correct answer.

Quick Tip

Remember that stabilizers and emulsifiers are used at very low concentrations. For ice cream, the legal maximum is a key number to memorize: **0.5%**.

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39. Match the LIST-I with LIST-II

LIST-I (Constituents of Ice cream)		**LIST-II** (Role of constituents)	
A.	Milk fat	I.	Improve upon and provide a uniform whipping quality to the mixture.
B.	Milk- solids- not - fat (MSNF)	II.	To prevent the formation of objectionably large ice crystals in ice-cream.
C.	Stabilizers	III.	Improve body and texture of ice cream.
D.	Emulsifiers	IV.	Enriches and mellows the ice cream, giving it a full, rich, creamy flavour.

Choose the correct 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-IV, B-III, C-II, D-I

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

Solution:
Step 1: Understanding the Concept:
This is a matching question that requires understanding the specific functional role of each major component in an ice cream formulation. Each ingredient is added for a specific purpose related to flavor, texture, structure, or stability.

Step 2: Detailed Explanation:
Let's match each constituent in LIST-I with its primary role from LIST-II.

- **A. Milk fat:** Milk fat is the most important ingredient for flavor and richness. It contributes to the creamy texture and characteristic mellow flavor of ice cream. It makes the ice cream rich and full-bodied. This directly matches with **(IV) Enriches and mellows the ice cream, giving it a full, rich, creamy flavour.**
- **B. Milk-solids-not-fat (MSNF):** MSNF consists of proteins (casein and whey) and lactose. These solids are crucial for the structure of the ice cream. They contribute to the flavor but, more importantly, they improve the **body** (firmness) and **texture** of the ice cream by providing structure and absorbing water. This matches with **(III) Improve body and texture of ice cream.**
- **C. Stabilizers:** As discussed in the previous question, the primary role of stabilizers (gums) is to bind water. By doing so, they control the size of ice crystals, especially during temperature fluctuations in storage (heat shock). Their main job is to **prevent the formation of objectionably large ice crystals**. This matches perfectly with **(II)**.
- **D. Emulsifiers:** Emulsifiers work at the fat-water interface. They help create a finer dispersion of fat globules and cause a controlled destabilization of the fat emulsion during freezing and whipping. This process is crucial for trapping air bubbles, leading to a smooth texture and good meltdown. Their key function is to **improve upon and provide a uniform whipping quality to the mixture**. This matches with **(I)**.

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

Quick Tip

For ice cream ingredients, remember these key associations:

- **Fat** → Flavor, Richness
- **MSNF** → Body, Texture
- **Stabilizer** → Stops large Ice Crystals
- **Emulsifier** → Whipping, Smoothness

40. Defects in ice cream are -
A. Rancid flavour
B. Soggy body
C. Fluffy texture
D. Foamy meltdown quality
Choose the correct answer from the options given below:

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

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

Solution:
Step 1: Understanding the Concept:
The question asks to identify which of the listed conditions are considered defects in ice cream. A defect is any characteristic of the final product that deviates from the desired quality standards for flavor, body, texture, or appearance.

Step 2: Detailed Explanation:
Let's analyze each item to see if it's a defect:

- **A. Rancid flavour:** This is a serious flavor defect. As discussed earlier, it's caused by the breakdown of milk fat by the lipase enzyme, resulting in a soapy, unpleasant taste. It is definitely a defect.
- **B. Soggy body:** This is a body and texture defect. A "soggy" ice cream feels heavy, dense, and sticky in the mouth. It is often caused by using high total solids and low overrun, creating a product that lacks lightness. It is considered a defect.
- **C. Fluffy texture:** This is also a body and texture defect. A "fluffy" texture indicates that the ice cream is too light and airy, lacking substance. It is typically caused by incorporating too much air (excessive overrun). The ideal texture should be creamy and smooth, not overly airy or fluffy. It is a defect.
- **D. Foamy meltdown quality:** This is a defect related to meltdown characteristics. When good quality ice cream melts, it should produce a smooth, creamy liquid similar to the original mix. A "foamy" meltdown, where the melting product is frothy and full of air bubbles, is undesirable. It is often associated with issues in the fat emulsion stability, possibly due to the type or amount of emulsifier and stabilizer used. It is a defect.

Step 3: Final Answer:
All four conditions listed—Rancid flavour, Soggy body, Fluffy texture, and Foamy meltdown quality—are recognized defects in ice cream. Therefore, the correct option includes A, B, C, and D.

Quick Tip

Ice cream quality is judged on multiple criteria. Any extreme characteristic is usually a defect. For example, the body should not be too heavy (soggy) or too light (fluffy). The texture should be smooth, not coarse (icy) or weak (fluffy).

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41. Slow melting quality of ice cream is due to -
A. Excessive stabilizer content.
B. Inadequate homogenization.
C. Excessive overrun
D. Excessive emulsifier content.
Choose the correct answer from the options given below:

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

Correct Answer: (C) A and D only

Solution:
Step 1: Understanding the Concept:
The question asks for the causes of a specific ice cream defect: slow melting or refusal to melt properly at room temperature. The meltdown characteristic is an important quality attribute and is influenced by the structural components of the ice cream.

Step 2: Detailed Explanation:
Let's analyze the effect of each factor on melting rate:

- **A. Excessive stabilizer content:** Stabilizers are gums that bind large amounts of water and form a gel network throughout the ice cream. If too much stabilizer is used, this gel network becomes excessively strong. It can hold the shape of the ice cream even after the ice crystals have melted, leading to a very **slow melting** quality. This is a primary cause.
- **B. Inadequate homogenization:** If homogenization is inadequate, the fat globules are large and the emulsion is less stable. This typically leads to a *faster*, coarser meltdown and churning of fat, not a slower one.
- **C. Excessive overrun:** Overrun is the amount of air incorporated. A high overrun (too much air) creates a product with a lot of insulating air pockets. While it might feel like it should melt slower, high overrun often leads to a foamy, frothy meltdown and a structure that collapses, rather than a slow, cohesive melt. It is not considered a primary cause of an unnaturally slow melt.
- **D. Excessive emulsifier content:** Emulsifiers help in creating a stable fat structure around the air cells. An excessive amount of certain emulsifiers can lead to an overly

stable fat network. This rigid structure can also hold the shape of the ice cream as the ice melts, contributing to an unnaturally **slow melting** rate.

Both excessive stabilizer and excessive emulsifier create an overly stable structure that resists collapsing as the ice melts.

Step 3: Final Answer:
The primary causes for a slow-melting defect in ice cream are the use of excessive amounts of stabilizer and/or emulsifier. Therefore, the correct combination is A and D.

Quick Tip

Think of the ice cream structure as a scaffold. Stabilizers (gels) and emulsifiers (fat network) build this scaffold. Too much of either makes the scaffold too strong, so it doesn't collapse properly when the ice (the filler) melts away.

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42. The yield of acid casein ranges between _____ to _____ from skim milk

(A) 2.2 to 2.4%
(B) 2.0 to 2.2%
(C) 4.0 to 4.5%
(D) 2.8 to 3.2%

Correct Answer: (D) 2.8 to 3.2%

Solution:
Step 1: Understanding the Concept:
The question asks for the typical yield of acid casein from skim milk. Casein is the main protein in milk. It can be precipitated from skim milk by acidifying it to its isoelectric point. The yield depends on the casein content of the skim milk.

Step 2: Key Formula or Approach:
The yield is directly proportional to the casein content of the raw material (skim milk).
Yield (%) $\approx$ Casein content in skim milk (%) $\times$ Recovery efficiency

Step 3: Detailed Explanation:

- **Casein Content of Skim Milk:** Skim milk typically contains about 3.3% to 3.6% total protein. Casein makes up about 80% of the total protein.

$$\text{Casein Content} \approx 3.4\% \,\text{total protein} \times 80\% = 2.72\%$$

Cow's milk in India often has a slightly higher protein content. Let's consider the casein content in skim milk to be in the range of 2.8% to 3.4%.

- **Acid Casein Production:** In this process, skim milk is acidified (using HCl or H_2SO_4) to a pH of 4.6. At this pH (the isoelectric point), casein precipitates out. The precipitated curd is then washed, pressed, dried, and ground to produce acid casein powder.
- **Yield Calculation:** The process is not 100% efficient; there are always some losses of fine particles during washing. However, the theoretical yield is very close to the casein content of the milk. A practical yield of acid casein from 100 kg of skim milk is roughly equal to its casein percentage. For example, if skim milk has 3.0% casein, the yield of dried acid casein will be around 2.9-3.0 kg.
- **Evaluating the Options:** Given that the casein content of skim milk is typically in the range of 2.8% to 3.4%, the yield of dried acid casein will also be in this range.
  - (A) 2.2 to 2.4%: This is too low.
  - (B) 2.0 to 2.2%: This is very low.
  - (C) 4.0 to 4.5%: This is too high; the casein content of skim milk is not this high.
  - (D) 2.8 to 3.2%: This range accurately reflects the typical casein content of skim milk and is therefore the most realistic yield range for acid casein.

Step 4: Final Answer:
The yield of acid casein is primarily determined by the casein content of the skim milk, which is generally between 2.8% and 3.4%. Therefore, the range of 2.8 to 3.2% is the most appropriate answer.

Quick Tip

For yield questions, start with the composition of the raw material. Skim milk is about 3.4% protein, and 80% of that is casein. This gives a quick estimate of $\sim$2.7%. Knowing Indian milk can be richer, the 2.8-3.2% range becomes the logical choice.

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43. A stabilizer used in ice cream is -

(A) Mono - glycerides
(B) Sodium alginate
(C) Di - glycerides
(D) Glycol esters

Correct Answer: (B) Sodium alginate

Solution:
Step 1: Understanding the Concept:
The question asks to identify a chemical compound that is used as a stabilizer in ice cream from the given list. It is important to differentiate between stabilizers and emulsifiers, as both are used in ice cream but have different chemical structures and functions.

Step 2: Detailed Explanation:

- **Stabilizers:** These are hydrocolloids, typically polysaccharides (long-chain carbohydrates or gums), that absorb water. Their function is to increase viscosity and prevent ice crystal growth.
- **Emulsifiers:** These are molecules with both a water-loving (hydrophilic) and a fat-loving (lipophilic) part. Their function is to act at the interface between fat and water to stabilize the emulsion.
- **Analyzing the Options:**
  - (A) Mono-glycerides and (C) Di-glycerides: These are classic examples of **emulsifiers**. They are derived from fats (triglycerides) and have the required hydrophilic-lipophilic structure. They are widely used in ice cream for their emulsifying properties.
  - (B) Sodium alginate: This is a salt of alginic acid, which is a polysaccharide extracted from brown seaweed. It is a type of gum. Like other gums, it forms viscous solutions with water and is a very common and effective **stabilizer** in ice cream and other food products.
  - (D) Glycol esters: Certain glycol esters, like propylene glycol monostearate (PGMS), can also function as **emulsifiers**.

Step 3: Final Answer:
Mono- and di-glycerides are emulsifiers. Sodium alginate is a polysaccharide gum used as a stabilizer. Therefore, sodium alginate is the correct answer.

Quick Tip

A simple rule of thumb: If the name sounds like a **gum** or a complex carbohydrate (**alginate**, **carrageenan**, **guar**, **cellulose**), it's a **stabilizer**. If it sounds like a part of a fat molecule (**mono/di-glyceride**, **lecithin**, **polysorbate**), it's an **emulsifier**.

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44. The sugar percentage of Shrikhand is generally

(A) 60%
(B) 40%
(C) 42%
(D) 30%

Correct Answer: (B) 40%

Solution:
Step 1: Understanding the Concept:

The question asks for the typical percentage of sugar in Shrikhand, a traditional Indian fermented milk product. The amount of sugar is a key factor in its taste, texture, and preservation.

Step 2: Detailed Explanation:

- **Shrikhand Preparation:** Shrikhand is made from *chakka*, which is de-watered, strained dahi (yogurt). To make Shrikhand, finely ground sugar is mixed thoroughly into the chakka, along with flavorings like cardamom, saffron, and nuts.
- **Composition:** The final composition of Shrikhand is a balance between the milk solids from the chakka and the added sugar. The sugar serves not only to sweeten the product but also acts as a preservative by lowering the water activity.
- **Sugar Level:** The amount of sugar added is typically equal to the weight of the chakka, or slightly less. Chakka itself contains about 30-35% total milk solids. When sugar is added, the final sugar percentage in the finished product generally falls in the range of **35% to 45%** by weight. A common industrial standard is to have the total sugar content be around 40% of the final product.
- **Evaluating the Options:**
  - (A) 60%: This is excessively high and would make the product unpalatably sweet and gritty.
  - (B) 40%: This value is right in the middle of the typical commercial range (35-45%) and is a very common standard for Shrikhand.
  - (C) 42%: This is also within the plausible range, but 40% is a more standard and general figure.
  - (D) 30%: This is on the lower side and would result in a less sweet and less preserved product.

Step 3: Final Answer:
The general and most widely accepted sugar percentage in commercial Shrikhand is around 40%. Therefore, option (B) is the most appropriate answer.

Quick Tip

For traditional sweets, remember the role of sugar. In products like Shrikhand, sugar is a major component, often making up nearly half the weight of the final product. A figure around 40% is a good benchmark to remember.

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45. The RM value of ghee generally varies between

(A) 20-25
(B) 28-32
(C) 13-18

(D) 9-12

Correct Answer: (B) 28-32

Solution:
Step 1: Understanding the Concept:
The question asks for the typical range of the Reichert-Meissl (RM) value for ghee. The RM value is a classical chemical constant used in fat analysis, particularly for butterfat (ghee). It is a crucial parameter for determining the purity of ghee.

Step 2: Detailed Explanation:

- **What is the RM Value?**: The Reichert-Meissl value is a measure of the amount of **volatile, water-soluble short-chain fatty acids** present in a fat. The test involves saponifying the fat, acidifying it to liberate the fatty acids, and then distilling the volatile acids (like butyric and caproic acid) to be titrated with a standard alkali.
- **Significance for Ghee:** Milk fat (and therefore ghee) is unique among all common fats and oils because it contains a significantly high percentage of these short-chain fatty acids, especially butyric acid (C4:0). Most other fats, like vegetable oils and animal body fats, contain almost none.
- **Normal Range:** Due to this unique composition, pure ghee has a characteristically high RM value. According to food regulations (FSSAI), the RM value for ghee **shall not be less than 28**. The typical range for pure cow and buffalo ghee is generally between **28 and 34**.
- **Detection of Adulteration:** If ghee is adulterated with vegetable oils or animal body fats, the RM value will drop significantly below 28, making it a powerful test for authenticity.
- **Evaluating the Options:**
  - (A) 20-25: This range is below the legal minimum and indicates adulteration.
  - (B) 28-32: This range perfectly represents the normal values for pure ghee and aligns with the legal standard.
  - (C) 13-18 and (D) 9-12: These are very low values, far from the norm for ghee.

Step 3: Final Answer:
The RM value is a hallmark of pure ghee, with a legal minimum of 28. The typical range is 28 to 32 (or slightly higher). Therefore, option (B) is the correct answer.

Quick Tip

For ghee purity, remember two key chemical values: **Reichert-Meissl (RM) Value** (should be high, >28) and **Baudouin Test** (should be negative, indicating absence of vanaspati). The high RM value is due to the presence of butyric acid in milk fat.

46. Phosphatase test is used for checking

(A) Efficiency of sterilization
(B) Efficiency of separation of milk
(C) Detection of sugar in milk
(D) Efficiency of pasteurization

Correct Answer: (D) Efficiency of pasteurization

Solution:
Step 1: Understanding the Concept:
The question asks for the purpose of the phosphatase test in the dairy industry. This is a crucial quality control test performed on heat-treated milk.

Step 2: Detailed Explanation:

- **The Enzyme:** Raw milk contains a naturally occurring enzyme called **alkaline phosphatase**.
- **Principle of the Test:** The key property of this enzyme is its heat resistance. It has been found that the conditions of time and temperature required to destroy alkaline phosphatase are slightly *more severe* than the conditions required to kill the most heat-resistant pathogenic bacterium found in milk, *Coxiella burnetii* (the cause of Q-fever).
- **Application:** This makes phosphatase a perfect **index organism** for pasteurization. If the milk has been correctly pasteurized (heated to the proper temperature for the proper time), the phosphatase enzyme will be destroyed. If the test detects the presence of active phosphatase, it means one of two things:
  1. The milk was not pasteurized correctly (under-processed).
  2. The pasteurized milk has been contaminated with a small amount of raw milk.
- **The Test:** The test involves adding a phosphate-containing substrate to the milk. If active phosphatase is present, it will break down the substrate, releasing a compound (like phenol or p-nitrophenol) that can be detected by a color change. A negative result (no color change) indicates that pasteurization was efficient.
- **Other Options:** The test is specific to pasteurization. Sterilization uses much higher temperatures that would destroy any enzyme, so this test is not needed. It has no relevance to separation or sugar detection.

Step 3: Final Answer:
The phosphatase test is used as a reliable indicator to verify that milk has been adequately pasteurized. Therefore, option (D) is the correct answer.

Quick Tip

Remember the key phrase: **Phosphatase for Pasteurization**. The presence of this enzyme means the process failed, ensuring that the milk is safe from pathogens which are even easier to kill.

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47. Commercial uses of lactose are
A. In infant food.
B. In caramel or fudges.
C. In solid pharmaceutical preparations such as pills and tablets.
D. In manufacturing whey proteins.
Choose the correct 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:
The question asks to identify the correct commercial applications of lactose, the sugar derived from milk whey. Lactose has several unique physical and chemical properties that make it useful in various industries.

Step 2: Detailed Explanation:
Let's analyze each stated use:

- **A. In infant food:** This is a major application. Human milk has a higher lactose content than cow's milk. To make infant formula more closely resemble human milk, purified lactose is added to cow's milk-based formulas to adjust the carbohydrate level. This is a correct use.
- **B. In caramel or fudges:** Lactose participates in the Maillard browning reaction with proteins and also caramelizes upon heating. It contributes to the characteristic color and flavor of baked goods, caramel, and confectionery like fudges. Its low sweetness is also desirable in some applications. This is a correct use.
- **C. In solid pharmaceutical preparations such as pills and tablets:** This is another very important use. Lactose is widely used as an **excipient** (an inactive filler or binder) in the pharmaceutical industry. It is used to form tablets because it is inert, has good compressibility properties, and is relatively cheap. This is a correct use.
- **D. In manufacturing whey proteins:** This statement is incorrect in its phrasing. Lactose is a *by-product* of whey protein manufacturing, not an ingredient used *in* it. Whey is the starting material. From whey, you can manufacture both whey proteins (through

processes like ultrafiltration, which separates the protein from lactose and minerals) and lactose (by crystallizing it from the de-proteinated whey, or permeate). So, you don't use lactose to make whey protein; you make both from whey.

Step 3: Final Answer:
The correct commercial uses of lactose are in infant formula, confectionery, and as a pharmaceutical excipient. Manufacturing whey protein is a process that separates protein from lactose, it does not use lactose as an ingredient. Therefore, A, B, and C are the correct uses.

Quick Tip

Remember the three main industries that use lactose: **Infant Food** (to mimic human milk), **Pharmaceuticals** (as a tablet filler), and **Confectionery/Bakery** (for browning and texture).

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48. In which of the following product edible casein is not used?

(A) Ice cream
(B) Coffee whiteners
(C) Imitation milk
(D) Whevit

Correct Answer: (D) Whevit

Solution:
Step 1: Understanding the Concept:
The question asks to identify the product from the list that does not use edible casein or its derivatives (like sodium caseinate) as an ingredient. Casein is used in many food products for its nutritional and functional properties (like emulsification, water binding, and whitening).

Step 2: Detailed Explanation:
Let's examine the composition of each product:

- **(A) Ice cream:** While traditional ice cream gets its casein naturally from the milk and cream used, caseinates (salts of casein) are sometimes added to specialty or imitation ice creams as a source of milk solids or for their emulsifying properties. So, casein is fundamentally present.
- **(B) Coffee whiteners:** Sodium caseinate is a key ingredient in most non-dairy coffee whiteners. It provides the whitening effect and helps to emulsify the fat in the product, preventing feathering in hot coffee. This is a very common use.
- **(C) Imitation milk:** Imitation milk is a product designed to resemble milk but is made from non-dairy ingredients, typically vegetable fat and a protein source. Sodium caseinate is frequently used as the protein source in these products to provide nutrition and functionality.

- **(D) Whevit:** The name itself is a clue. "Whev-it" suggests a product based on **whey**. Whevit is a brand name for a whey-based beverage. The primary protein source in such a drink would be **whey proteins**, not casein. Whey is the liquid left over after casein has been removed from milk (e.g., during cheese making). Therefore, a whey-based product would logically not contain casein.

Step 3: Final Answer:
Coffee whiteners and imitation milk are classic examples of products that use purified caseinates. Ice cream naturally contains casein. Whevit, being a whey-based product, would be formulated with whey proteins, not casein. Therefore, Whevit is the correct answer.

Quick Tip

Pay attention to product names as they often give clues about the main ingredients. "Whevit" strongly implies it's made from whey, which is by definition the milk serum from which casein has already been removed.

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49. All dairy fermentations use lactic acid bacteria for -

(A) Acidification and flavour production
(B) Salting
(C) Sweetening
(D) Bitterness

Correct Answer: (A) Acidification and flavour production

Solution:
Step 1: Understanding the Concept:
The question asks for the primary and universal function of Lactic Acid Bacteria (LAB) in all dairy fermentations (like yogurt, dahi, cheese, buttermilk).

Step 2: Detailed Explanation:

- **Lactic Acid Bacteria (LAB):** This is a group of bacteria (including genera like *Lactococcus*, *Lactobacillus*, *Streptococcus*) that are defined by their ability to ferment sugars, primarily lactose, into lactic acid.
- **Primary Functions in Dairy:**
  1. **Acidification:** This is the most fundamental role. The production of lactic acid from lactose causes a drop in the pH of the milk. This acidification is responsible for the sour taste of fermented products and, critically, for the coagulation of casein protein to form the gel structure of yogurt or the curd for cheese. The low pH also helps to preserve the product by inhibiting the growth of spoilage and pathogenic bacteria.

2. **Flavour Production:** In addition to lactic acid, LAB produce a variety of other metabolic by-products that contribute to the characteristic flavor and aroma of the final product. These include compounds like acetaldehyde (gives the typical yogurt aroma), diacetyl (gives a buttery flavor), and various other aldehydes, ketones, and esters.

- **Evaluating the Options:**
  - (A) Acidification and flavour production: This option correctly identifies the two main, universal roles of LAB in dairy fermentations.
  - (B) Salting: Salting is a separate, physical step in cheese making; it is not a function of the bacteria.
  - (C) Sweetening: LAB consume sugar (lactose) and produce acid, making the product more sour, not sweeter.
  - (D) Bitterness: Bitterness is typically a defect in fermented products, often caused by excessive breakdown of proteins (proteolysis) by the bacteria or other enzymes. It is not a desired function.

Step 3: Final Answer:
The core functions of lactic acid bacteria across all dairy fermentations are to produce acid (acidification) and to develop the characteristic taste and aroma (flavour production). Therefore, option (A) is the correct answer.

Quick Tip

The name says it all: **Lactic Acid Bacteria** (LAB) produce **lactic acid**. This acidification is their primary role, which leads to preservation, coagulation, and the basic sour taste. Flavor production is their secondary, but equally important, role.

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50. The selective criteria for Cheddar cheese cultures are-
A. Rapid acid production
B. Bacteriophage resistance
C. Salt senstivity
D. Ripening activity
Choose the correct 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: (A) A, B and D only

Solution:
Step 1: Understanding the Concept:

The question asks for the desirable characteristics (selective criteria) for the starter cultures (lactic acid bacteria) used specifically for making Cheddar cheese. These criteria are crucial for successful and consistent cheese making.

Step 2: Detailed Explanation:
Let's analyze each criterion:

- **A. Rapid acid production:** This is extremely important. The Cheddar making process relies on a controlled and predictable rate of acid development. This acidification is needed for proper curd formation, whey expulsion (syneresis), and to control the growth of unwanted bacteria. A culture that produces acid too slowly can lead to a defective cheese. This is a desired trait.
- **B. Bacteriophage resistance:** Bacteriophages (or 'phages') are viruses that infect and kill bacteria. An attack by phages can wipe out the starter culture in the cheese vat, leading to a "dead vat" where acid production stops completely. This is a major cause of cheese making failure. Therefore, selecting starter strains that are resistant to common phages is a critical criterion. This is a desired trait.
- **C. Salt senstivity:** This is the opposite of what is desired. During the Cheddaring process, a significant amount of salt is added to the curd (typically around 2% w/w). The starter culture must be **salt-tolerant**, not salt-sensitive. It needs to continue producing some acid even after salting. A salt-sensitive culture would be inhibited or killed by the salt, which would be undesirable. Therefore, "salt sensitivity" is a negative trait to be avoided.
- **D. Ripening activity:** Cheddar cheese is ripened for several months to develop its characteristic sharp flavor and texture. This ripening is a complex process involving the breakdown of proteins and fats. The enzymes released by the starter bacteria after they die and lyse (break open) play a crucial role in this process. Therefore, a good culture must have the appropriate enzymatic profile for ripening activity. This is a desired trait.

Step 3: Final Answer:
The desirable criteria for Cheddar cheese cultures are rapid acid production (A), bacteriophage resistance (B), and good ripening activity (D). Salt sensitivity (C) is an undesirable trait; salt tolerance is what's needed. Therefore, the correct combination is A, B, and D only.

Quick Tip

When evaluating criteria for starter cultures, think about the entire process. They need to be **fast** and **strong** (rapid acid production), **tough** (phage resistant, salt tolerant), and have a **good legacy** (contribute to ripening after they die).

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51. Rose-Gottlieb method is used for extraction of

(A) Milk Fat
(B) Milk Sugar

(C) Milk Protein
(D) Vitamin

Correct Answer: (A) Milk Fat

Solution:
Step 1: Understanding the Concept:
The question asks to identify the milk component that is extracted and quantified using the Rose-Gottlieb method. This is a classic, highly accurate chemical analysis method used in dairy science.

Step 2: Detailed Explanation:

- **The Rose-Gottlieb Method:** This is considered a reference or "gold standard" method for the gravimetric determination of fat in milk and milk products. It is a solvent extraction method.
- **Procedure Outline:** The method involves the following key steps:
  1. A known weight of the milk sample is treated with ammonia. The ammonia neutralizes the acidity and helps to break the protein-fat emulsion by dissolving the casein.
  2. Ethyl alcohol is added to precipitate the proteins, further breaking the emulsion and preventing the formation of gels.
  3. The fat is then extracted from this mixture using a combination of two solvents: diethyl ether (which is an excellent solvent for fat) and petroleum ether (which dissolves less non-fat material, improving the purity of the extracted fat).
  4. The solvent layer containing the dissolved fat is carefully separated, the solvents are evaporated off, and the remaining residue, which is the pure milk fat, is dried and weighed.
  5. The percentage of fat is then calculated based on the weight of the extracted fat and the initial weight of the milk sample.
- **Conclusion:** The entire purpose of the elaborate Rose-Gottlieb procedure is to accurately separate and quantify the **milk fat**. Other components like sugar, protein, and vitamins are determined by different analytical methods (e.g., Kjeldahl method for protein, HPLC for sugars/vitamins).

Step 3: Final Answer:
The Rose-Gottlieb method is a reference chemical procedure specifically designed for the extraction and quantitative determination of milk fat. Therefore, option (A) is the correct answer.

Quick Tip

Associate key analytical methods with their targets:

- **Rose-Gottlieb / Mojonnier:** Reference method for **Fat**.
- **Gerber:** Rapid/routine method for **Fat**.
- **Kjeldahl:** Reference method for **Protein**.
- **Lactometer:** Specific gravity (for detecting added **Water**).

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52. Culture for Mozzarella cheese is -

(A) S.thermophillus and L.delbrueckii subsp.bulgaricus
(B) S.thermophillus and L.helveticus and P. frudenreichii sub sp. shermanii
(C) Leuc. mesenteroides subsp. cremoris
(D) Propionibacterim

Correct Answer: (A) S.thermophillus and L.delbrueckii subsp.bulgaricus

Solution:
Step 1: Understanding the Concept:
The question asks to identify the specific starter culture bacteria used for the production of Mozzarella cheese. Different types of cheese use different cultures depending on the desired flavor, texture, and manufacturing conditions (especially temperature).

Step 2: Detailed Explanation:

- **Classification of Starter Cultures:** Starter cultures are broadly classified based on their optimal growth temperature.
  - **Mesophilic cultures:** Grow best at moderate temperatures (25-35°C). Used for cheeses like Cheddar and Gouda. Example: *Lactococcus lactis*.
  - **Thermophilic cultures:** Grow best at higher temperatures (40-45°C). Used for cheeses where the curd is cooked to a high temperature.
- **Mozzarella Production:** Mozzarella is a "pasta filata" or stretched-curd cheese. During its manufacture, the curd is cooked and then kneaded and stretched in hot water (typically ¿75°C). This high-temperature process requires the use of **thermophilic** starter cultures that can survive the cooking stage and produce acid at a high temperature.
- **Specific Cultures for Mozzarella:** The classic starter culture for Italian-style cheeses like Mozzarella and Parmesan is a combination of two thermophilic lactic acid bacteria:
  - ***Streptococcus thermophilus*:** A coccus that provides the initial rapid acid production.

– ***Lactobacillus delbrueckii* subsp. *bulgaricus*:** A rod-shaped bacterium that contributes to further acidification and flavor development.

This combination is the same one used to make yogurt.

- **Evaluating other options:**
  – (B) and (D): *Propionibacterium freudenreichii* subsp. *shermanii* is the culture responsible for the characteristic "eyes" (holes) and nutty flavor in **Swiss-type cheeses**. It is not used for Mozzarella.
  – (C): *Leuconostoc mesenteroides* is a mesophilic culture, often used as a secondary culture in cheeses like Gouda for gas (small eye) and flavor (diacetyl) production.

Step 3: Final Answer:
The standard thermophilic culture combination used for making Mozzarella cheese is *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*. Therefore, option (A) is the correct answer.

Quick Tip

Associate cheese types with their culture's temperature preference. **Cheddar** = **Mesophilic**. **Italian cheeses (Mozzarella, Parmesan)** and **Swiss cheese** = **Thermophilic**. The yogurt culture (*S. thermophilus* + *L. bulgaricus*) is the one used for Mozzarella.

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53. MBRT of properly pasteurized milk shall not be less than

(A) 5 hours
(B) 3 hours
(C) 2 hours
(D) 1 hour

Correct Answer: (A) 5 hours

Solution:
Step 1: Understanding the Concept:
The question asks for the minimum Methylene Blue Reduction Time (MBRT) required for milk to be considered "properly pasteurized" according to standards. The MBRT test is an indirect method to estimate the microbiological quality of milk.

Step 2: Detailed Explanation:

- **Principle of the MBRT Test:** The test is based on the ability of bacteria in milk to grow and consume oxygen. Methylene blue is a redox indicator dye that is blue in its oxidized state and becomes colorless (is "reduced") in an oxygen-depleted environment.

- A milk sample with a **high bacterial load** will consume the dissolved oxygen quickly, leading to a rapid reduction of the methylene blue dye and a **short reduction time**.
- A milk sample with a **low bacterial load** will take a long time to consume the oxygen, resulting in a **long reduction time**.

- **MBRT as a Standard for Pasteurized Milk:** Pasteurization is designed to kill most vegetative bacteria. Therefore, properly pasteurized milk should have a very low bacterial count. When subjected to the MBRT test, it should take a very long time to decolorize the dye.
- **The Standard:** According to food regulations (like FSSAI in India), properly pasteurized milk is considered to be of good quality and to have been effectively treated if it does not decolorize methylene blue in **5 hours**. This is often referred to as the "MBRT test for pasteurized milk" and serves as a check on both the efficiency of the process and the post-pasteurization hygiene. A time of less than 5 hours indicates either inefficient pasteurization or significant post-pasteurization contamination.

Step 3: Final Answer:
The standard for properly pasteurized milk requires that its Methylene Blue Reduction Time (MBRT) should not be less than 5 hours. Therefore, option (A) is the correct answer.

Quick Tip

Remember the inverse relationship: **High bacterial count = Short MBRT** (poor quality). **Low bacterial count = Long MBRT** (good quality). For pasteurized milk, the standard is a very long time, 5 hours, indicating very few surviving bacteria.

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54. Microbiologically induced defect in cheese is
A. Mold Growth
B. Yeast Growth
C. Gassy defect in cheese
D. Discoloration in cheese
Choose the correct 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:
The question asks to identify which of the listed defects in cheese are caused by microorganisms.

Cheese is a product of controlled microbial activity, but uncontrolled growth of undesirable microbes can lead to various spoilage issues or defects.

Step 2: Detailed Explanation:
Let's analyze each defect to determine its cause:

- **A. Mold Growth:** Unwanted mold growth on the surface or inside a cheese (except for blue cheeses like Roquefort or surface-ripened cheeses like Camembert where specific molds are desired) is a very common microbial defect. Spoilage molds like *Penicillium commune* can cause off-flavors and discoloration. This is a microbiological defect.
- **B. Yeast Growth:** Certain yeasts can grow on the surface of cheese, especially in the brine or during early ripening, causing slimy surfaces and off-flavors. Some fermentative yeasts can also grow inside the cheese and produce gas. This is a microbiological defect.
- **C. Gassy defect in cheese:** This defect, also known as "early blowing" or "late blowing," is characterized by the excessive formation of gas holes or cracks in the cheese. It is caused by gas-producing microorganisms. Early blowing is often caused by coliform bacteria, while late blowing is caused by anaerobic spore-formers like *Clostridium tyrobutyricum*. This is a classic microbiological defect.
- **D. Discoloration in cheese:** Many types of discoloration are caused by microbial activity. For example, patches of black, brown, or pink on the cheese surface can be due to the growth of specific molds, yeasts, or bacteria (*e.g., Pseudomonas*). This is a microbiological defect.

Step 3: Final Answer:
All the listed issues—unwanted mold growth, yeast growth, gassiness, and discoloration—are well-known cheese defects that are induced by the activity of undesirable microorganisms. Therefore, A, B, C, and D are all correct.

Quick Tip

In cheese, microorganisms are both friends and foes. The starter cultures are friends. Undesirable microbes (contaminants) are foes. These foes can cause issues with appearance (mold, discoloration), texture (gassiness), and flavor. Almost any spoilage sign you can see or taste in cheese is likely microbiological in origin.

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55. Manufacture of yoghurt involves following chronological steps-
A. Standardization of mix and homogenization
B. Heat treatment and cooling to inoculation temperature
C. Inoculation with yoghurt cultures and incubation
D. Cooling and Packaging
Choose the correct answer from the options given below:

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

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

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

Solution:
Step 1: Understanding the Concept:
The question asks to confirm if the listed steps for yogurt manufacturing are correct and in the right chronological order. Yogurt production is a standardized process with a clear sequence of operations.

Step 2: Detailed Explanation:
Let's examine the sequence of the steps provided:

1. **A. Standardization of mix and homogenization:** This is the first step. The base milk is standardized to the desired fat and milk solids-not-fat (MSNF) content. MSNF is often increased by adding skim milk powder to achieve a firmer gel. The mix is then homogenized to create a stable fat emulsion and contribute to a smooth texture. This step is correctly placed at the beginning.

2. **B. Heat treatment and cooling to inoculation temperature:** After standardization, the mix is subjected to a high heat treatment (e.g., 85-95°C for several minutes). This is more severe than pasteurization and serves to kill competing microorganisms, denature whey proteins (which improves gel firmness), and create a favorable environment for the starter culture. After heating, the mix must be cooled down to the optimal incubation temperature for the thermophilic yogurt cultures, which is typically 42-45°C. This step correctly follows step A.

3. **C. Inoculation with yoghurt cultures and incubation:** Once the mix is at the correct temperature, the starter culture (a mix of *S. thermophilus* and *L. bulgaricus*) is added (inoculated). The mix is then held at the incubation temperature for several hours (e.g., 3-6 hours) to allow the bacteria to ferment lactose into lactic acid. This fermentation process causes the milk to coagulate into a gel. This step correctly follows step B.

4. **D. Cooling and Packaging:** Once the desired acidity (pH $\approx$ 4.5) is reached, the fermentation must be stopped to prevent the yogurt from becoming too sour. This is done by rapidly cooling the yogurt to below 5°C. The cooled yogurt is then packaged. (Note: For set-style yogurt, inoculation and packaging happen before incubation; for stirred-style yogurt, cooling happens before packaging). In either case, cooling to stop fermentation and subsequent packaging are the final steps. This step correctly follows step C.

Step 3: Final Answer:
The steps listed (A, B, C, and D) represent the correct and complete chronological sequence for the manufacture of yogurt. Therefore, the option including all four is correct.

Quick Tip

Remember the yogurt making process like a recipe: 1. **Prepare** the base (Standardize). 2. **Cook and Cool** (Heat treat, cool to warm). 3. **Add culture and Wait** (Inoculate, incubate). 4. **Stop and Store** (Cool, package).

---

56. According to optimum growth temperature, bacteria associated with milk are not included in following group -

(A) Psychrotrophic
(B) Mesophilic
(C) Thermophilic
(D) Endophilic

Correct Answer: (D) Endophilic

Solution:
Step 1: Understanding the Concept:
The question asks to identify a term that does not belong to the standard classification of bacteria based on their optimal growth temperature, especially in the context of milk microbiology.

Step 2: Detailed Explanation:
Bacteria are commonly classified into groups based on the temperature range at which they grow best. In dairy microbiology, the following groups are of primary importance:

- **(A) Psychrotrophic:** These are microorganisms that can grow at refrigeration temperatures (0-7°C), but their optimum temperature is higher (around 20-30°C). They are the primary cause of spoilage in refrigerated milk. Examples include *Pseudomonas*, *Achromobacter*. This is a standard group.
- **(B) Mesophilic:** These microorganisms grow best at moderate temperatures, typically between 20°C and 45°C. This group includes most human pathogens (*e.g., Salmonella, Listeria*) and many starter cultures used for products like Cheddar cheese and buttermilk. This is a standard group.
- **(C) Thermophilic:** These microorganisms grow best at high temperatures, typically between 45°C and 70°C. This group includes yogurt and Swiss cheese starter cultures, as well as some heat-resistant spore-forming spoilage bacteria. This is a standard group.
- **(D) Endophilic:** This term is not a standard classification for bacteria based on temperature. "Endo-" is a prefix meaning "within" or "inner". While terms like "endospore" (a structure within a bacterium) or "endophyte" (an organism living within a plant) exist, "Endophilic" is not used to describe a temperature growth range for bacteria.

Step 3: Final Answer:
Psychrotrophic, Mesophilic, and Thermophilic are the three major temperature-based classifications for bacteria relevant to milk. Endophilic is not a term used in this context. Therefore,

option (D) is the correct answer.

Quick Tip

Remember the three main "philes" for milk bacteria temperature: **Psychro-** (cold-loving), **Meso-** (middle-loving), and **Thermo-** (heat-loving). Any other "-philic" term related to temperature is likely incorrect.

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57. The source of contamination of mastitis milk is -

(A) Interior of udder
(B) The milker
(C) Utensils
(D) Flies and other vermin

Correct Answer: (A) Interior of udder

Solution:
Step 1: Understanding the Concept:
The question asks for the source of contamination specifically for "mastitis milk". Mastitis is a disease, and understanding its nature is key to identifying the source of the associated microorganisms.

Step 2: Detailed Explanation:

- **What is Mastitis?:** Mastitis is an inflammation of the mammary gland (udder) in dairy cattle, almost always caused by a bacterial infection. The infection occurs when bacteria penetrate the teat canal and establish themselves within the udder tissue.
- **Source of Contamination:** Because mastitis is an infection *inside* the udder, the bacteria causing it (*e.g., Staphylococcus aureus, Streptococcus agalactiae*) and the by-products of the infection (e.g., high numbers of white blood cells, or somatic cells) originate from the **interior of the udder**. Milk drawn from a healthy udder is nearly sterile, but milk from a mastitic udder is contaminated at the source, before it even leaves the teat.
- **Other Sources vs. Mastitis:**
  - (B) The milker, (C) Utensils, and (D) Flies and other vermin are all examples of **external** or **post-milking** sources of contamination. They can introduce spoilage bacteria into clean milk *after* it has been drawn from the udder. However, they are not the source of the mastitis infection itself, which resides within the udder. The question is about the source of contamination *of mastitis milk*, which by definition is the udder itself.

Step 3: Final Answer:
Mastitis is an infection within the udder. Therefore, the source of the microorganisms and abnormal components found in mastitic milk is the interior of the udder. Option (A) is the correct answer.

Quick Tip

Differentiate between the source of an infection and sources of general contamination. Mastitis is an **internal** infection of the udder. Dirty hands, utensils, and flies are **external** sources of contamination for any milk, healthy or not.

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58. The common milk microorganisms grow best between the temperature -

(A) 5°C to 10°C
(B) 20°C to 40°C
(C) 3°C to 4°C
(D) -5°C to 0°C

Correct Answer: (B) 20°C to 40°C

Solution:
Step 1: Understanding the Concept:
The question asks for the optimal growth temperature range for "common milk microorganisms". This refers to the most prevalent group of bacteria found in raw milk that are responsible for spoilage at ambient temperatures and also includes many pathogens.

Step 2: Detailed Explanation:

- **Categorization of Microorganisms:** As discussed before, milk microorganisms are categorized as psychrotrophs, mesophiles, and thermophiles. The term "common milk microorganisms" generally refers to the mesophilic group, as they thrive at ambient and animal body temperatures.
- **Mesophilic Range:** Mesophiles are defined as organisms that grow best at moderate temperatures. Their optimal growth range is typically between 20°C and 45°C. This group includes most of the common spoilage bacteria found in raw milk kept at room temperature (like *Lactococcus*), as well as pathogens of concern (*e.g., E. coli, Salmonella, Listeria*).
- **Evaluating the Options:**
  - (A) 5°C to 10°C: This is the refrigeration temperature range. While psychrotrophs can grow here, it is not the *best* or optimal temperature for most common bacteria. Growth is slow.

- (B) 20°C to 40°C: This range perfectly represents the optimal growth temperatures for the vast majority of mesophilic bacteria, which are the most common contaminants and spoilage organisms in milk.
- (C) 3°C to 4°C: This is deep refrigeration temperature where bacterial growth is very slow.
- (D) -5°C to 0°C: This is freezing or sub-zero temperature, where microbial growth ceases.

Step 3: Final Answer:
The vast majority of common milk microorganisms are mesophiles, which have their optimal growth temperature range between 20°C and 40°C. Therefore, option (B) is the correct answer.

Quick Tip

Think of the "danger zone" for food safety, which is roughly 5°C to 60°C. The range where bacteria grow *best* and fastest is right in the middle of this zone, corresponding to room temperature and body temperature, which is the 20-40°C range.

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59. Lactometer reading test is used to test milk for detection of adulteration of -

(A) Odour
(B) Appearence
(C) Water
(D) Temperature

Correct Answer: (C) Water

Solution:
Step 1: Understanding the Concept:
The question asks for the primary purpose of using a lactometer to test milk. A lactometer is a specific type of hydrometer designed for milk.

Step 2: Detailed Explanation:

- **What is a Lactometer?:** A lactometer is an instrument that measures the specific gravity of milk. Specific gravity is a measure of the density of milk relative to the density of water.
- **Principle of Detection:**
  - Normal milk has a specific gravity that is higher than water, typically ranging from 1.028 to 1.032. This is because milk contains dissolved and suspended solids (proteins, lactose, minerals) which are denser than water.
  - Water has a specific gravity of 1.000.

  - When water is added to milk (adulteration), it dilutes the milk solids. The resulting mixture becomes less dense, and its specific gravity will decrease, moving closer to 1.000.

- **The Test:** By measuring the specific gravity with a lactometer, one can detect this decrease. If the lactometer reading is below the normal range for milk (e.g., below 1.028), it is a strong indication that extraneous **water** has been added.
- **Other Options:** A lactometer is a physical device that measures density; it cannot detect odour (A), appearance (B), or temperature (D) (though temperature must be corrected for, as it affects the reading).

Step 3: Final Answer:
A lactometer measures the specific gravity of milk, and its primary use as a platform test is to detect adulteration with water. Therefore, option (C) is the correct answer.

Quick Tip

Remember: **Lactometer** → **Specific Gravity** → **Density**. Adding water lowers the density of milk, which is what the lactometer detects.

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60. Milk collection operation includes-
A. Unloading and Grading
B. Sampling
C. Weighing
D. Packaging
Choose the correct 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:
The question asks to identify the standard operations that are part of the milk collection process at a dairy plant or collection center, which is the initial receiving stage.

Step 2: Detailed Explanation:
Let's analyze the sequence of events when a farmer or a milk tanker brings milk to the dairy:

1. **A. Unloading and Grading:** The first step is to unload the milk cans or pump the milk from the tanker into the reception dock. As this happens, the milk is graded, primarily

using organoleptic tests (smell, color, appearance) to immediately reject any obviously spoiled milk. This is a core part of collection.

2. **C. Weighing:** The received milk must be accurately weighed to determine the quantity supplied. This is crucial for payment and for inventory records. Milk is paid for by weight (kg), not volume (litres), as its volume changes with temperature. This is a core part of collection.
3. **B. Sampling:** Before or during unloading, a representative sample of the milk is taken from each can or tanker compartment. This sample will be used for quality control tests (like fat, SNF, acidity, MBRT) which determine the quality of the milk and the final price paid to the supplier. This is a core part of collection.
4. **D. Packaging:** Packaging is the *final* step in the dairy processing chain, which happens *after* the milk has been processed (e.g., pasteurized, homogenized). It is not part of the initial milk *collection* or reception operation. At the collection stage, milk is pooled into large raw milk silos.

The logical flow at the reception dock is Unloading/Grading, followed by Weighing and Sampling (the order of weighing and sampling can sometimes vary).

Step 3: Final Answer:
The core operations at a milk collection point are Unloading and Grading (A), Sampling (B), and Weighing (C). Packaging (D) is a post-processing step and is not part of collection. Therefore, the correct combination is A, B, and C only.

Quick Tip

Think of the milk's journey. **Collection** is the entry point: unload, check quality, weigh, and take a sample. **Processing** is the middle part: clarify, pasteurize, homogenize. **Packaging** is the final exit point before distribution.

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61. Is not a platform test?

(A) Sediment test
(B) Turbidity test
(C) Alcohol test
(D) Smell and colour

Correct Answer: (B) Turbidity test

Solution:
Step 1: Understanding the Concept:
The question asks to identify which of the listed tests is NOT a "platform test". Platform tests are simple, rapid tests performed on the milk reception platform or dock to quickly assess the

quality of incoming raw milk and decide whether to accept or reject it.

Step 2: Detailed Explanation:
Let's analyze each test:

- **(A) Sediment test:** This is a classic platform test. A certain volume of milk is passed through a white filter disc. The amount of visible dirt, dust, and debris (sediment) collected on the disc gives a quick indication of the cleanliness of milk production. It's rapid and simple.
- **(C) Alcohol test:** This is another common platform test. Equal volumes of milk and ethanol (typically 68-75% strength) are mixed. If the milk has high acidity or abnormal salt balance, the proteins will become unstable and coagulate, forming clots. It is a quick test for protein stability and developed acidity.
- **(D) Smell and colour:** This is part of the organoleptic evaluation, the very first and most basic platform test. The person receiving the milk smells it for any off-odors (sour, barny, etc.) and looks at its color and appearance. It's the fastest way to reject obviously bad milk.
- **(B) Turbidity test:** The turbidity test is a specific laboratory test used to check the **efficiency of sterilization**, not to assess raw milk quality. It is performed on sterilized milk (like in-can sterilized milk). The principle is that if sterilization was effective, all the whey proteins (especially albumin and globulin) would have been denatured and would precipitate with the casein upon the addition of an ammonium sulfate solution. If the filtrate remains clear (low turbidity), the test is negative, meaning sterilization was successful. If the whey proteins were not denatured, they remain in the filtrate, making it turbid. This is a lab test for a finished product, not a rapid platform test for raw milk.

Step 3: Final Answer:
The Sediment test, Alcohol test, and organoleptic tests (Smell and colour) are all standard platform tests. The Turbidity test is a laboratory test to check the efficiency of sterilization. Therefore, it is not a platform test.

Quick Tip

Platform tests must be **fast** and **simple**. Think: can you do this in a minute or two on a busy reception dock? Smell, alcohol, and sediment tests fit this description. Lab tests for sterilization or detailed composition do not.

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62. Food poisoning caused due to milk by causal organism present in milk is -

(A) Micrococcus pyrogenes
(B) Bacillus anthracis
(C) Borrehota varidae
(D) Brucella abortus

Correct Answer: (D) Brucella abortus

Solution:
Step 1: Understanding the Concept:
The question asks to identify a pathogenic organism from the list that can be present in milk and cause food poisoning or disease in humans. This requires knowledge of common milk-borne zoonotic diseases (diseases transmissible from animals to humans).

Step 2: Detailed Explanation:
Let's analyze the options:

- **(A) Micrococcus pyrogenes:** The name *Micrococcus pyogenes* is an older term, largely replaced by *Staphylococcus aureus*. While certain strains of *Staphylococcus aureus* can cause food poisoning by producing heat-stable toxins in milk, the name given is archaic. More importantly, other options represent more definitive milk-borne pathogens.
- **(B) Bacillus anthracis:** This is the causative agent of **anthrax**, a very serious disease. While it can infect cattle, it is rarely transmitted through milk. Transmission is more common through contact with infected animals or their products (hides, wool).
- **(C) Borrehota varidae:** This does not appear to be a recognized or valid name for a bacterial species in standard nomenclature. It is likely an incorrect or fictional name.
- **(D) Brucella abortus:** This is a classic and very important milk-borne pathogen. It is the causative agent of **Brucellosis** (also known as Undulant Fever or Malta Fever) in humans. The bacterium infects cattle (causing abortions, hence the name *abortus*) and is shed in their milk. Consumption of raw, unpasteurized milk from an infected cow is a primary route of transmission to humans. Pasteurization effectively kills *Brucella abortus*.

Step 3: Final Answer:
Among the given options, *Brucella abortus* is the most well-known and significant pathogenic organism that causes a serious food-borne illness (Brucellosis) through the consumption of contaminated raw milk.

Quick Tip

When thinking about milk-borne diseases, remember the "big three" that pasteurization was designed to eliminate: *Mycobacterium tuberculosis* (Tuberculosis), *Brucella abortus* (Brucellosis), and *Coxiella burnetii* (Q-fever).

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63. For the neutralization of cream, neutralizers to be added are -

(A) Gelatin
(B) Sucrose
(C) Sodium bicarbonate and Calcium hydroxide
(D) Lactose

Correct Answer: (C) Sodium bicarbonate and Calcium hydroxide

Solution:
Step 1: Understanding the Concept:
The question asks to identify the chemical substances used for the neutralization of cream. Neutralization is a process, particularly in butter making, where the acidity of sour cream is reduced before it is pasteurized and churned.

Step 2: Detailed Explanation:

- **Why Neutralize Cream?:** If cream has developed high acidity (due to bacterial growth), it can cause problems during processing. High-acid cream can coagulate during pasteurization, leading to high fat losses in the buttermilk and producing butter with a poor flavor and short shelf life. Neutralization aims to reduce the acidity to a desired level (typically around 0.12-0.15% lactic acid).
- **What are Neutralizers?:** Neutralizers are mild alkaline (basic) substances that react with and neutralize the lactic acid present in the cream. The ideal neutralizer should be food-grade, effective, and should not impart any off-flavor to the final product.
- **Common Neutralizers Used:** The most commonly used neutralizers in the dairy industry are weak alkalis.
  - **Sodium bicarbonate** ($NaHCO_3$, baking soda) is a common choice.
  - **Calcium hydroxide** ($Ca(OH)_2$, slaked lime) and **Magnesium hydroxide** ($Mg(OH)_2$) are also used, often in combination.
- **Evaluating the Options:**
  - (A) Gelatin: This is a protein used as a stabilizer or gelling agent. It is not an alkali.
  - (B) Sucrose and (D) Lactose: These are sugars (carbohydrates) used for sweetening. They are not neutralizers.
  - (C) Sodium bicarbonate and Calcium hydroxide: These are both well-known, permitted alkaline compounds used for neutralizing sour cream.

Step 3: Final Answer:
Sodium bicarbonate and calcium hydroxide are standard alkaline chemicals used to neutralize the developed acidity in sour cream before butter making. Therefore, option (C) is the correct answer.

Quick Tip

To neutralize an acid (like lactic acid in sour cream), you need a base (alkali).
Look for chemical names that are hydroxides (like calcium hydroxide) or carbonates/bicarbonates (like sodium bicarbonate). Sugars and proteins are not neutralizers.

64. A fat concentrate which is obtained by churning cream, gathering the fat into a compact mass is -

(A) Butter
(B) Khoa
(C) Dried milk
(D) Condensed Milk

Correct Answer: (A) Butter

Solution:
Step 1: Understanding the Concept:
The question asks to identify the dairy product that is made by the specific process of churning cream. The description outlines the fundamental principle of butter making.

Step 2: Detailed Explanation:

- **The Process of Churning:** Churning is the process of agitating cream with high mechanical force. Cream is an oil-in-water emulsion (fat globules dispersed in a watery serum).
  - The agitation in the churn causes the fat globules to collide and disrupt their protective membranes.
  - This allows the liquid fat to coalesce and clump together, separating from the watery phase. This phenomenon is called phase inversion.
  - The result is a semi-solid mass of fat, which is the **butter**, and a liquid by-product called buttermilk.
- **Description Analysis:** The phrase "obtained by churning cream, gathering the fat into a compact mass" is the exact definition of how butter is made. Butter is a fat concentrate, typically containing at least 80% milk fat.
- **Other Products:**
  - (B) Khoa, (C) Dried milk, and (D) Condensed Milk are all produced by the **evaporation of water** from milk to concentrate all the milk solids, not just the fat. They are not made by churning.

Step 3: Final Answer:
The product made by churning cream to concentrate the fat into a solid mass is butter. Therefore, option (A) is the correct answer.

Quick Tip

Associate the key process with the product:

- **Churning → Butter**
- **Evaporation/Heating → Khoa, Condensed Milk, Dried Milk**
- **Fermentation → Yogurt, Cheese**

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65. Tests for the quality of butter are
A. Coliform count
B. Lipolytic count
C. Yeast and mold count
D. Sediment test
Choose the correct 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:
The question asks to identify which of the listed tests are used to assess the quality of butter. Butter quality is judged based on its chemical, physical, and microbiological characteristics. The options provided focus on microbiological and physical contaminants.

Step 2: Detailed Explanation:
Let's analyze the relevance of each test for butter quality:

- **A. Coliform count:** Coliform bacteria are indicator organisms. Their presence in a finished product like butter suggests poor sanitation during processing, post-pasteurization contamination, or use of contaminated water for washing the butter granules. A low coliform count is a key indicator of hygienic manufacturing. This is a standard quality test for butter.
- **B. Lipolytic count:** This test enumerates lipolytic microorganisms, which are bacteria or molds that produce the lipase enzyme. As discussed earlier, lipase breaks down fat and causes rancidity. A high lipolytic count indicates a high potential for the butter to become rancid during storage, severely affecting its quality. This is a crucial quality test.
- **C. Yeast and mold count:** Yeasts and molds are common contaminants in butter plants. They can grow on the surface of butter, causing discoloration and off-flavors. Their count is an important indicator of the general sanitation of the plant and the potential shelf life of the butter. This is a standard quality test.

- **D. Sediment test:** This test assesses the level of extraneous matter or visible dirt in the butter. It is done by dissolving the butter in hot, filtered water and passing it through a filter disc. The presence of sediment indicates poor hygiene during production or handling. This is a standard quality test.

Step 3: Final Answer:
All four tests listed are important and standard procedures for assessing the microbiological and physical quality of butter. Coliform count, yeast and mold count, and sediment test all relate to hygiene, while the lipolytic count relates to the potential for flavor defects. Therefore, A, B, C, and D are all correct.

Quick Tip

For quality tests of any finished food product, think about the two main categories of risk: **Hygiene** (Is it clean? - tested by Coliforms, Yeast/Mold, Sediment) and **Spoilage Potential** (Will it go bad? - tested by spoilage organism counts like Lipolytic bacteria).

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66. Composition of butter oil is -
A. Butter fat - 99.5 to 99.8%
B. Moisture - 0.1 to 0.3%
C. Acidity (oleic) - 0.2 to 0.5%
D. Peroxide value - 0.0 to 0.1%
Choose the correct 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:
The question asks to identify the correct compositional and quality parameters for butter oil. Butter oil, also known as anhydrous milk fat (AMF), is a product made by removing almost all the water and non-fat solids from butter or cream, resulting in nearly pure milk fat.

Step 2: Detailed Explanation:
Let's analyze each statement:

- **A. Butter fat - 99.5 to 99.8%:** This is the defining characteristic of butter oil. By definition, it must have a very high fat content. Standards, such as those by Codex Alimentarius, require AMF to have a minimum milk fat content of 99.8%. Butter oil may

have a slightly lower minimum of 99.3%. The range 99.5 to 99.8% is therefore a correct representation of a high-quality product. This statement is correct.

- **B. Moisture - 0.1 to 0.3%:** To achieve such a high fat content, the moisture must be extremely low. The legal maximum for moisture in butter oil/AMF is typically very low, often specified as not more than 0.1% for AMF and slightly higher for butter oil. The range 0.1 to 0.3% is a plausible and correct range for moisture content. This statement is correct.
- **C. Acidity (oleic) - 0.2 to 0.5%:** This refers to the Free Fatty Acid (FFA) content, which is a measure of hydrolytic rancidity. It is conventionally expressed as % oleic acid. A good quality butter oil should have a very low FFA. The range 0.2 to 0.5% (or 0.2 to 0.35% as per some standards) is a typical specification for good quality butter oil. This statement is correct.
- **D. Peroxide value - 0.0 to 0.1%:** Peroxide value (PV) is a measure of primary oxidation. It is usually expressed in milliequivalents of active oxygen per kg of fat (meq/kg). It is not expressed as a percentage. A typical PV for fresh butter oil would be very low, but the unit given (%) is incorrect. Standard specifications for PV are often ¡ 0.2 or ¡ 0.1 meq/kg. The value is plausible, but the unit is wrong, making the statement technically incorrect as written in a compositional list. However, if we interpret it loosely, it represents a low level of oxidation. In the context of the other options being clearly correct, and the ambiguity of this one, let's re-evaluate. Many sources list the Peroxide Value in meq/kg. The value 0.0 to 0.1% is highly unconventional. Let's assume there might be a typo in the question and focus on the first three which are standard compositional parameters. Given the options, the combination of A, B, and C represents the most certain and accurate description of butter oil's composition and basic quality.

Step 3: Final Answer:
Statements A (Butter fat content), B (Moisture content), and C (Acidity) are all standard and correctly stated parameters for the composition and quality of butter oil. Statement D (Peroxide value) is expressed in incorrect units, making it technically inaccurate. Therefore, the best choice is the one that includes A, B, and C.

Quick Tip

Butter oil is essentially pure fat. Remember: Fat content is extremely high (>99%), and everything else is extremely low. Moisture must be minimal (<0.5%, often <0.1%), and signs of spoilage like acidity (FFA) and oxidation (PV) must also be very low.

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67. Cheesy flavour in butter is due to -

(A) Growth of proteolytic bacteria in cream
(B) Over heating of cream
(C) Over neutralization of cream

(D) Use of sour cream

Correct Answer: (A) Growth of proteolytic bacteria in cream

Solution:
Step 1: Understanding the Concept:
The question asks for the cause of a specific off-flavor in butter known as "cheesy". This defect makes the butter taste and smell like old cheese. The cause is microbiological.

Step 2: Detailed Explanation:

- **Source of the Defect:** The cheesy flavor is a sign of protein decomposition. It develops when the cream used for butter making is of poor microbiological quality and has been stored for a long time, allowing specific types of bacteria to grow.
- **Proteolytic Bacteria:** The bacteria responsible are **proteolytic**, meaning they produce enzymes (proteases) that break down proteins. In cream, these bacteria break down the casein and other milk proteins into smaller peptides and amino acids. Some of these breakdown products have a bitter or cheese-like flavor. The process is similar to what happens during cheese ripening, but in the case of cream for butter, it is an uncontrolled and undesirable process.
- **Evaluating the other options:**
  - (B) Over heating of cream: This would cause a "cooked" flavor, not a cheesy one.
  - (C) Over neutralization of cream: This can lead to a "neutralizer" or soapy flavor.
  - (D) Use of sour cream: Sour cream (high in lactic acid) would lead to a "sour" or "acidic" flavor in the butter, not a cheesy flavor. Cheesy flavor is from protein breakdown, not acid production.

Step 3: Final Answer:
The development of a cheesy off-flavor in butter is a direct result of the breakdown of proteins in the cream by proteolytic bacteria before churning. Therefore, option (A) is the correct answer.

Quick Tip

Associate off-flavors with their chemical source:

- **Fat** breakdown (lipolysis) $\rightarrow$ **Rancid/Soapy** flavor.
- **Protein** breakdown (proteolysis) $\rightarrow$ **Bitter/Cheesy** flavor.
- **Sugar** breakdown (fermentation) $\rightarrow$ **Sour/Acidic** flavor.

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68. Match the LIST-I with LIST-II

LIST-I (Traditional dairy product)		LIST-II (Principle of manufacture of product)	
A.	Khoa	I.	Open pan dehydration to a semi solid consistency
B.	Dahi	II.	Fermentation
C.	Paneer	III.	Sweetened Khoa
D.	Peda	IV.	Acid coagulation and draining

Choose the correct 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: (C) A-I, B-II, C-IV, D-III

Solution:
Step 1: Understanding the Concept:
This is a matching question that requires knowledge of the fundamental manufacturing principle behind four common traditional Indian dairy products.

Step 2: Detailed Explanation:
Let's match each product in LIST-I with its manufacturing principle from LIST-II.

- **A. Khoa:** Khoa is a heat-coagulated, partially dehydrated milk product. It is made by vigorously boiling and stirring milk in a large, open pan (a karahi) until most of the water has evaporated and a semi-solid mass is left. This matches perfectly with **(I) Open pan dehydration to a semi solid consistency**.
- **B. Dahi:** Dahi is the Indian equivalent of yogurt. It is produced by inoculating boiled and cooled milk with a starter culture of lactic acid bacteria and allowing it to set through a process of **(II) Fermentation**.
- **C. Paneer:** Paneer is an unripened, non-fermented, pressed cheese. It is made by boiling milk and then adding a food acid (like citric acid, lemon juice, or sour whey) to coagulate the casein. The resulting curd is then separated from the whey by draining it in a muslin cloth and pressing it. This matches with **(IV) Acid coagulation and draining**.
- **D. Peda:** Peda is a popular sweet made using Khoa as the base ingredient. Finely ground sugar is mixed into the Khoa, and the mixture is heated slightly before being formed into small, flattened discs. Therefore, the principle of its manufacture is based on using **(III) Sweetened Khoa**.

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

Quick Tip

Remember the core process for each product:

- **Khoa** = Heat + Evaporation.
- **Dahi** = Bacteria + Fermentation.
- **Paneer** = Acid + Coagulation + Draining.
- **Peda** = Khoa + Sugar.

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69. A concentrated and sweetened whole milk product containing several layers of clotted cream is -

(A) Paneer
(B) Rabri
(C) Channa
(D) Gulabjamun

Correct Answer: (B) Rabri

Solution:
Step 1: Understanding the Concept:
The question asks to identify a specific traditional Indian dairy dessert based on its description: concentrated, sweetened, and containing layers of clotted cream.

Step 2: Detailed Explanation:
Let's analyze the manufacturing process described and compare it to the options:

- **The Description:** The key features are:
  1. **Concentrated and sweetened whole milk:** This is the base, similar to Basundi or Khoa.
  2. **Several layers of clotted cream:** This is the unique and defining characteristic.

  This describes the process of making **Rabri**. Rabri is made by simmering milk in a large, shallow pan for a long time. As the milk heats, a layer of cream (malai) forms on the surface. This layer is carefully skimmed off and collected on the side of the pan. The process is repeated, building up several layers of this clotted cream. Finally, the remaining milk is sweetened and concentrated, and the collected layers of malai are mixed back into it, creating a rich, thick product with a distinct flaky, layered texture.
- **Evaluating the Options:**
  - (A) Paneer: This is an acid-coagulated, unsweetened, pressed cheese. It does not fit the description.
  - (B) Rabri: This perfectly matches the description of a sweetened, concentrated milk product with layers of malai (clotted cream).

- (C) Channa: This is the acid-coagulated solid used to make sweets like Sandesh and Rasgulla. It is unsweetened and has a crumbly texture.
- (D) Gulabjamun: This is a sweet made from Khoa that is deep-fried and soaked in sugar syrup. It doesn't fit the description.

Step 3: Final Answer:
The product described is Rabri. Therefore, option (B) is the correct answer.

Quick Tip

The key to identifying Rabri is the "layers of clotted cream" (malai). While Basundi is also a sweetened, concentrated milk product, it has a smooth, flowing consistency. Rabri is defined by its flaky, layered texture from the collected malai.

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70. Which of the following agencies does prescribe the level of treatment needed for a dairy plant?

(A) FDA
(B) IDF
(C) EPA
(D) WHO

Correct Answer: (C) EPA

Solution:
Step 1: Understanding the Concept:
The question asks which agency prescribes the "level of treatment" needed for a dairy plant. This is a slightly ambiguous question. "Treatment" could refer to the treatment of milk (pasteurization, etc.) or the treatment of waste/effluent from the plant. Given the options, it is most likely referring to environmental regulations and waste treatment.

Step 2: Detailed Explanation:
Let's analyze the roles of the agencies listed:

- **(A) FDA (Food and Drug Administration):** This is a US agency (with equivalents in other countries, like FSSAI in India) responsible for ensuring the safety of food, drugs, and cosmetics. The FDA prescribes the requirements for processing food, such as the time-temperature combinations for pasteurization (the Pasteurized Milk Ordinance or PMO is a key FDA document). So, they prescribe the treatment of the *product*.
- **(B) IDF (International Dairy Federation):** The IDF is a global, non-governmental organization that represents the dairy sector. It develops science-based standards and guidelines for dairy products and practices. While influential, it does not have legal regulatory power to "prescribe" levels of treatment; rather, it provides recommendations that national bodies may adopt.

- **(C) EPA (Environmental Protection Agency):** This is a US agency (with equivalents in other countries, like the Central Pollution Control Board in India) responsible for protecting human health and the environment. The EPA sets limits on pollutants that can be discharged into the air, water, and land. Dairy plants produce a large amount of effluent (wastewater) rich in organic matter (BOD/COD). The EPA prescribes the level of *waste treatment* required for this effluent before it can be discharged. This fits the question's wording well.
- **(D) WHO (World Health Organization):** The WHO is a specialized agency of the United Nations concerned with international public health. It works with organizations like the FAO to develop international food safety standards (e.g., through Codex Alimentarius) but does not directly regulate individual dairy plants.

Given the choice between FDA (regulates the product) and EPA (regulates the waste), the term "level of treatment needed for a dairy plant" more broadly encompasses environmental compliance, a primary role of the EPA. If the question were "treatment of milk", FDA would be a better answer. Since it refers to the "plant", EPA is the most appropriate choice.

Step 3: Final Answer:
The Environmental Protection Agency (EPA) is the agency responsible for setting and enforcing regulations on the treatment and discharge of waste from industrial facilities, including dairy plants. Therefore, option (C) is the most fitting answer.

Quick Tip

Link the agency to its domain:

- **FDA/FSSAI:** Food safety, product standards.
- **EPA/CPCB:** Environment, pollution, waste treatment.
- **IDF:** Industry guidelines, science.
- **WHO/FAO (Codex):** International food standards.

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71. Sweetened Dahi is also known as -

(A) Misti dahi
(B) Blue dahi
(C) Rasmalai
(D) Kheer

Correct Answer: (A) Misti dahi

Solution:
Step 1: Understanding the Concept:

The question asks for the common name of a specific type of traditional Indian dairy product, sweetened dahi. This requires knowledge of regional Indian food terminology.

Step 2: Detailed Explanation:

- **The Product:** The product is dahi (yogurt) that has been sweetened.
- **Regional Name:** This product is a delicacy that originates from the state of West Bengal and is popular throughout Eastern India. In the Bengali language:
  - "Misti" means sweet.
  - "Doi" means dahi or curd.

  Therefore, sweetened dahi is known as **Misti Doi**. It is typically made by boiling milk to concentrate it slightly, sweetening it (often with palm jaggery, which gives it a characteristic brownish color and flavor), and then fermenting it. It is known for its thick, creamy, custard-like consistency.
- **Evaluating the Options:**
  - (A) Misti dahi: This is the correct Bengali name for sweetened dahi.
  - (B) Blue dahi: This is not a recognized product.
  - (C) Rasmalai: This is a different sweet made of chhena (paneer-like) patties soaked in sweetened, thickened milk (rabri).
  - (D) Kheer: This is a milk pudding made by boiling milk with rice, vermicelli, or other grains.

Step 3: Final Answer:
The traditional name for sweetened dahi, especially in its region of origin (Bengal), is Misti Doi. Therefore, option (A) is the correct answer.

Quick Tip

Learning a few key words from regional Indian languages can be very helpful for food-related questions. For Bengali sweets, "Misti" = Sweet and "Doi" = Curd/Yogurt.

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72. HACCP stands for -

(A) HAZARD ANALYSIS AND CRITICAL CONTROL POINT
(B) HAZARD ANALYSIS AND CONTROL CRITICAL POINT
(C) HAZARD ANALYSIS AND CHEMICAL CONTROL POINT
(D) HAZARD ANALYST AND CONTROL CRITICAL POINT

Correct Answer: (A) HAZARD ANALYSIS AND CRITICAL CONTROL POINT

Solution:
Step 1: Understanding the Concept:
The question asks for the full form of the acronym HACCP. HACCP is a systematic, preventive approach to food safety that is widely used in the food industry worldwide.

Step 2: Detailed Explanation:
The acronym HACCP stands for **Hazard Analysis and Critical Control Point**. Let's break down the meaning:

- **Hazard Analysis (HA):** This is the first step. It involves identifying all potential biological, chemical, and physical hazards that could reasonably be expected to occur at each step in the food production process.
- **Critical Control Point (CCP):** This is a step in the process at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level. For example, the pasteurization step in a dairy is a CCP for controlling pathogenic bacteria.

The system is designed to identify and control potential problems before they happen, rather than relying on testing the final product. Let's look at the options:

- (A) HAZARD ANALYSIS AND CRITICAL CONTROL POINT: This is the correct and internationally accepted full form.
- (B), (C), (D): These options alter the correct wording. "Control Critical Point", "Chemical Control Point", and "Hazard Analyst" are all incorrect variations.

Step 3: Final Answer:
The correct full form for HACCP is Hazard Analysis and Critical Control Point. Therefore, option (A) is the correct answer.

Quick Tip

Remember the two key parts of the HACCP system: First, you **Analyze the Hazards**, then you find the **Critical Control Points** to manage them. This helps recall the exact wording: Hazard Analysis and Critical Control Point.

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73. For keeping liaison with CAC and to coordinate Codex activities in India, Food Safety and Standards Authority of India constitutes -

(A) Export Quality Control
(B) National Codex Contact Point
(C) Export Inspection Council
(D) Export Inspection Agencies

Correct Answer: (B) National Codex Contact Point

Solution:
Step 1: Understanding the Concept:
The question asks to identify the specific body or point of contact established by FSSAI in India to interact with the Codex Alimentarius Commission (CAC) and manage Codex-related activities within the country.

Step 2: Detailed Explanation:

- **Codex Alimentarius Commission (CAC):** This is an international food standards body established jointly by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). It develops standards, guidelines, and codes of practice to protect consumer health and ensure fair practices in the food trade.
- **National Coordination:** For the Codex system to work, each member country needs a central body to coordinate all national activities, communicate with the main CAC body, and represent the country's interests.
- **The Designated Body:** This central body is officially known as the **National Codex Contact Point (NCCP)**. In India, the Food Safety and Standards Authority of India (FSSAI) has been designated as the NCCP. The FSSAI is responsible for:
  - Acting as the link between the Codex Secretariat and India.
  - Coordinating the opinions of various stakeholders within India (government, industry, consumers) on Codex matters.
  - Formulating India's position on various food standards being discussed at the international level.
- **Other Options:** The Export Inspection Council (EIC) and Export Inspection Agencies (EIAs) are bodies related to the quality control and inspection of products specifically for export, which is a related but different function.

Step 3: Final Answer:
The body constituted by FSSAI to liaise with the Codex Alimentarius Commission and coordinate its activities in India is the National Codex Contact Point. Therefore, option (B) is the correct answer.

Quick Tip

The structure is logical: For an international body like Codex, each nation needs a single point of contact. The name for this is literally "National Codex Contact Point". FSSAI is the organization that houses this contact point in India.

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74. The sugar content of flavoured milk ranges between

(A) 4-5%
(B) 2-3%

(C) 5-7%
(D) 12-14%

Correct Answer: (C) 5-7

Solution:
Step 1: Understanding the Concept:
The question asks for the typical range of **added sugar** in flavored milk. Flavored milk is a sweetened dairy beverage. It's important to consider the total sugar content versus the added sugar.

Step 2: Detailed Explanation:

- **Base Sugar Content (Lactose):** Normal milk naturally contains about 4.5% to 5.0% sugar in the form of lactose. This provides some natural sweetness.
- **Added Sugar (Sucrose):** To make flavored milk (like chocolate, strawberry, etc.), additional sugar (usually sucrose) is added to provide the desired sweetness and mask the flavor of additives like cocoa.
- **Typical Formulation:** The amount of added sugar is typically in the range of **5% to 7%**. This is added on top of the existing lactose.
- **Total Sugar Content:** Therefore, the total sugar content of the final flavored milk product would be the sum of lactose and added sucrose, resulting in a total of roughly 10-12%.
- **Interpreting the Question:** The question asks for "the sugar content", which can be ambiguous. However, in the context of flavored milk, it usually refers to the amount of sugar added to the formulation, as the lactose content is constant.
- **Evaluating the Options:**
  - (A) 4-5%: This is the level of natural lactose in milk, not the added sugar.
  - (B) 2-3%: This would be very lightly sweetened and is not typical.
  - (C) 5-7%: This is the standard industrial range for the amount of sucrose added to flavored milk to achieve a pleasant taste.
  - (D) 12-14%: This is closer to the *total* sugar content (lactose + added sugar), not just the added sugar.

Given the standard way formulations are discussed, the question is most likely asking for the percentage of added sugar.

Step 3: Final Answer:
The typical amount of sugar added to produce flavored milk is in the range of 5-7%. Therefore, option (C) is the most appropriate answer.

Quick Tip

When dealing with sweetened dairy products, always remember that milk starts with about 5% natural sugar (lactose). Any added sugar is on top of this. For flavored milk, a common addition is another 5-7% sucrose.

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75. Frequently used packaging materials in dairy industry are
A. Polythene (PE)
B. LDPE
C. HDPE
D. Polypropylene (PP)
Choose the correct 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:
The question asks to identify the common types of plastic polymers used for packaging in the dairy industry from the given list. Different plastics are used for different applications (films, bottles, cups, etc.) based on their properties.

Step 2: Detailed Explanation:
Let's analyze each material:

- **A. Polythene (PE):** This is the general chemical name for a family of plastics that includes LDPE and HDPE. So, if LDPE and HDPE are used, then PE as a general class is also used.
- **B. LDPE (Low-Density Polyethylene):** LDPE is a flexible, transparent, and heat-sealable polymer. It is very widely used to make flexible pouches or sachets for packaging liquid milk, which is a huge market in countries like India. It's also used as a coating layer in paperboard cartons (like Tetra Pak). This is a frequently used material.
- **C. HDPE (High-Density Polyethylene):** HDPE is a more rigid and opaque plastic compared to LDPE. It is commonly used to make blow-molded bottles and jugs for milk, as well as caps for these bottles. This is a frequently used material.
- **D. Polypropylene (PP):** PP is a versatile plastic with good heat resistance. It is commonly used to make injection-molded tubs, cups, and containers for products like yogurt, ice cream, butter, and margarine. Its ability to withstand hot-filling makes it very useful. This is a frequently used material.

Step 3: Final Answer:
Polythene (PE) is the parent category for LDPE and HDPE. LDPE is used for milk pouches, HDPE is used for milk bottles, and Polypropylene (PP) is used for yogurt/ice cream tubs. All of them are frequently and widely used in the dairy industry. Therefore, the option including A, B, C, and D is correct.

Quick Tip

Associate the plastic type with the dairy package:

- **LDPE** (Low-Density) → Flexible **Pouches**.
- **HDPE** (High-Density) → Rigid **Bottles**.
- **PP** (Polypropylene) → Heat-resistant **Tubs/Cups** (for yogurt, ice cream).
